House of Lords
Lord Oxburgh of Liverpool
E-mail [redacted]

Professor David Hand
Professor of Statistics
Department of Mathematics
Imperial College London

10 March 2010

Dear Professor Hand,

You will be aware from the extensive media coverage that late last year there was a cyber-attack on the e-mail system of the Climatic Research Unit of the University of East Anglia in Norwich. A large number of e-mails were then leaked and were interpreted by some of the media as establishing scientific malpractice and deception at the Unit which has made its name in doing some of the primary science of climate change. The University has every confidence in the Unit but recognises that today that is not enough and is extremely anxious that, whatever it may be, the truth be independently established.

An independent lay-led inquiry has been established by the University to look at working practices and data handling within the Unit and in parallel I have been invited jointly by the University and the Royal Society to put together a small group to re-evaluate some important elements of the Unit's published science. This work comprises around a dozen papers largely published in major peer-reviewed journals.

The Royal Society has helped to identify a small group of independent scientists, who have not had a primary involvement in discussions of climate change but do have experience relevant to the CRU work. Although all the panel would be welcome to read all the work it is planned that each paper would be looked at in detail by at least two members, and each member would be asked to pay attention to several papers in particular. I am attaching a list of the publications that need to be scrutinized.

Letter from Lord Oxburgh
10 March 2010

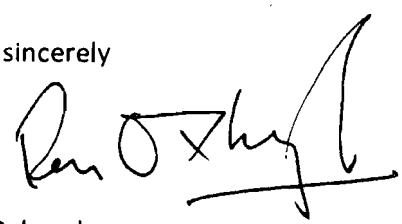
It is hoped to bring the external reviewers together for two days in Norwich with a view to carrying out any study of original material or interviews that they regarded as necessary and for agreeing a report. As you might have guessed the purpose of this letter is to invite you to participate in this review. I hope very much that you will agree and would be grateful if you could let me know as soon as possible. Clearly this is a miserable time for the researchers themselves. It is urgent that the panel should get to work soon, and UEA would like to issue details of the panel's membership this week if at all possible.

I am proposing that as soon as the panel is established we should assign primary responsibility for chosen items and try to arrange a couple of days that we may all be in Norwich, ideally within the next month or so. Given the short notice and people's crowded diaries this is going to be the difficult part. Tentatively we have identified the days 6-8 April for a visit to Norwich. If this does not suit we will try other times. If this doesn't work - and much less satisfactory - some members could come on one occasion and the others on another. I and, hopefully one other, could be present on both occasions to ensure continuity.

UEA will support business class travel and provide accommodation in a good hotel and incidental expenses for panel members.

As soon as panel members accept we shall be in touch about detailed logistics. I look forward to hearing from you. Please reply by e-mail to Lisa Williams [Lisa.Williams@uea.ac.uk] in the Vice-Chancellor's Office at UEA.

Yours sincerely



Lord Oxburgh

House of Lords

Lord Oxburgh of Liverpool
E-mail [redacted]

15 March 2010

Dear Colleagues,

First may I thank you all for agreeing to help with this assignment. I am most grateful to you for rearranging your plans so that you can participate. Everyone we approached agreed to serve and I believe that we have a very strong group.

Last week I made my first visit to UEA for many years. I was able to meet with members of the Climatic Research Unit. It is very small department with only a handful of 'permanent' staff and a dozen or so post-docs and research associates. There is clearly a high level of stress that has been generated by aggressive and abusive blogs and a very large number of requests for information under Freedom of Information legislation. I wanted to reassure them that we were in no sense seeking to victimise them further and that our scrutiny would be as fair as we could make it.

As far as assessing the work of the Unit goes, we are primarily concerned with the question of whether there has been any deliberate attempt to withhold or manipulate data or any other inappropriate conduct to achieve a particular outcome. This is different from approving the researchers' approach to particular problems or agreeing with their analysis, judgement or conclusions. The group I met pointed out that in the light of more recent experience and knowledge, the conclusions of some of the earlier work that we are asked to look at would certainly need to be modified.

I think that you have received the list of publications that we are asked to consider. We shall all have to assess work that is outside our normal academic comfort zone. Bearing that in mind I should be very grateful if you could review the list and identify the three or four papers that you would be willing to look at carefully. In an ideal world we would end up with the right number of reviewers for each paper but the world is not ideal and I shall undoubtedly have to come back to some or all of you with a request to extend into some less familiar territory.

Now to how we go about our task:

I hope that our final report may comprise a list of the publications we have considered in which each is followed by a few or at the most ten lines of comment.

Ideally we might be able to round the report off with half a page or so of overall conclusions, but depending on our findings this could be more. I would hope that we could complete and agree the report before we leave Norwich

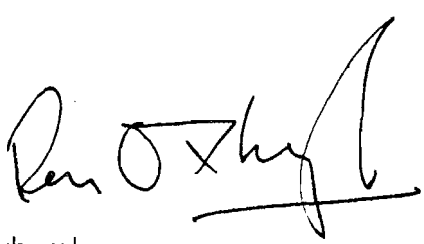
To achieve this it would be helpful if we each arrived in Norwich with comments on the papers that we have been asked to review (and, of course, any others on which we have formed a view) and a note of those people to whom we might like to speak to personally and what if any data we should see. In the case of some of the papers some of the authors may have moved on but I will ask the University to let us have the details of this.

There is an attachment to this message which you need not read unless you wish to do so. It is a document prepared in answer to questions from the lay Committee set up by the University to look into other questions about the conduct of the Climatic Research Unit. You will note that they have understandably asked some questions that relate to the science. I was in two minds whether to send it to you because our job is to focus on the publications themselves. I decided to do so because for those of us for whom some of this material is new it provides a relatively easy way in to some aspects of the subject. Any member of the Panel is welcome to see any other material, or supporting documentation that has been published relating to the current inquiries, including the evidence that was submitted by the University to the Science and Technology Committee of the House of Commons before which the University was summoned to appear. Simply request it by email from Lisa.

Finally it is possible that we may all be subject to personal comment from bloggers and media alike, and any of us may be contacted directly by the media. Should this happen I would ask you not to respond to any such approaches or to speak to the media for the time being. While our work is under way we should avoid fuelling speculation and keep our powder dry until we are ready to issue our final report.

I apologise for the length of this letter and would be grateful to have the indication of which papers you would prefer to review as soon as possible. When I have this information I will circulate a complete reviewer list. I should also be very happy to hear any other comments or answer any questions that you may have.

With my thanks and good wishes,



Lord Oxburgh

Panel Biographies

Ron Oxburgh FRS (Lord Oxburgh of Liverpool) trained originally as a geologist and has worked as an academic, a civil servant and in business. He taught and researched in geology and geophysics at Oxford, and Cambridge, with periods at California Institute of Technology and Stanford universities. From 1982 to 1989 he served as President of Queens' College Cambridge. Between 1987 and 1993 he was Chief Scientific Adviser to the Ministry of Defence and from 1993 to 2001 Rector of Imperial College. He was non-executive Chairman of Shell Transport and Trading until the Company merged with Royal Dutch Petroleum to form Royal Dutch Shell in 2005. He is currently President of the Carbon Capture and Storage Association and Chairman of Falck Renewables. He is a former Chairman of the Trustees of the Natural History Museum and of the House of Lords Select Committee on Science and Technology. He is Foreign member of the US, Australian and German Academies of Science.

Professor Michael Kelly FRS is Prince Philip Professor of Technology at the University of Cambridge, where during 2003-5 he was also executive director of the Cambridge-MIT Institute. He was a member of the research staff of GEC during 1981-1992, and professor of physics and electronics at the University of Surrey during 1992-2002, and head of its School of Electronics and Physical Sciences during 1996-2001. He is also a non-executive director of the Laird Group plc. He is a fellow of the Royal Societies of London and New Zealand and of the Royal Academy of Engineering, the Institute of Physics and the Institute of Engineering and Technology. He was chief scientific adviser to the Department of Communities and Local Government from 2006 to 2009.

Professor Herbert Huppert FRS has been Professor of Theoretical Geophysics and Foundation Director, Institute of Theoretical Geophysics, at Cambridge University since 1989 and Fellow of King's College Cambridge since 1970. He was elected Fellow of the Royal Society in 1987. His area of expertise is general fluid mechanics, in particular as applied to the Earth Sciences. Current areas of active research include: phase changes between fluid and solids (solidification and melting); formation of ice in the Arctic and Antarctic; propagation of gravity currents; particle-driven flows; turbidites and pyroclastic flows; flow of granular media; volcanic eruption dynamics; natural ventilation; slow viscous motions; flow in porous media and carbon dioxide sequestration.

Kerry Emanuel is Professor of Meteorology at the Massachussets Institute of Technology and was elected a Member of the US National Academy of Sciences in 2007. He specialises in atmospheric convection, tropical cyclones and the mechanisms acting to intensify hurricanes, coining the term "hypercane" in 1994. His research group at MIT has developed a promising technique for inferring tropical cyclone activity from climate models. He was named one of the 100 influential people of 2006 by Time Magazine.

Huw Davies is Professor Emeritus at the ETH in Zürich where he served as both Director of the Institute for Atmospheric & Climate Science and Head of the Department of Environmental Sciences. He graduated from the University of Wales, studied for his doctorate at Imperial College London, and is a member of the Academia Europaea. He has served as President of the International Association of Meteorology & Atmospheric Science (IAMAS), and as a member of the Swiss Research Council and the World Weather Research Programme. Currently he is on the council of the Natural Environment Research Council (NERC), and on the executive committee of the International THORPEX programmes. His research is in the fields of atmospheric dynamics and short-term climate variability.

David Hand FBA is Professor of Statistics in the Department of Mathematics at Imperial College. He is also Chief Scientific Adviser to Winton Capital Management, and President of the Royal Statistical Society. He has broad research interests, including multivariate statistics, classification methods, pattern detection, the interface between statistics and computing, and the foundations of statistics. He has wide-ranging consultancy experience to organisations ranging from banks, through pharmaceutical companies, to governments.

Lisa Graumlich is Director of the School of Natural Resources and the Environment at The University of Arizona. As a researcher, she investigates how ecosystems and human societies adapt to climate change, with a special focus on severe and persistent droughts. She started her career at The University of Arizona in the Laboratory of Tree-Ring Research and was first Director of the University of Arizona's Institute for the Study of Planet Earth. In 1999, she moved to Montana State University to direct the Big Sky Institute, returning to Arizona to take up her current post in 2007.

House of Commons

Science and Technology Committee

The disclosure of climate data from the Climatic Research Unit at the University of East Anglia

Eighth Report of Session 2009–10

Report, together with formal minutes

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The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science. Under arrangements agreed by the House on 25 June 2009 the Science and Technology Committee was established on 1 October 2009 with the same membership and Chairman as the former Innovation, Universities, Science and Skills Committee and its proceedings were deemed to have been in respect of the Science and Technology Committee.

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The Committee is one of the departmental Select Committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No.152. These are available on the Internet via www.parliament.uk.

Publications

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at http://www.parliament.uk/science. A list of reports from the Committee in this Parliament is included at the back of this volume.

Committee staff

The current staff of the Committee are: Glenn McKee (Clerk); Richard Ward (Second Clerk); Dr Christopher Tyler (Committee Specialist); Xameerah Malik (Committee Specialist); Andy Boyd (Senior Committee Assistant); Camilla Brace (Committee Assistant); Dilys Tonge (Committee Assistant); Melanie Lee (Committee Assistant); Jim Hudson (Committee Support Assistant); and Becky Jones (Media Officer).

Contacts

All correspondence should be addressed to the Clerk of the Science and Technology Committee, Committee Office, 7 Millbank, London SW1P 3JA. The telephone number for general inquiries is: 020 7219 2793; the Committee's e-mail address is: scitechcom@parliament.uk.

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Summary

The disclosure of climate data from the Climatic Research Unit (CRU) at the University of East Anglia (UEA) in November 2009 had the potential to damage the reputation of the climate science and the scientists involved.

We believe that the focus on CRU and Professor Phil Jones, Director of CRU, in particular, has largely been misplaced. Whilst we are concerned that the disclosed e-mails suggest a blunt refusal to share scientific data and methodologies with others, we can sympathise with Professor Jones, who must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to undermine his work.

In the context of the sharing of data and methodologies, we consider that Professor Jones's actions were in line with common practice in the climate science community. It is not standard practice in climate science to publish the raw data and the computer code in academic papers. However, climate science is a matter of great importance and the quality of the science should be irreproachable. We therefore consider that climate scientists should take steps to make available all the data that support their work (including raw data) and full methodological workings (including the computer codes). Had both been available, many of the problems at UEA could have been avoided.

We are content that the phrases such as "trick" or "hiding the decline" were colloquial terms used in private e-mails and the balance of evidence is that they were not part of a systematic attempt to mislead. Likewise the evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers.

In the context of Freedom of Information (FOIA), much of the responsibility should lie with UEA. The disclosed e-mails appear to show a culture of non-disclosure at CRU and instances where information may have been deleted, to avoid disclosure. We found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited.

The Deputy Information Commissioner has given a clear indication that a breach of the Freedom of Information Act 2000 may have occurred but that a prosecution was time-barred; however no investigation has been carried out. In our view it is unsatisfactory to leave the matter unresolved. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner.

We accept the independence of the Climate Change E-mail Review and recommend that the Review be open and transparent, taking oral evidence and conducting interviews in public wherever possible.

On 22 March UEA announced the Scientific Appraisal Panel to be chaired by Lord

Oxburgh. This Panel should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge its work.

1 Introduction

1. On Friday 20 November 2009 it was reported across the world that hackers had targeted a "leading climate research unit"[1] and that e-mails from the University of East Anglia's (UEA) Climatic Research Unit (CRU), one of the world's foremost centres of climate science, had been published in the internet.[2] The story of the substantial file of private e-mails, documents and data that had been leaked helped ignite the global warming debate in the run up to the Copenhagen climate change conference in December 2009. As reported by the press, exchanges on the internet alleged that data had been manipulated or deleted, in order to support evidence on global warming.

The Climatic Research Unit at UEA

2. UEA was founded in 1963 and in 1972 UEA established CRU.[3] CRU's website describes the Unit as being "widely recognised as one of the world's leading institutions concerned with the study of natural and anthropogenic [human caused] climate change".[4] CRU has a staff of around thirty research scientists and students.[5] But as we heard in oral evidence, it is in fact "a very small Unit [with only] three full-time members of academic staff".[6]

3. CRU has developed a number of the datasets widely used in climate research, including the global temperature record used to monitor the state of the climate system, as well as statistical software packages and climate models. In its written submission to the inquiry UEA outlined CRU's "pioneering role" in the science of understanding the world's changing climate. CRU's contributions included the compilation of a global land temperature record and the development of increasingly sophisticated methods by which to represent the average temperature of the globe and changes in that average over time.[7] Professor Edward Acton, the Vice-Chancellor of UEA, indicated that he was "immensely proud of what they have done; [as] without them humanity would be vastly less able to understand climate change."[8]

The disclosure of climate data

4. In mid November 2009 it appeared that a server used by CRU had been accessed with 160 MB of data containing more than 1,000 e-mails and 3,000 other documents being

1 "Hackers target leading climate research unit", *BBC News website*, 20 November 2009 news.bbc.co.uk/1/hi/sci/tech/8370282.stm

2 For example: "Hacked E-Mail Is New Fodder for Climate Dispute", *New York Times website*, 21 November 2009 www.nytimes.com/2009/11/21/science/earth/21climate.html?_r=4 and "Hackers leak emails, stoking climate debate", *Sydney Morning Herald website*, 23 November 2009, www.smh.com.au/technology/technology-news/hackers-leak-emails-stoking-climate-debate-20091123-iu6u.html

3 Ev 17, paras 1.2 and 1.5

4 "About the Climatic Research Unit", CRU website, www.cru.uea.ac.uk/cru/about/

5 *As above*

6 Q 92

7 Ev 17, paras 1.5-1.6

8 Q 152

copied.[9] A UEA spokeswoman confirmed that the information was not available on a server that could be easily accessed and could not have been inadvertently released.[10] It is not known exactly when the breach occurred; the RealClimate website, "a commentary site on climate science by working climate scientists for the interested public and journalists",[11] indicated that UEA had been notified of the possible security breach on 17 November.[12] The following was posted anonymously on the climate-sceptic blog, *The Air Vent*:

> November 17, 2009 at 9:57 pm
>
> We feel that climate science is, in the current situation, too important to be kept under wraps.
>
> We hereby release a random selection of correspondence, code, and documents. Hopefully it will give some insight into the science and the people behind it.[13]

From here the debate was "blown wide open".[14] *The Guardian* ran the story on 20 November with the headline: "Climate sceptics claim leaked e-mails are evidence of collusion among scientists".[15]

5. UEA issued a statement on 20 November: "This information has been obtained and published without our permission and we took immediate action to remove the server in question from operation. We are undertaking a thorough internal investigation and we have involved the police in this inquiry."[16] The e-mails contained technical and routine aspects of climate research, including data analysis and details of scientific conferences. The controversy has focused on a small number of e-mails, particularly those sent to, or written by, climatologist Professor Phil Jones, the Director of CRU.

The aftermath

6. Condemnation of alleged malpractices found within the leaked CRU e-mails was quickly disseminated on the internet. Contributors to climate change debate websites and written submissions to us claimed that these e-mails showed a deliberate and systematic attempt by leading climate scientists to manipulate climate data, arbitrarily adjusting and "cherry-picking" data that supported their global warming claims and deleting adverse data that questioned their theories.[17] It was alleged that UEA may not have complied with the requirements of the Freedom of Information Act 2000, that inappropriate statistical methods and defective computer programmes may have been used to analyse data and that

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9 RealClimate website archive, November 2009, www.realclimate.org/index.php/archives/2009/11/the-cru-hack

10 "Scotland Yard call in to probe climate data leak from UEA in Norwich", *Norwich Evening News*, 1 December 2009

11 RealClimate website 'about' page, www.realclimate.org

12 RealClimate website archive, November 2009, www.realclimate.org/index.php/archives/2009/11/the-cru-hack; the data may have been downloaded on to the RealClimate—see paragraph 12.

13 The Air Vent website, November 2009 archive, noconsensus.wordpress.com/2009/11/page/3/

14 *As above*

15 "Climate sceptics claim leaked emails are evidence of collusion among scientists", *The Guardian*, 20 November 2009

16 "Sceptics publish climate e-mails 'stolen from East Anglia University'", *The Times*, 21 November 2009

17 For examples see Ev 85 [Roger Helmer MEP], Ev 92 [Godfrey Bloom MEP], and Ev 144 [Stephen McIntyre]

CRU may have attempted to abuse the process of peer review to prevent the publication of research papers with conflicting opinions about climate change.[18]

7. In a statement released on 24 November, Professor Trevor Davies, UEA pro-Vice-Chancellor with responsibility for research, rejected calls for Professor Jones's resignation: "We see no reason for Professor Jones to resign and, indeed, we would not accept his resignation. He is a valued and important scientist."[19] He also contested several of the claims of malpractice: "It is well known within the scientific community and particularly those who are sceptical of climate change that over 95% of the raw station data has been accessible through the Global Historical Climatology Network for several years. We are quite clearly not hiding information which seems to be the speculation on some blogs and by some media commentators". He added:

> There is nothing in the stolen material which indicates that peer-reviewed publications by CRU, and others, on the nature of global warming and related climate change are not of the highest-quality of scientific investigation and interpretation. CRU's peer-reviewed publications are consistent with, and have contributed to, the overwhelming scientific consensus that the climate is being strongly influenced by human activity.[20]

8. On 1 December, Professor Jones announced that he would step aside from the Director's role during the course of the independent review.[21]

The independent inquiries set up by UEA

9. On 3 December UEA announced that an independent review—the Independent Climate Change Email Review—into the allegations made against CRU would be carried out by Sir Muir Russell.[22] Professor Acton explained in a letter to us why Sir Muir was chosen to head the review:

> Sir Muir is extremely experienced in public life, has an understanding of the conduct of universities and research, and is entirely independent of any association with this University and with the climate change debate.[23]

10. Alongside the Independent Climate Change E-Mails Review, UEA decided on a separate scientific assessment of CRU's key scientific publications; an external reappraisal of the science itself. The Royal Society agreed to assist UEA in identifying assessors with the requisite experience, standing and independence.[24] UEA announced on 22 March that Lord Oxburgh FRS would "chair an independent Scientific Assessment Panel to examine

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18 For examples see Ev 90 [Phillip Bratby]; Ev 115 [David Holland], para 2; Ev 144 [Stephen McIntyre]; Ev 194 [Peabody Energy Company], para 24.

19 "Climate scientist at centre of leaked email row dismisses conspiracy claims", *The Guardian*, 24 November 2009

20 UEA, "CRU update 2", 24 November 2009, www.uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate

21 UEA, "CRU update 3", 1 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/nov/CRUupdate

22 "Sir Muir Russell to head the Independent Review into the allegations against the Climatic Research Unit (CRU)", UEA Press Release, 3 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/dec/CRUreview

23 Ev 16

24 Ev 18, para 2.3

important elements of the published science of the Climatic Research Unit (CRU) at the University of East Anglia".[25]

Our inquiry

11. We were concerned by the press reports and on 1 December 2009 the Chair of the Committee wrote to the Vice-Chancellor of UEA. The letter explained that we took a close interest in academic integrity and the systems in place to ensure the quality of evidence from research and evidence-based policy making. The letter requested a note on the recent events setting out:

a) what had taken place;

b) the steps that had been taken to investigate the allegations and to test the integrity of the data held and used by CRU;

c) how CRU justified its commitment to academic transparency; and

d) how the Vice-Chancellor proposed to restore confidence in CRU and its handling of data.

We also asked for an assurance that none of the data referred to in the e-mails that had been publicised had been destroyed.[26]

12. UEA replied on 10 December 2009. It explained that "a significant amount of material including emails and documents appears to have been accessed illegally from a back-up server in CRU and downloaded in whole, or possibly in part, on to the RealClimate website."[27] This incident was the subject of a police enquiry and the Norfolk Constabulary investigation was expected to take some time. UEA was keen to stress that this "episode is being treated very seriously" and announced that it had set up the independent inquiry, headed by Sir Muir Russell, to investigate the allegations against CRU. UEA said that "none of the adjusted station data referred to in the emails that have been published has been destroyed."[28]

13. In the light of the gravity of the allegations against CRU, the growing weight of damaging press coverage, on-going concerns about the deletion of data and the serious implications for UK science we decided to hold an inquiry into the disclosure of the data at CRU. On 22 January 2010 we therefore announced the inquiry inviting submissions on three key issues:

- What were the implications of the disclosures for the integrity of scientific research?
- Were the terms of reference and scope of the Independent Review announced on 3 December 2009 by UEA adequate?

25 "CRU Scientific Assessment Panel announced", UEA Press Release, 22 March 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAPannounce

26 House of Commons Science and Technology Committee Press Notice 04, 7 December 2009, Session 2009–10

27 Ev 16

28 Ev 17

- How independent were the other two international data sets (see paragraph 23)?

14. If there had been more time available before the end of this Parliament we would have preferred to carry out a wider inquiry into the science of global warming itself. In response to enquiries we issued a statement on 1 February making it clear that the inquiry would focus on the terms of reference announced on 22 January and that this was not an inquiry into global warming.[29]

15. We set a deadline of 10 February for the submission of memoranda and we have received 58 submissions, not including supplementary memoranda. We held one oral evidence session on 1 March, when we took evidence from five panels:

a) Rt Hon Lord Lawson of Blaby, Chairman, and Dr Benny Peiser, Director, Global Warming Policy Foundation;

b) Richard Thomas CBE, former Information Commissioner;

c) Professor Edward Acton, Vice-Chancellor, UEA and Professor Phil Jones, Director of CRU;

d) Sir Muir Russell, Head of the Independent Climate Change E-Mails Review; and

e) Professor John Beddington, Government Chief Scientific Adviser, Professor Julia Slingo OBE, Chief Scientist, Met Office, and Professor Bob Watson, Chief Scientist, Department for Environment, Food and Rural Affairs.

16. We would like to thank everyone who contributed to the inquiry through written submissions or oral evidence. We also received unsolicited copies of a number of books challenging anthropogenic global warming and reviewing events at CRU and the disclosed e-mails.[30]

Our Report

17. In the time left before the end of this Parliament we will not be able to cover all the issues raised by the events at UEA, nor cover all the ground that would be covered by the Independent Climate Change Email Review and the Scientific Appraisal Panel. We have therefore concentrated on what we believe to be key issues. Of central concern is the accuracy and availability of CRU's data, datasets and computer programming, which we address in Chapter 2 of this Report; and related to the data and methodology is the question of access, or the withholding of access, under the Freedom of Information Act 2000 which we cover in Chapter 3. Finally, in Chapter 4 we comment on the independent reviews that UEA has announced.

29 House of Commons Science and Technology Committee Press Notice 11, 1 February 2010, Session 2009–10

30 The Committee received the following books:
Christopher Booker, *The Real Global Warming Disaster*, Continuum, 2009
A.W. Montford, *The Hockey Stick Illusion*, Stacey International, 2010
Steven Mosher and Tom Fuller, *Climategate*, St Matthew Publishing, 2010
Ian Plimer, *Heaven and Earth*, Quartet Books Limited, 2009

2 Datasets

Climate science

18. *Climate* is distinct from *weather*: it is the average of weather conditions over a number of years. Climatologists study climates in different parts of the world and for the Earth as a whole. CRU, according to its website: "has developed a number of the data sets widely used in climate research, including the global temperature record used to monitor the state of the climate system, as well as statistical software packages and climate models".[31]

19. The process of calculating the Earth's average global temperatures (past, present and future) is complicated and lengthy. Data from thousands of weather stations all around the world, on land and at sea, must be collected, checked for quality, adjusted for inconsistencies and error margins, and then mapped onto a series of grids on the Earth's surface. The methods, results and conclusions are then presented to the academic world, first by passing the peer review process prior to publication, and second, after presentation, the scrutiny of the wider academic community.

20. Climate science, like any other science, uses the scientific method to make its assessments of past and present climate and predictions about the future climate. The key characteristics of the scientific method can be described as: characterisations, hypotheses, predictions, and experiments.

- Characterisations: consideration of a problem, and examination of whether or not an explanation exists for it.
- Hypotheses: if no such explanation exists, a new explanation is stated.
- Predictions: what consequences follow from a new explanation?
- Experiments: is the outcome consistent with the predicted consequences?

Each of these is subject to peer review prior to the formal sharing of knowledge through publication. Through peer review scientists allow their views and methods to be critically appraised expertly and externally.

- Replication and verification

To have the results and conclusions survive criticism or scepticism and be part of the accepted canon of scientific knowledge, most experiments will have to be demonstrably replicable (by the same group) to pass peer review and will often need to be verified by other independent researchers taking similar approaches.

21. Therefore climatologists are, like other scientists, required to test their theories—such as global warming and the causes of warming—against observational data. They must also replicate and verify their experiments, by holding independent datasets and conducting independent analyses of these datasets, and by publishing their full methods and results for

31 www.cru.uea.ac.uk/cru/about

scrutiny. Ultimately, these ideas are put up to the threat of falsification by other scientists working in the field.

22. In this Chapter we discuss some aspects of this process.

Context

23. There are three main international climate datasets, which have been built up from direct temperature measurements on land and sea at weather stations all around the world:

a) the National Climatic Data Center (NCDC) of the National Oceanographic and Atmospheric Administration (NOAA) in Asheville, North Carolina, USA;

b) the Goddard Institute of Space Studies (GISS), part of the National Aeronautic and Space Administration (NASA) in New York, USA; and

c) CRUTEM3, at CRU, UEA.[32]

24. In addition, there are two others, one in Russia and one in Japan, that use similar methods.[33] There are also two that use satellite observations, by the University of Alabama at Huntsville and by Remote Sensing Systems, California.[34]

25. Professor Jones, commenting on the different climate research groups around the world in the UK, US, Russia and Japan,[35] told us that:

> we are all working independently so we may be using a lot of common data but the way of going from the raw data to a derived product of gridded temperatures and then the average for the hemisphere and the globe is totally independent between the different groups.[36]

26. What sets the CRU dataset apart is its comprehensiveness:

> The CRU dataset, which forms the land surface component of the HadCRUT global temperature record, was compiled with the aim of comprehensiveness. The majority of the data in it are derived from the same freely-available raw data sets used by NOAA and NASA. However, it also includes data derived from station data that were obtained directly from countries, institutions and scientists on the understanding that they would not be passed on.[37]

Complaints and accusations

27. The complaints and accusations made against CRU in relation to the scientific process come under two broad headings. The first is transparency: that CRU failed to abide by best

32 Ev 21, para 4.2

33 Q 78

34 Ev 104 [D.R. Keiller], para 2

35 Q 79

36 Q 80

37 Ev 64 [John Beddington and Julia Slingo]

scientific practice by refusing to share its raw data and detailed methods. The second is honesty: that CRU has deliberately misrepresented the data, in order to produce results that fit its preconceived views about the anthropogenic warming of the climate. We take each of these complaints and accusations in turn.

Transparency

Raw data

28. Warwick Hughes, a "freelance earth scientist from Australia",[38] had asked Professor Jones for CRU's raw data. He received the following reply:

> I should warn you that some data we have we are not supposed [to] pass on to others. We can pass on the gridded data—which we do. Even if WMO [World Meteorological Organization] agrees, I will still not pass on the data. We have 25 or so years invested in the work. Why should I make the data available to you, when your aim is to try and find something wrong with it.[39]

29. On the face of it, this looks like an unreasonable response to a reasonable request. As Lord Lawson put it: "Ask any decent scientist and they will say the keystone for integrity in scientific research is full and transparent disclosure of data and methods".[40] However, Professor Jones, while confessing that he has sent some "awful" e-mails,[41] defended his position.

30. First, in answer to the question of whether the raw data are accessible and verifiable, Professor Jones told us that:

> The simple answer is yes, most of the same basic data are available in the United States in something called the Global Historical Climatology Network. They have been downloadable there for a number of years so people have been able to take the data, do whatever method of assessment of the quality of the data and derive their own gridded product and compare that with other workers.[42]

31. In addition, of course, there are the sources of the data, the weather stations, to which any individual is free to go and collect the data in the same way that CRU did. This is feasible because the list of stations that CRU used was published in 2008.[43]

32. Even if CRU had wanted to, it would have been unable to publish all of these data because, as Professor Acton explained, some of the data are bound by commercial agreements with different national meteorological organisations:

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38 www.warwickhughes.com

39 Ev 158, Appendix 1

40 Q 9

41 Q 103

42 Q 78

43 Q 98

> Unfortunately, several of these countries impose conditions and say you are not allowed to pass [on the data]. Seven countries have said "No, you cannot", half the countries have not yet answered, Canada and Poland are amongst those who have said, "No you cannot publish it" and also Sweden. Russia is very hesitant. We are under a commercial promise, as it were, not to; we are longing to publish it because what science needs is the most openness.[44]

(The issue with Sweden has since been resolved. The Swedish Meteorological and Hydrological Institute gave permission for CRU to publish its Swedish data on the UEA website on 8 March 2010.[45])

33. Second, as UEA explained in its submission, it is:

> sometimes necessary to adjust temperature data because changes in station location, instrument or observation time, or in the methods used to calculate monthly average temperatures can introduce false trends. These have to be removed or adjusted, or else the overall series of values will be incorrect. In the early 1980s, CRU painstakingly examined the long-term homogeneity of each station temperature series which it acquired. As a result, data were adjusted for about 11% of the sites, that is approximately 314 sites out of a then-total of some 3,276. This was in complete accordance with standard practice, and all adjustments were documented.[46]

34. Professor Jones added, when he gave oral evidence:

> It is all documented [...] what [adjustments we made to the data] in the 1980s and since then we have obviously added more station data as more has become available, as countries have digitised more data; we have added that in and we have reported on that in our peer review publications in 2003 and 2006.[47]

35. These kinds of adjustments to raw data take a lot of time. That is why, in the words of Professor Jones, "Most scientists do not want to deal with the raw station data, they would rather deal with a derived product".[48]

36. A third point was made by Professor Acton that CRU should not be under any obligation to provide raw data:

> May I also point out that it is not a national archive, it is not a library, it is a research unit. It has no special duty to conserve and its data is the copy of data provided by over 150 countries, whose national meteorological stations turn the data into the average for a month.[49]

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44 Q 94

45 Ev 39, para B

46 Ev 18, para 3.4

47 Q 81

48 Q 107

49 Q 92

37. CRU's refusal to release the raw data gave some the impression that it was deliberately keeping its work private so that its studies could not "be replicated and critiqued".[50] The Peabody Energy Company said of CRU that "they appeared to be particularly concerned that putting their information in the public domain would expose their work to criticism".[51] Even an effort to conduct a simple quality check was said to be thwarted by CRU's unwillingness to share the data it had used.[52] In contrast, NASA has been able to make all its raw data available as well as its programmes.[53]

38. **We recognise that some of the e-mails suggest a blunt refusal to share data, even unrestricted data, with others. We acknowledge that Professor Jones must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to seek to undermine his work. But Professor Jones's failure to handle helpfully requests for data in a field as important and controversial as climate science was bound to be viewed with suspicion. He was obviously frustrated by other workers in the field trying to "undermine" his work, but his actions were inevitably counterproductive. Professor Jones told us that the published e-mails represented only "one tenth of 1%" of his output, which amounts to one million e-mails, and that we were only seeing the end of a protracted series of e-mail exchanges. We consider that further suspicion could have been allayed by releasing all the e-mails. In addition, we consider that had the available raw data been available online from an early stage, these kinds of unfortunate e-mail exchanges would not have occurred. In our view, CRU should have been more open with its raw data and followed the more open approach of NASA to making data available.**

39. **We are not in a position to set out any further the extent, if any, to which CRU should have made the data available in the interests of transparency, and we hope that the Independent Climate Change Email Review will reach specific conclusions on this point. However, transparency and accountability are of are increasing importance to the public, so we recommend that the Government reviews the rules for the accessibility of data sets collected and analysed with UK public money.**

Methods

40. The Royal Society of Chemistry in its submission made it clear that:

> It is essential that the public and all non-specialists remain truly confident in the scientific method to provide a sound scientific evidence-base on which strong decisions can be made.[54]

There have been criticisms that Professor Jones and colleagues have not shared their methodologies. Andrew Montford, author of *The Hockey Stick Illusion*,[55] pointed out in his memorandum that:

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50 Ev 194 [Peabody Energy Company], para 20

51 *As above*

52 Ev 152 [Steven Mosher], para 8

53 Q 150 [Professor Jones]

54 Ev 170, summary

> The scientific method demands that findings be subject to testing and verification by others. The refusal of CRU scientists to release information to those who they felt might question or threaten their findings have led many to conclude that the CRU's work is not trustworthy.[56]

41. Professor Jones contested these claims. According to him, "The methods are published in the scientific papers; they are relatively simple and there is nothing that is rocket science in them".[57] He also noted: "We have made all the adjustments we have made to the data available in these reports[58]; they are 25 years old now".[59] He added that the programme that produced the global temperature average had been available from the Met Office since December 2009.[60]

42. On this basis, he argued, it was unnecessary to provide the exact codes that he used to produce the CRUTEM3 chart. The Met Office had released its code and it produced exactly the same result.[61]

43. In answer to the charge that the computer codes that were stolen from CRU's computer network were defective,[62] Professor Jones pointed out that:

> Those codes are from a much earlier time, they are from the period about 2000 to 2004. [They] do not relate to the production of the global and hemispheric temperature series. They are nothing to do with that, they are to do with a different project [...] that was funded by the British Atmospheric Data Centre, which is run by NERC, and that was to produce more gridded temperature data and precipitation data and other variables. A lot of that has been released on a Dutch website and also the BADC website.[63]

44. CRU's alleged refusal to disclose its assumptions and methodologies gave credence to the view that exposure to "independent scrutiny would have undermined the AGW [anthropogenic global warming] hypothesis".[64] However, the failure to publish the computer code for CRUTEM3 left CRU vulnerable when concerns emerged that other codes it used had faults. John Graham-Cumming, a professional computer programmer, told us that:

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55 Andrew Montford, *The Hockey Stick Illusion: Climategate and the corruption of science*, Stacey International, 2010

56 Ev 159, para 4

57 Q 92

58 Raymond Bradley, Mick Kelly, Phil Jones and others, *A Climatic Data Bank for Northern Hemisphere Land Areas, 1851-1980*, US DoE, Technical Report TRO17, 1985, p 335; Phil Jones, Sarah Raper, Ben Santer, and others, *A Grid Point Surface Air Temperature Data Set for the Northern Hemisphere*, DoE Technical Report No. TR022, US Department of Energy, 1985, p 251; Phil Jones, Sarah Raper, Claire Goodess, and others, *A Grid Point Surface Air Temperature Data Set for the Southern Hemisphere, 1851-1984*, DoE Technical Report No. TR027, US Department of Energy, 1986, 73

59 Q 97

60 *As above*

61 Qq 139-42

62 Ev 32, Q 137; Ev 196 [John Graham-Cumming]

63 Qq 137-38

64 Ev 94 [Clive Menzies], para 1.5

> the organization writing the [other] code did not adhere to standards one might find in professional software engineering. The code had easily identified bugs, no visible test mechanism, was not apparently under version control and was poorly documented. It would not be surprising to find that other code written at the same organization was of similar quality. And given that I subsequently found a bug in the actual CRUTEM3 code only reinforces my opinion.[65]

45. The conspiracy claims were fuelled by CRU's refusal to share the most detailed aspects of its methodologies, for example, the computer codes for producing global temperature averages. **We note that the research passed the peer review process of some highly reputable journals. However, we note that CRU could have been more open at that time in providing the detailed methodological working on its website. We recommend that all publicly funded research groups consider whether they are being as open as they can be, and ought to be, with the details of their methodologies.**

Repeatability and verification

46. These complaints and concerns surrounding transparency cut to the heart of the scientific process. It has been argued that without access to the raw data and detailed methodology it is not possible to check the results of CRU's work. The Institute of Physics pointed out that:

> Published reconstructions may represent only a part of the raw data available and may be sensitive to the choices made and the statistical techniques used. Different choices, omissions or statistical processes may lead to different conclusions. This possibility was evidently the reason behind some of the (rejected) requests for further information.[66]

47. This has substance if one considers CRU's work in isolation. But science is more than individual researchers or research groups. One should put research in context and ask the question: what would one hope to find by double checking the processing of the raw data? If this were the only dataset in existence, and Professor Jones's team had been the only team in the world to analyse it, then it might make sense to double check independently the processing of the raw data and the methods. But there are other datasets and other analyses that have been carried out as Professor Jones explained:

> There are two groups in America that we [CRU] compare with and there are also two additional groups, one in Russia and one in Japan, that also produce similar records to ourselves and they all show pretty much the same sort of course of instrumental temperature change since the nineteenth century compared to today.[67]
>
> [...] we are all working independently so we may be using a lot of common data but the way of going from the raw data to a derived product of gridded temperatures and

65 Ev 196

66 Ev 167, para 4

67 Q 78

> then the average for the hemisphere and the globe is totally independent between the different groups.[68]

48. In its memorandum UEA explained the differences between the methodologies used by three basic datasets for land areas of the world, NOAA, NASA and CRU/UEA:

> All these datasets rely on primary observations recorded by NMSs [National Meteorological Services] across the globe.[69]
>
> GISS[70] and NCDC[71] each use at least 7,200 stations. CRUTEM3 uses fewer. In CRUTEM3, each monthly temperature value is expressed as a departure from the average for the base period 1961–90. This "anomaly method" of expressing temperature records demands an adequate amount of data for the base period; this limitation reduces the number of stations used by CRUTEM3 to 4,348 (from the dataset total of 5,121). The latest NCDC analysis [...] has now moved to the "anomaly method" though with different refinements from those of CRU.[72]
>
> NCDC and GISS use different approaches to the problem of "absolute temperature" from those of CRUTEM3. The homogeneity procedures undertaken by GISS and NCDC are completely different from those adopted for CRUTEM3. NCDC has an automated adjustment procedure [...], whilst GISS additionally makes allowances for urbanization effects at some stations.[73]

49. In our call for evidence we asked for submissions on the question of how independent the other international data sets are. We have established to the extent that a limited inquiry of this nature can, that the NCDC/NOAA and GISS/NASA data sets measuring temperature changes on land and at sea have arrived at similar conclusions using similar data to that used by CRU, but using independently devised methodologies. We have further identified that there are two other data sets (University of Alabama and Remote Sensing Systems), using satellite observations that use entirely different data than that used by CRU. These also confirm the findings of the CRU work. **We therefore conclude that there is independent verification, through the use of other methodologies and other sources of data, of the results and conclusions of the Climate Research Unit at the University of East Anglia.**

50. The fact that all the datasets show broadly the same sort of course of instrumental temperature change since the nineteenth century compared to today was why Professor John Beddington, the Government Chief Scientific Adviser, had the confidence to say that

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68 Q 80

69 Ev 21, para 4.3

70 Dataset held by the Goddard Institute for Space Studies (GISS, USA) part of the National Aeronautic and Space Administration (NASA)

71 Global Historical Climatology Network (GHCN) dataset held by National Climatic Data Center (NCDC), the National Oceanographic and Atmospheric Administration (NOAA, USA)

72 Ev 21, para 4.4

73 Ev 21, para 4.5

human induced global warming was, in terms of the evidence to support that hypothesis, "unchallengeable":[74]

> I think in terms of datasets, of the way in which data is analysed, there will always be some degree of uncertainty but when you get a series of fundamentally different analyses on the basic data and they come up with similar conclusions, you get a [...] great deal of certainty coming out of it.[75]

51. **Even if the data that CRU used were not publicly available—which they mostly are—or the methods not published—which they have been—its published results would still be credible: the results from CRU agree with those drawn from other international data sets; in other words, the analyses have been repeated and the conclusions have been verified.**

52. That is probably part of why it has not been practice in the climate science community to publish all the data and computer codes with the academic papers. We got to the crux of the issue during an interesting exchange with Professor Jones:

> **Graham Stringer:** You are saying that every paper that you have produced, the computer programmes, the weather stations, all the information, the codes, have been available to scientists so that they could test out how good your work was. Is that the case on all the papers you have produced?
>
> ***Professor Jones:*** That is not the case.
>
> **Graham Stringer:** Why is it not?
>
> ***Professor Jones:*** Because it has not been standard practice to do that.
>
> **Graham Stringer:** That takes me back to the original point, that if it is not standard practice how can the science progress?
>
> ***Professor Jones:*** Maybe it should be standard practice but it is not standard practice across the subject.[76]

53. Another reason why data and the codes were not published may be that norms for publication evolved in a period when the journals were only published in hard copy. In such circumstances it is understandable why an editor would not want to publish raw climate data (extremely long lists of numbers) and code for the computer programmes that analyse the data (which run to hundreds of thousands of lines of code). However, in the age of the internet, these kinds of products can be made available more easily, and we are minded to agree with Professor Jones observation on this point that: "Maybe it should be standard practice".[77]

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74 Q 191

75 Qq 191–92

76 Qq 100–02

77 Q 102

54. **It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers. We think that this is problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable. We therefore consider that climate scientists should take steps to make available all the data used to generate their published work, including raw data; and it should also be made clear and referenced where data has been used but, because of commercial or national security reasons is not available. Scientists are also, under Freedom of Information laws and under the rules of normal scientific conduct, entitled to withhold data which is due to be published under the peer-review process.[78] In addition, scientists should take steps to make available in full their methodological workings, including the computer codes. Data and methodological workings should be provided via the internet. There should be enough information published to allow verification.**

Dishonesty

55. Of all the e-mails released, one dated 16 November 1999 has caused particular concern:

> I've just completed Mike's Nature trick of adding in the real temps to each series for the last 20 years (ie from 1981 onwards) amd [*sic*] from 1961 for Keith's to hide the decline.[79]

56. The word "trick" and the phrase "hide the decline" have been taken by some to demonstrate intent on the part of Professor Jones to "falsify data" and to "exaggerate warming".[80]

"Trick"

57. In his submission, Peter Taylor, author of *Chill*,[81] states that:

> The tree ring data did not match the model expectation (ie the 'hockey stick' pattern of a sudden rise at the end of the period). Rather than admit this, the team-workers discuss using Michael Mann's 'trick' of replacing the offending tree-ring data and using instrumental data in its place in a spliced graph.[82]

58. UEA interpreted the use of the word "trick" differently:

> as for the (now notorious) word 'trick', so deeply appealing to the media, this has been richly misinterpreted and quoted out of context. It was used in an informal email, discussing the difficulties of statistical presentation. It does not mean a 'ruse' or method of deception. In context it is obvious that it is used in the informal sense

78 See paragraph 78 and following; section 22 of the FOIA provides an exemption from disclosure where the requested information is intended for future (but imminent) publication.

79 E-mail from Phil Jones to Ray Bradley, 16 November 1999

80 Ev 93 [Godfrey Bloom MEP], para 4

81 Peter Taylor, *Chill, A Reassessment of Global Warming Theory: Does Climate Change Mean the World is Cooling, and If So What Should We Do About It?*, Clairview Books, 2009

82 Ev 188, para 22

> of 'the best way of doing something'. In this case it was 'the trick or knack' of constructing a statistical illustration which would combine the most reliable proxy and instrumental evidence of temperature trends.[83]

59. These interpretations of the colloquial meaning of "trick" have been accepted by even the staunchest of critics:

> ***Lord Lawson of Blaby:*** The sinister thing is not the word 'trick'. In their [UEA's] own evidence they say that what they mean by 'trick' is the best way of doing something.
>
> **Chairman:** You accept that?
>
> ***Lord Lawson of Blaby:*** I accept that.[84]

60. **Critics of CRU have suggested that Professor Jones's use of the word "trick" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominately caused by human activity. The balance of evidence patently fails to support this view. It appears to be a colloquialism for a "neat" method of handling data.**

"Hide the decline"

61. Lord Lawson did, however, describe CRU's treatment of the data as "reprehensible",[85] because, in his view, Professor Jones deliberately hid data that demonstrated a decline in temperatures.[86]

62. The data that he believed to be "hidden" are a set of tree ring data that disagree with other data sources regarding temperature trends. Lord Lawson said: "when the proxy series [...] departed from the measured temperature series, a normal person will say maybe that means the proxy series is not all that reliable".[87] In that context he made two specific claims:

- that the tree ring data were flawed because "for a long period before 1421 they relied on one single pine tree";[88] and
- that the divergence problem was not just for data after the 1960s, "it is not a good fit in the latter half of the nineteenth century either".[89]

63. It is outside the remit of the terms of reference of this inquiry to make a detailed assessment of the science, but it is worth noting that Professor Jones had a very different perspective. On the first point, he commented:

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83 Ev 19, para 3.5.6

84 Qq 25–26

85 Q 26

86 Qq 26–28

87 Q 26

88 *As above*

89 Q 28

> That particular reconstruction went back to 1400, or just after 1400, and that is because there are insufficient trees to go back before that, there are more than just one. We have criteria to determine how far you can go back in terms of the number of trees you have at a certain number of sites.[90]

64. On the second point, he told us:

> One of the curves was based on tree ring data which showed a very good relationship between the tree rings and the temperature from the latter part of the nineteenth century through to 1960, and after that there was a divergence where the trees did not go up as much as the real temperatures had.[91]

65. Professor Jones has published on this issue on several occasions, including a 1998 *Nature* paper[92] and subsequent papers.[93] He contested the view that he was trying to hide the decline in the sense that he was trying to pretend that these data did not exist and thereby exaggerate global warming: "We do not accept it was hidden because it was discussed in a paper[94] the year before and we have discussed it in every paper we have written on tree rings and climate".[95] Rather, what was meant by "hide the decline" was remove the effects of data known to be problematic in the sense that the data were known to be misleading. UEA made it clear in its written submission that:

> CRU never sought to disguise this specific type of tree-ring "decline or divergence". On the contrary, CRU has published a number of pioneering articles that illustrate, suggest reasons for, and discuss the implications of this interesting phenomenon.[96]

66. **Critics of CRU have suggested that Professor Jones's use of the words "hide the decline" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominantly caused by human activity. That he has published papers—including a paper in *Nature*—dealing with this aspect of the science clearly refutes this allegation. In our view, it was shorthand for the practice of discarding data known to be erroneous. We expect that this is a matter the Scientific Appraisal Panel will address.**

Perverting the peer review process

67. The main allegations on the suppression or distortion of others' findings concern the role of CRU in the operation of the peer review process. It has been alleged that scientists at CRU abused the peer review process to prevent those with dissenting views on climate change the opportunity in getting papers published. There are three key accusations. First,

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90 Q 125

91 Q 122

92 Q 122; Keith Briffa and others, "Reduced sensitivity of recent tree-growth to temperature at high northern latitudes", *Nature*, vol 391 (1998), pp 678-82

93 For example: Edward Cook, Paul Krusic and Phil Jones, "Dendroclimatic signals in long tree-ring chronologies from the Himalayas of Nepal", *International Journal of Climatology*, Vol 23 (2003), pp 707-32

94 Keith Briffa and others, "Trees tell of past climates: but are they speaking less clearly today?", *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*, vol 353 (1998), pp 65-73

95 Q 124

96 Ev 19, para 3.5.5

David Holland, an author of several FOIA requests that were mentioned in the leaked e-mails, claimed that climate scientists at CRU corrupted the IPCC process:

> The emails show that a group of influential climate scientists colluded to subvert the peer-review process of the IPCC and science journals, and thereby delay or prevent the publication and assessment of research by scientists who disagreed with the group's conclusions about global warming. They manufactured pre-determined conclusions through the corruption of the IPCC process and deleted procedural and other information hoping to avoid its disclosure under freedom-of-information requests.[97]

68. In one e-mail, Professor Jones appeared to suggest that he and another scientist would deliberately try to "keep out" two papers from the IPCC's Fourth Assessment Report.[98]

> From: Phil Jones <p.jones@xxxxxxxxx.xxx>
> To: "Michael E. Mann" <mann@xxxxxxxxx.xxx>
> Subject: HIGHLY CONFIDENTIAL
> Date: Thu Jul 8 16:30:16 2004
>
> Mike,
>
> Only have it in the pdf form. FYI ONLY - don't pass on. Relevant paras are the last
>
> 2 in section 4 on p13. As I said it is worded carefully due to Adrian knowing Eugenia for years. He knows the're wrong, but he succumbed to her almost pleading with him to tone it down as it might affect her proposals in the future !
>
> I didn't say any of this, so be careful how you use it - if at all. Keep quiet also that you have the pdf. The attachment is a very good paper - I've been pushing Adrian over the last weeks to get it submitted to JGR or J. Climate. The main results are great for CRU and also for ERA-40. The basic message is clear - you have to put enough surface and sonde obs into a model to produce Reanalyses. The jumps when the data input change stand out so clearly. NCEP does many odd things also around sea ice and over snow and ice. The other paper by MM is just garbage - as you knew. De Freitas again. Pielke is also losing all credibility as well by replying to the mad Finn as well - frequently as I see it. I can't see either of these papers being in the next IPCC report. Kevin and I will keep Them out somehow - even if we have to redefine what the peer-review literature is !

69. The second is that climate scientists tried to suppress a paper on research fraud. As Dr Benny Peiser, Director of the Global Warming Policy Foundation, put it:

> The CRU e-mails under investigation suggest that climate scientists (not only at CRU but also elsewhere) have actively sought to prevent a paper on alleged research fraud from being published in violation of principles of academic integrity.[99]

70. The third allegation is made by Dr Sonja Boehmer-Christiansen, a former peer reviewer for the IPCC, editor of the journal, *Energy & Environment*, and Reader Emeritus

97 Ev 115, para 2

98 www.eastangliaemails.com

99 Ev 164, para 2

at Hull University, who stated in her memorandum that her journal became the focus of attacks from CRU scientists:

> As editor of a journal which remained open to scientists who challenged the orthodoxy, I became the target of a number of CRU manoeuvres. The hacked emails revealed attempts to manipulate peer review to E&E's disadvantage, and showed that libel threats were considered against its editorial team. Dr Jones even tried to put pressure on my university department. The emailers expressed anger over my publication of several papers that questioned the 'hockey stick' graph and the reliability of CRU temperature data. The desire to control the peer review process in their favour is expressed several times. [...] CRU clearly disliked my journal and believed that "good" climate scientists do not read it.[100]

71. When we asked Professor Jones about these accusations, he contested each of them.

- On the claim that he tried to keep two papers out of the IPCC report, he explained that the papers were already published and that "I was just commenting that I did not think those papers were very good".[101]

- On the claim by he tried to suppress papers that alleged research fraud, he told us:

> Dr Benny Peiser [...] was editing a series of papers in *Energy & Environment*. He asked me to comment on a particular paper and I sent him some views back that I did not think the paper was very good. It was not a formal review, he was just asking me for my views.[102]

- On the claims made by Dr Boehmer-Christiansen, he noted: "I was sending an email to the head of department about a complaint that she had made about me to the UK Climate Impacts Programme, so I was just responding there".[103]

72. In summary, Professor Jones argued:

> I do not think there is anything in those emails that really supports any view that I or CRU have been trying to pervert the peer review process in any way. I have just been giving my views on specific papers.[104]

73. **The evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers. The Independent Climate Change Email Review should look in detail at all of these claims.**

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100 Ev 125, paras 4.1–4.3

101 Q 154

102 Q 157

103 *As above*

104 Q 159

3 Freedom of information issues

74. We are not a tribunal reviewing whether breaches of the Freedom of Information Act 2000 (FOIA) have taken place but see as our role in this inquiry as considering whether:

(a) the arrangements for examining whether CRU breached FOIA are adequate;

(b) whether the six-month time limit on the initiation of a prosecution where a public authority acts so as to prevent intentionally the disclosure of requested information needs to be revised; and

(c) whether UEA ensured that CRU was able to meet the requirements of the legislation when it received FOIA requests.

Freedom of Information legislation

75. The FOIA creating new rights of access to information came into operation on 1 January 2005. CRU, as part of UEA, is classed as a "public authority" for the purposes of the FOIA. In his submission Richard Thomas, who was Information Commissioner from 2002 until June 2009, explained the application of the FOIA to scientific data held by UK universities:

> the public must be satisfied that publicly-funded universities, as with any other public authority in receipt of public funding, are properly accountable, adopt systems of good governance and can inspire public trust and confidence in their work and operations [...] The fact that the FOIA requests relate to complex scientific data does not detract from this proposition or excuse non-compliance.[105]

76. When he gave oral evidence, we asked Mr Thomas if the legislation drew a distinction between, on the one hand, scientific data and modelling and, on the other hand, administrative records. He replied:

> the broad answer [...] is no [...] First of all, the legislation applies to information held by the public authority, and information is not elaborated in that sense. [...] It is not ownership. The legislation uses the word "held", and in the Environmental Information Regulations [EIR] that phrase "held" is slightly elaborated. If I can quote the regulation for you there, "It is held by a public authority if the information: (a) is in the authority's possession and has been produced or received by the authority, or (b) is held by another person on behalf of the authority." So that is an elaboration of the concept of "held". It is not ownership.[106]

77. Mr Thomas considered that the issues in this case which were most relevant to the information law appeared to be:

(a) the relevance and impact of the information laws on scientific and academic research conducted within universities;

105 Ev 8, para 3.2

106 Qq 59-60

(b) the adequacy of section 77 of FOIA to deal with suggestions that CRU researchers deleted information, not in the course of normal work, but to frustrate FOIA/EIR[107] requests;

(c) the handling of a large number of FOIA/EIR requests by UEA relating especially to climate change research which (within CRU) it "held"; and

(d) whether this case illustrates that there is scope to extend the "proactive" disclosure provisions of FOIA as they relate to universities.[108]

78. Parliament has created a presumption in favour of disclosure but there are exclusions.[109] Mr Thomas explained:

> There are over 20 exemptions to the fundamental duty to disclose requested information in FOIA.[...] Eight of the main exemptions are absolute and 16 are qualified. Qualified means that there is a "public interest override," which means that, even where the exemption applies, the public interest considerations must be considered. In formal terms, there must still be disclosure—even though the qualified exemption applies—unless the public interest in the exemption outweighs the public interest in disclosure.

Mr Thomas added that:

> The exemptions are similar to those found in other Freedom of Information laws in force in the world. I am not aware which exemptions were considered by the University as potentially applicable to some or all of the requests to CRU. I can speculate that some or all of the following [...] might have been considered:
>
> (a) Section 22—where the requested information is intended for future (but imminent) publication;
>
> (b) Section 40—where disclosure of personal data would breach any of the data protection principles;
>
> (c) Section 41—where the information had been obtained from elsewhere in such circumstances that its disclosure would constitute an actionable breach of confidence under common law;
>
> (d) Section 43 (qualified)—where disclosure would, or would be likely to, prejudice the commercial interests of any person, including the public authority;
>
> (e) Section 44—where disclosure is prohibited by another enactment or inconsistent with an EU obligation (which may include some intellectual property restrictions); and

107 EIR: Environmental Information Regulations 2004. Deriving from European Directive 2003/4/EC these give rights of public access to environmental information held by public authorities.

108 Ev 8, para 2.2

109 Ev 9, para 3.6

(f) Section 14 (not an exemption, strictly speaking)—where the request is vexatious.[110]

79. We were grateful to Mr Thomas for explaining the operation of the FOIA and EIR. He did, however, point out that he did not have detailed knowledge of events at UEA since leaving the Information Commissioner's Office:

> I have no idea at all what has happened inside my former office. I cannot say because this is a serious matter. It depends a great deal on the circumstances of the particular case, the evidence. I have had no direct contact with the office as to how this case is being handled.[111]

Alleged breaches of the Freedom of Information Act 2000

The e-mails

80. Some of the hacked e-mails appear to reveal scientists encouraging their colleagues to resist disclosure and to delete e-mails, apparently to prevent them from being revealed to people making FOIA requests. Below are examples, in chronological order, of e-mails sent by Professor Jones which address FOIA and requests for information.

E-mail: 1107454306 [Extract]
At 09:41 AM 2/2/2005, Phil Jones wrote:
Mike,[...]Just sent loads of station data to Scott. Make sure he documents everything better this time! And don't leave stuff lying around on ftp sites - you never know who is trawling them. The two MMs have been after the CRU station data for years. If they ever hear there is a Freedom of Information Act now in the UK, I think I'll delete the file rather than send to anyone. Does your similar act in the US force you to respond to enquiries within 20 days? - our does ! The UK works on precedents, so the first request will test it. We also have a data protection act, which I will hide behind. Tom Wigley has sent me a worried email when he heard about it - thought people could ask him for his model code. He has retired officially from UEA so he can hide behind that. IPR should be relevant here, but I can see me getting into an argument with someone at UEA who'll say we must adhere to it !. [...]

E-mail: 1219239172 [Extract]
From: Phil Jones <p.jones@xxxxxxxxx.xxx>
To: Gavin Schmidt <gschmidt@xxxxxxxxx.xxx>
Subject: Re: Revised version the Wengen paper
Date: Wed Aug 20 09:32:52 2008

[...] Keith/Tim still getting FOI requests as well as MOHC and Reading. All our FOI officers have been in discussions and are now using the same exceptions not to respond - advice they got from the Information Commissioner. As an aside and just between us, it seems that Brian Hoskins has withdrawn himself from the WG1 Lead nominations. It seems he doesn't want to have to deal with

110 Ev 9, para 3.7

111 Q 58

this hassle.

The FOI line we're all using is this. IPCC is exempt from any countries FOI – the Sceptics have been told this. Even though we (MOHC, CRU/UEA) possibly hold relevant info the IPCC is not part our remit (mission statement, aims etc) therefore we don't have an obligation to pass it on.
Cheers
Phil

E-mail: 1228330629
From: Phil Jones <p.jones@xxxxxxxxx.xxx>
To: santer1@xxxxxxxxx.xxx, Tom Wigley <wigley@xxxxxxxxx.xxx>
Subject: Re: Schles suggestion
Date: Wed Dec 3 13:57:09 2008
Cc: mann <mann@xxxxxxxxx.xxx>, Gavin Schmidt <gschmidt@xxxxxxxxx.xxx>, Karl Taylor <taylor13@xxxxxxxxx.xxx>, peter gleckler gleckler1@xxxxxxxxx.xxx

Ben,
When the FOI requests began here, the FOI person said we had to abide by the requests. It took a couple of half hour sessions - one at a screen, to convince them otherwise showing them what CA was all about. Once they became aware of the types of people we were dealing with, everyone at UEA (in the registry and in the Environmental Sciences school - the head of school and a few others) became very supportive. I've got to know the FOI person quite well and the Chief Librarian - who deals with appeals. The VC is also aware of what is going on - at least for one of the requests, but probably doesn't know the number we're dealing with. We are in double figures.

One issue is that these requests aren't that widely known within the School. So I don't know who else at UEA may be getting them. CRU is moving up the ladder of requests at UEA though - we're way behind computing though. We're away of requests going to others in the UK - MOHC, Reading, DEFRA and Imperial College. So spelling out all the detail to the LLNL management should be the first thing you do. I hope that Dave is being supportive at PCMDI. The inadvertent email I sent last month has led to a Data Protection Act request sent by a certain Canadian, saying that the email maligned his scientific credibility with his peers!

If he pays 10 pounds (which he hasn't yet) I am supposed to go through my emails and he can get anything I've written about him. About 2 months ago I deleted loads of emails, so have very little - if anything at all. This legislation is different from the FOI - it is supposed to be used to find put why you might have a poor credit rating ! In response to FOI and EIR requests, we've put up some data - mainly paleo data. Each request generally leads to more - to explain what we've put up. Every time, so far, that hasn't led to anything being added - instead just statements saying read what is in the papers and what is on the web site! Tim Osborn sent one such response (via the FOI person) earlier this week. We've never sent programs, any codes and manuals.

In the UK, the Research Assessment Exercise results will be out in 2 weeks time.
These are expensive to produce and take too much time, so from next year we'll be moving onto a metric based system. The metrics will be # and amounts of grants, papers and citations etc. I did flippantly suggest that the # of FOI requests you get should be another.

When you look at CA, they only look papers from a handful of people. They will start on another coming out in The Holocene early next year. Gavin and Mike are on this with loads of others. I've told both exactly what will appear on CA once they get access to it!
Cheers

Phil
E-mail: 1237496573 [Extract] From: Phil Jones <p.jones@xxxxxxxxx.xxx> To: santer1@xxxxxxxxx.xxx Subject: Re: See the link below Date: Thu Mar 19 17:02:53 2009 [...] CRU has had numerous FOI requests since the beginning of 2007. The Met Office, Reading, NCDC and GISS have had as well – many related to IPCC involvement. I know the world changes and the way we do things changes, but these requests and the sorts of simple mistakes, should not have an influence on the way things have been adequately dealt with for over a century. Cheers Phil

81. In his submission Andrew Montford stated that:

> Research materials should be made available to outsiders as a requirement of the scientific method. That scientists have failed to do so is reprehensible, but the fact that they have apparently also resorted to breaches of the Freedom of Information Act in order to do so requires urgent attention from policymakers.[112]

82. As we explained in the previous chapter, David Holland was the author of several FOIA requests that were mentioned in the leaked e-mails. In his submission he pointed out that on 9 May [2008] in e-mail 1210367056, Professor Jones sent "my formal information request to 'team' members Mann, Hughes and Ammann" writing:

> You can delete this attachment if you want. Keep this quiet also, but this is the person who is putting in FOI requests for all emails Keith and Tim have written and received re Ch 6 of AR4.[113] We think we've found a way around this.[114]

83. Mr Holland also drew attention to e-mail 1212063122 dated 29 May 2008 in which Professor Jones asked Professor Mann:

> Can you delete any emails you may have had with Keith re AR4? Keith will do likewise. Can you also email [Eu]Gene [Wahl] and get him to do the same? I don't have his new email address. We will be getting Caspar [Ammann] to do likewise.[115]

Correspondence with the Deputy Information Commissioner

84. On 22 January 2010, when the Deputy Information Commissioner, Graham Smith, issued a statement which suggested that at l east some of the requested information should

112 Ev 159, para 6

113 Intergovernmental Panel on Climate Change: Fourth Assessment Report

114 Ev 117, para 23

115 Ev 118, para 32

have been disclosed in the absence of applicable exemptions, it gave support to the criticisms of CRU's handling of FOIA requests. Mr Smith said:

> The FOI Act makes it an offence for public authorities to act so as to prevent intentionally the disclosure of requested information. Mr Holland's FOI requests were submitted in 2007/8, but it has only recently come to light that they were not dealt with in accordance with the Act. The legislation requires action within six months of the offence taking place, so by the time the action came to light the opportunity to consider a prosecution was long gone.[116]

85. Mr Thomas commented that this was "clearly a reference to section 77 of the Act and/or the near-identical Regulation 19 of EIR".[117] Section 77 of the FOIA provides:

> 1. Where:
>
> (a) a request for information has been made to a public authority,
>
> (b) under section 1 of this Act or section 7 of the Data Protection Act 1998, the applicant would have been entitled (subject to payment of any fee) to communication of any information in accordance with that section,
>
> any person to whom this subsection applies is guilty of an offence if he alters, defaces, blocks, erases, destroys or conceals any record held by the public authority, with the intention of preventing the disclosure by that authority of all, or any part, of the information to the communication of which the applicant would have been entitled.
>
> 2. Subsection (1) applies to the public authority and to any person who is employed by, is an officer of, or is subject to the direction of, the public authority.
>
> 3. A person guilty of an offence under this section is liable on summary conviction to a fine not exceeding level 5 on the standard scale.[118]

86. Mr Thomas added that the Deputy Commissioner also appeared "to have in mind" section 127(1) of the Magistrates Court Act 1980, which provides that

> a magistrates' court shall not try an information or hear a complaint unless the information was laid, or the complaint made, within 6 months from the time when the offence was committed, or the matter of complaint arose.[119]

Mr Thomas confirmed in oral evidence that

> because of the interaction with the Magistrates Court Act, any prosecution must be brought within six months of the offence being committed.[120]

87. In its memorandum to our inquiry, UEA defended its actions:

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116 Ev 9, para 4.1

117 Ev 10

118 Ev 10, para 4.1

119 Ev 10, para 4.2

120 Q 56

> CRU has been accused of refusing to release data requested under the FOIA. There are many obstacles outside CRU's control surrounding the release of data provided by NMSs [National Meteorological Services]. Many FOIA requests made to CRU related to primary data provided by the NMSs. Some of these data are subject to formal non-publication agreements between the NMS and CRU. Other primary data had been provided to CRU on an individual-to-individual basis, with accompanying verbal agreements that they may be used within the gridded dataset, but should not be passed on to others. CRU responded to the FOIA requests for primary data by pointing out that approximately 90% of the stations in the CRU dataset are available from other sources, particularly GHCN.[121]

88. On 29 January there was an exchange between UEA and Mr Smith, the Deputy Commissioner. Brian Summers, the Registrar and Secretary of UEA responded forcibly to Mr Smith's 22 January press statement, which asserted that UEA had not dealt with FOIA requests "as they should have been under the legislation".[122] He did not consider it was "acceptable that such a statement which has led to an extremely damaging commentary on the University [was] first communicated to the University by a journalist".[123] His letter goes on to defend UEA's actions in detail and to ask that, if the Information Commissioner's Office (ICO) cannot retract the 22 January statement, it issue a clarification regarding the alleged breaches of the FOIA. A response from the ICO was issued the same day. It did not retract the original statement but offered clarification:

1. [No] decision notice has yet been issued and no alleged breaches have yet been put to the University for comment. That matter has yet to be addressed, but it will be over coming months.

2. The fact that the elements of a section 77 offence may have been found here, but cannot be acted on because of the elapsed time, is a very serious matter. The ICO is not resiling from its position on this.

3. The ICO's position is as stated in point 2 above. The statement may be read to indicate that.[124] Under section 77, an offence may be committed by an individual, not necessarily the public authority itself.

4. Errors like this are frequently made in press reports and the ICO cannot be expected to correct them, particularly when the ICO has not itself referred to penalties or sanctions in its own statement.[125]

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121 Ev 20, para 3.7.2

122 "Scientists in stolen e-mail scandal hid climate data", *The Times*, 28 January 2010

123 Registrar and Secretary to Deputy Information Commissioner - 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

124 UEA had asked the Deputy Commissioner to confirm that "your statement cannot be taken to mean that there has been a demonstrable breach of Section 77, which is a breach of the FOI which can result in prosecution"; Registrar and Secretary to Deputy Information Commissioner, 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

125 Deputy Information Commissioner to Registrar and Secretary - 29 January 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

89. UEA responded on 1 February thanking the ICO for the clarification but setting out its concerns relating to the press coverage of the ICO's original statement:

> Your clarification that the press cannot infer from your statement to the Sunday Times that it has been established that the University (or indeed any individual associated with the University) has breached the terms of the Freedom of Information Act is welcome. [UEA's] reputation which has been subjected to these damaging and incorrect assertions claiming to be based on your statement and we must take some steps to put this right. We will be writing to the media which carried reports based on your statement, pointing out the inaccuracies and asking them to rectify the position.[126]

90. In his oral evidence Professor Acton questioned the ICO statement of 22 January:

> our principle is that *prima facie* evidence is evidence which on the face of it and without investigation suggests that there is a case to answer. To my mind if there is *prima facie* evidence; why did I set up the Muir Russell independent review? Prima facie evidence is not the same as, you have been found to breach. [...] If it is sub judice, if, as we had in the letter ten days ago from the ICO, the investigation has not even begun, I am puzzled how we could have been found to breach if there has been no investigation.[127]

91. The ICO's most recent letter, dated 3 March, in UEA's view, "makes plain that there is no assumption by the ICO, prior to investigation, that UEA has breached the Act; and that no investigation has yet been completed."[128] The ICO's letter confirmed that the "ICO is not pursuing any investigation under section 77 of the Act. That matter is closed as far as the ICO is concerned, given the statutory time limits for action". It added that:

> The ICO acknowledges your concern about the statement made and the subsequent media and blog reports. Given that the Deputy Commissioner has already been publicly associated with the matter, any Decision Notice will be reviewed and signed off by another authorised signatory.[129]

We regret that the ICO made a statement to the press that went beyond that which it could substantiate and that it took over a month for the ICO properly to put the record straight. We recommend that the ICO develop procedures to ensure that its public comments are checked and that mechanisms exist to swiftly correct any mis-statements or misinterpretations of such statements.

92. The disclosed e-mails appear to show a culture of non-disclosure at CRU and instances where information (disclosable or otherwise) may have been deleted, to avoid disclosure. The Deputy Information Commissioner's letter of 29 January gives a clear indication that a

126 Registrar and Secretary to Deputy Information Commissioner - 1 February 2010, UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

127 Q130

128 Ev 39, para A

129 Ev 39, annex

breach of the FOIA may have occurred but that a prosecution was time-barred.[130] As, however, UEA pointed out, no investigation has been carried out.

93. It seems to us that both sides have a point. **There is *prima facie* evidence that CRU has breached the Freedom of Information Act 2000. It would, however, be premature, without a thorough investigation affording each party the opportunity to make representations, to conclude that UEA was in breach of the Act. In our view, it is unsatisfactory to leave the matter unresolved simply because of the operation of the six-month time limit on the initiation of prosecutions. Much of the reputation of CRU hangs on the issue. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner.**

94. On the question of the six-month time limit on the initiation of prosecutions, Mr Thomas pressed for a revision of the law. He pointed out that apart from in the most blatant cases "it will usually be impossible for the ICO to detect an offence within 6 months of its occurrence" and thus to be able to initiate a prosecution.[131] He drew attention to a recent debate in the House of Lords on a proposal to amend the time limit. In reply, in the debate the Parliamentary Under-Secretary of State at the Ministry of Justice said that:

> The Freedom of Information Act 2000 came into force only in 2005, and [...] we have no evidence at present that the current six-month time limit presents a systemic problem for the Information Commissioner or any other prosecutor in taking action under Section 77. [...] We will listen to the views of the Information Commissioner and other interested parties on this point, and if there is evidence that the current legislation is causing systemic difficulties, we will look for ways to address the matter, if necessary by means of an alternative legislative vehicle in the future. However, I cannot go further than that today on behalf of the Government.[132]

No change was made to the legislation.

95. We consider that events at CRU throw light on the operation of the Freedom of Information Act 2000 and, in particular, whether there is a need to amend the time limit on prosecutions from six months from the time the alleged offence was committed. **If the Minister was correct to assert in July 2009 that the Government had no evidence that the current six-month time limit presents a systemic problem, then it is now clear that such evidence exists. Irrespective of whether or not CRU breached the Freedom of Information Act 2000, we recommend that the Government review the operation of section 77 of the 2000 Act and the six month limit on the initiation of prosecutions provided by section 127(1) of the Magistrates Court Act 1980.**

130 UEA website, Correspondence between University of East Anglia and the Information Commissioner's Office, www.uea.ac.uk/mac/comm/media/press/CRUstatements/ICOcorrespondence

131 Ev 10, para 4.3

132 HL Deb, 21 July 2009, col 1571

Volume of requests

96. In the face of allegations of poor handling of FOIA requests, one of the explanations offered by UEA was that in:

> July 2009 UEA received an unprecedented, and frankly administratively overwhelming, deluge of FOIA requests related to CRU. These amounted to 61 requests out of a 2009 total of 107 related to CRU, compared to annual totals of 2 in 2008 and 4 in 2007 (University totals for those years were 204, 72 and 44 respectively).[133]

97. At the oral evidence session Lord Lawson commented on the increase in the volume of FOIA requests:

> what had happened was there had been a very, very small number of FOI Act requests to begin with and it was in response to those that there was all the evasion, the lack of disclosure and all the other things which we have seen in the emails: discussions about possibly destroying evidence and so on. All that came well before the 2009 flood of stuff. The 2009 flood, if you look at the sequence of events, was a response to the refusal to give disclosure of various things before. That was what came first.[134]

98. There are two issues here: the adequacy of CRU's handling of the FOIA requests and whether the increase in the number of requests in July 2009 was a deluge. On the latter, Mr Thomas said that, whilst agreeing that UEA had faced a significant rise in FOIA requests in July 2009, he did not consider that a total of 61 was a "huge number".[135]

99. On handling, CRU claimed that it could not cope with the significant rise in FOIA requests because it only had three full-time academic staff.[136] We therefore wrote to UEA on 2 March 2010 to ask what extra resources were provided to assist CRU cope with these requests. UEA responded that:

> additional support was provided to the University's Information Policy Compliance Manager (IPCM) who handles FOI requests. This included rescheduling workloads to allow him to concentrate on the CRU FOI requests and diverting secretarial support to provide additional resource. Given the high volume of requests received, the Director of Information Services (DoIS) also took an active role in the first stage of a number of requests, thus providing additional support to the IPCM. (Should any cases where the DoIS was directly involved in the first stage be appealed then we have arranged for the PVC Academic to adjudicate to ensure impartiality). ISD also fast-tracked the merging of the Security Policy and Compliance team to ensure that a fully trained back-up to the IPCM was available.[137]

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133 Ev 20, para 3.7.4

134 Q 9

135 Q 68

136 Q 92 [Professor Acton], Ev 20, para 3.7.4; Ev 37, Q 1

137 Ev 37, para 1

100. The Science Faculty also provided additional administrative support, including that of the Director of Faculty Administration, the most senior member of the Faculty's administrative staff. UEA pointed out that many of the requests were of a very technical nature and:

> required scientific knowledge and understanding of the subject area in order to provide the details. Despite the additional administrative resources provided, the requirement to respond to the 61 requests received in July 2009 impacted considerably upon the work of CRU.[138]

101. We also asked UEA to outline what legal advice and guidance on handling had been offered to CRU in handling these FOIA requests. UEA confirmed that the:

> IPCM provided advice to CRU on the requirements of the Act both generally, and in relation to any applicable sections, exemptions or exceptions pertaining to the specific request. In this latter role, the IPCM set out the requirements of any possible exemption or exception, inclusive of the public interest test, and elicited from CRU staff whether the public interest test had been met. Additional advanced training was provided to the 'FOI Contact' for the Faculty of Science, the Director of Faculty Administration. In this role, the FOI contact acted as a support to CRU in the location and retrieval of information and provided assistance to the IPCM in exploring the application of the Act to the specific requests.[139]

102. On the evidence we took we have concerns about the handling of FOIA requests by CRU. First, the disclosed e-mails betray an attitude to freedom of information that was antipathetic to the spirit of disclosure in the legislation. Mr Thomas pointed out that:

> the simplest approach, particularly where requests tend to generate either a defensive attitude or place a great burden on the public authority, is proactive disclosure in the first place.[...] Public authorities ought to decide what really has to be kept away from the public. If it is particularly sensitive or there is a good reason for withholding it, fair enough, but where there is no good reason for withholding information, then why not proactively disclose it and avoid the hassle of large numbers of requests?[140]

103. Whether or not CRU liked it, those making FOIA requests were entitled to have their requests dealt with in accordance with the legislation and, if the information sought did not fall within one of the exclusions provided by the FOIA, it should have been disclosed. **We have already recommended in paragraph 54 above that in future information, including data and methodology, should be published proactively on the internet wherever possible. However, a culture of withholding information—from those perceived by CRU to be hostile to global warming—appears to have pervaded CRU's approach to FOIA requests from the outset. We consider this to be unacceptable.**

104. In the face of such an unhelpful approach we are not surprised that FOIA requests multiplied. When the surge in FOIA requests hit CRU in July 2009 UEA provided extra

138 Ev 37, para 1

139 Ev 37, para 2

140 Q 70

resources but because of their technical nature the same small group of staff at CRU had a pivotal role in handling the requests. We are not clear that the culture changed. **We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to handle FOIA requests. Further, we found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited.**

4 Independent inquiries

105. There are two reviews underway: the Independent Climate Change Email Review led by Sir Muir Russell; and a scientific assessment panel reviewing CRU's key scientific publications. The Vice-Chancellor explained to us in oral evidence on 1 March 2010 that the reviews would focus on different matters:

> Muir Russell's independent review is not looking at the science, it is looking at allegations about malpractice. As for the science itself, I have not actually seen any evidence of any flaw in the science but I am hoping, later this week, to announce the chair of a panel to reassess the science and make sure there is nothing wrong.[141]

In the event the announcement was not made until 22 March.

The Independent Climate Change Email Review

106. The Independent Climate Change Email Review is being conducted by a team, led by Sir Muir Russell. According to the Review's website the team has more than 100 years' collective expertise of scientific research methodology and a wide range of scientific backgrounds. None have any links to the Climatic Research Unit, or the United Nations' Intergovernmental Panel on Climate Change (IPCC).[142]

Terms of reference

107. The Review's terms of reference are as follows:

> The Independent Review will investigate the key allegations that arose from a series of hacked e-mails from the University of East Anglia's Climatic Research Unit (CRU). The review will:
>
> 1.1. Examine the hacked e-mail exchanges, other relevant e-mail exchanges and any other information held at CRU to determine whether there is any evidence of the manipulation or suppression of data which is at odds with acceptable scientific practice and may therefore call into question any of the research outcomes.
>
> 1.2. Review CRU's policies and practices for acquiring, assembling, subjecting to peer review and disseminating data and research findings, and their compliance or otherwise with best scientific practice.
>
> 1.3. Review CRU's compliance or otherwise with the University's policies and practices regarding requests under the Freedom of Information Act ('the FOIA') and the Environmental Information Regulations ('the EIR') for the release of data.

141 Q 129

142 www.cce-review.org/About.php

> 1.4. Review and make recommendations as to the appropriate management, governance and security structures for CRU and the security, integrity and release of the data it holds.[143]

108. Sir Muir has discretion to amend or add to the terms of reference if he feels necessary, devise his own methods of working, and call on appropriate expertise, in order to investigate the allegations fully. UEA has asked for the Review to be completed by Spring 2010 and this will be made public along with UEA's response.[144]

109. Lord Lawson, in both his written submission and his oral evidence, considered that the terms of reference "may be a bit too CRU-centric"[145] and "needed to be extended to include more fully the issue of the dissenting scientists".[146] These points were echoed in written submissions to us. Andrew Montford suggested that:

> The independence of the review is not assured. Sir Muir Russell was appointed to head the review by the vice-chancellor of the University of East Anglia, [...] Edward Acton. However, the emails disclosed implicate [his] predecessor in an apparent breach of the Freedom of Information Act and there is therefore a prime-facie case that the review is not sufficiently independent. [...] The review must take evidence from sceptics. At time of writing it appears that no prominent sceptic has been contacted by Sir Muir with a view to providing evidence. Without complainants being able to make their case to the review, it is unlikely that the findings will be sound or accepted by the sceptic community.[147]

Mike Haseler, creator of the Number 10 Petition regarding the CRU, was also critical of the Review saying that it "seems to serve no real purpose except the PR of the University to appear to be doing something."[148]

110. Others offered amendments to the terms of reference. Professor Ross McKitrick, a professor of environmental economics, recommended that the terms of reference "should consider whether CRU scientists whose responsibilities include providing climate data to the IPCC should not serve as IPCC Lead Authors (or Coordinating Lead Authors) on any Report or Chapter that assesses evidence for or against its quality for climatic research purposes."[149]

111. The Royal Society of Chemistry considered the terms of reference "adequate"[150] and Professor John Beddington suggested that they "give sufficient scope for the issue to be investigated in full".[151] Professor Peter Cox, a former lead author on the last IPCC Working

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143 Ev 39

144 "Sir Muir Russell to head the Independent Review into the allegations against the Climatic Research Unit (CRU)" UEA Press Release, 3 December 2009, www.uea.ac.uk/mac/comm/media/press/2009/dec/CRUreview

145 Q 5, Ev 1, annex containing letter dated 26 January 2010 from the Foundation to Sir Muir Russell (*not printed*)

146 Q 3

147 Ev 161, paras 22 and 24

148 Ev 139, para 27

149 Ev 140, para 3.2

150 Ev 172, para 12

151 Ev 45, para 7

Group, suggested that the "Inquiry should hear evidence on the reviewing of scientific papers and the exclusion of papers from the IPCC report. It will be critical to determine whether these decisions were carried out on the basis of scientific merit alone".[152]

112. In response to criticisms Sir Muir pointed out that the review "is not actually about the big science of global warming and making forecasts for the next hundred years".[153] He said that "it will not be window dressing", and UEA had "not interfered at all".[154]

113. **We accept the assurances that Sir Muir Russell has given about the independence of the Independent Climate Change Email Review and we expect him to be scrupulous in preserving its impartiality. We see no reason why the Review's conclusions and UEA's response have to be published together. Indeed, it could give the impression that UEA was being given an advantage when it comes to responding. We consider that the Review's conclusions and recommendations should not be conveyed to UEA in advance of publication.**

114. **With regards to the terms of reference of the Review, we consider that as well as measuring CRU against current acceptable scientific practice, the Review should also make recommendations on best practice to be followed by CRU in the future. We invite Sir Muir Russell to respond formally to our Report to the extent that he sets out whether, on the basis of its contents, he finds the Terms of Reference of his inquiry need to be changed.**

The Review team

115. The Review Team membership, as announced, consisted of:

> Sir Muir Russell
> Professor Geoffrey Boulton
> Dr Philip Campbell [*subsequently resigned*]
> Professor Peter Clarke
> Mr David Eyton
> Professor Jim Norton.[155]

116. Sir Muir and the Review team held a press briefing at the Science Media Centre in London on 11 February 2010 to announce its membership, publish its workplan and issue a call for submissions from interested parties. Almost immediately it was beset by claims of partiality. On the same day as the launch Sir Muir Russell accepted the resignation of Dr Philip Campbell, Editor of Chief of *Nature*, after a recording of an interview given by Dr Campbell to China Radio International in December 2009 was alleged to raise doubts over his impartiality. Dr Campbell said:

> I made the remarks in good faith on the basis of media reports of the leaks. As I have made clear subsequently, I support the need for a full review of the facts behind the

152 Ev 132, para 2

153 Q 163

154 Q 166

155 Ev 40

> leaked e-mails. There must be nothing that calls into question the ability of the independent Review to complete this task, and therefore I have decided to withdraw from the team.[156]

117. Sir Muir said "I have spoken to Philip Campbell, and I understand why he has withdrawn. I regret the loss of his expertise, but I respect his decision."[157] Further allegations arose on 12 February that Professor Geoffrey Boulton's background and views affected his ability to be a member of the Review.[158] These have been rejected by Sir Muir Russell and by Professor Boulton. Professor Boulton said:

> At the Review press conference (on February 11), I pointed out that I had worked full-time in the School of Environmental Sciences at UEA from its inception in 1968 to 1980, and that I had a part-time appointment between 1980 and 1986, whilst working primarily in the University of Amsterdam. Since then, I have had no professional contact with the University of East Anglia or the Climatic Research Unit. I was equally clear that although my research is not in the field of modern or recent climate change, I am familiar with its scientific basis and uncertainties surrounding it. I declared my current view of the balance of evidence: that the earth is warming and that human activity is implicated. These remain the views of the vast majority of scientists who research on climate change in its different aspects. They are based on extensive work worldwide, not that of a single institution. As a sceptical scientist, I am prepared to change those views if the evidence merits it. They certainly do not prevent me from being heavily biased against poor scientific practice, wherever it arises.[159]

Sir Muir Russell said:

> This Review must determine if there is evidence of poor scientific practice, as well as investigate allegations around the manipulation and suppression of data. As others have pointed out, it would be impossible to find somebody with the qualifications and experience we need who has not formed an opinion on climate change. I am completely confident that each member of the Review team has the integrity, the expertise, and the experience to complete our work impartially.[160]

118. In his oral evidence Sir Muir outlined his approach in choosing the team:

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156 "Dr Philip Campbell withdraws from the Review", *Independent Climate Change Email Review News release*, 12 February 2010, www.cce-review.org/News.php

157 *As above*

158 There has been pressure on Professor Boulton to step down. *The Scotsman* reported: "Dr Benny Peizer, [*sic*] director of the Global Warming Policy Foundation, a think tank which claims the debate on climate change has become distorted, called for Prof Boulton to step down, too. He said: 'Prof Boulton obviously is a very distinguished geologist. The problem is, he is a very outspoken campaigner on this issue and he's given talks calling for galvanising public opinion. He also worked at the very institution that he is now going to be investigating. That, we think, is a conflict of interest.'" ("Senior Scots scientist in climate probe row", *The Scotsman*, 13 February 2010) Sir Muir has rejected the call. ("Allegations of bias against Review member rejected", *Independent Climate Change Email Review News release*, 15 February 2010)

159 "Allegations of bias against Review member rejected", *Independent Climate Change Email Review News release*, 15 February 2010,www.cce-review.org/News.php

160 *As above*

> You can see as you look at the composition of the team that I needed to be looking at climate science in general but not somebody who was associated with this particular stream of work but would understand what was going on. There were going to be huge data handling issues, there was a lot of work on computing and data security and so on and that the work was going to have a resonance out there in the real world and around the world. Really on that basis I came up with this set of names that you can see. In relation to Dr Campbell, the others that I had got together thought that it would be extremely important to have somebody who knew about peer review and that was really the qualification that brought him in.[161]

119. **It is unfortunate that the Independent Review got off to a bad start with the necessary resignation of Dr Campbell. The question of the operation of peer review is going to be a critical issue in the inquiry and the Review Team needs to take steps to ensure the insight and experience he would have brought are replaced.**

Transparency

120. Contributors to our inquiry have suggested the importance that the Independent Review is open and transparent. Lord Lawson, in his oral evidence, said that he was:

> concerned about the openness and transparency, [...] there should be public hearings, like you are having here—I think that is very, very important—and I regret the fact that it appears that they do not intend to do this.[162]

Andrew Montford commented:

> The review must be held in public. Sir Muir Russell has stated that he wants to retain the confidence of global warming sceptics. However, in his letter to Mr Willis of 10 December 2009, [...] the vice-chancellor of UEA, states that Sir Muir will present his findings to [him], who will in turn present a report to the council of the university. We are asked to believe that Sir Muir will properly investigate [the Vice-Chancellor's] role in the alleged FoI breaches, and that [he] will pass on the findings that Sir Muir makes on this subject to the university council.[163]

121. When answering our question on transparency Sir Muir indicated that the Review team "plans to put on its website the evidence that we receive".[164] When pressed on the question of holding public evidence sessions Sir Muir responded that:

> all my predispositions and those of the fellow team members are to do it that way [via written evidence] rather than to do it in a hearing of perhaps this kind or in a series of one-to-one interviews or whatever. Where we have interviews with people in CRU or elsewhere, those will be written up and they will be part of the record but at the moment I am not really sure that getting to the stage of putting people in a

161 Q 160

162 Q 3

163 Ev 161, para 23

164 Q 172

> hearing context is going to be a particularly effective way of adding value to the objective evidence that we want to get our hands on.[165]

122. We agree that the Review must be open and transparent. **We conclude that, when the Independent Review holds oral hearings or interviews, they should be carried out in public wherever possible and that it should publish all the written evidence it receives on its website as soon as possible.**

Scientific Appraisal Panel

123. In its evidence to us the Independent Climate Change Email Review stated that its remit does not invite it to re-appraise the scientific work of CRU. That re-appraisal is being separately commissioned by UEA, with the assistance of the Royal Society.[166] In a statement released on 11 February UEA said that:

> The Royal Society will assist the University in identifying assessors with the requisite expertise, standing and independence. "Published papers from CRU have gone through the rigorous and intensive peer review process which is the keystone for maintaining the integrity of scientific research," said Professor Trevor Davies, the University's Pro-Vice-Chancellor for Research, Enterprise and Engagement. "That process and the findings of our researchers have been the subject of significant debate in recent months. Colleagues in CRU have strenuously defended their conduct and the published work and we believe it is in the interests of all concerned that there should be an additional assessment considering the science itself."
>
> The independent reassessment will complement Sir Muir Russell's Review of the key allegations about the handling of data arising from the publication of a series of e-mails hacked from CRU. Sir Muir's Review is expected to announce its finding in Spring 2010.
>
> The reassessment of CRU's key publications will be completed at the earliest date the assessors can manage. The findings will be made public.[167]

124. Details of the panel were announced on 22 March. It will be headed by Lord Oxburgh. His appointment was made on the recommendation of the Royal Society, which was also consulted on the choice of the six scientists on the panel: Professor Huw Davies, Professor of Physics at the Institute for Atmospheric and Climate Science at ETH Zürich; Professor Kerry Emanuel, Professor of Meteorology at Massachusetts Institute of Technology; Professor Lisa Graumlich, Director of the School of Natural Resources and the Environment at The University of Arizona; Professor David Hand, Professor of Statistics in the Department of Mathematics at Imperial College; Professor Herbert Huppert, Professor of Theoretical Geophysics at the University of Cambridge; and Professor Michael Kelly, Prince Philip Professor of Technology at the University of Cambridge. The panel will have

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165 Q 176

166 Ev 40, para 4

167 UEA, 11 February 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/New+scientific+assessment+of+climatic+research+publications+announced

access to any publications or materials it requests, and all information considered will be listed in the Report. UEA, in consultation with the Royal Society, has suggested that the panel looks in particular at key publications, from the body of CRU's research referred to in the UEA submission to our inquiry. According to the announcement on 22 March, the panel will meet in Norwich in April and will have the opportunity to see original data and speak to those who did the work and it comprises of scientists who use techniques similar to those used in CRU but who largely apply them to other areas of research, as well as those with experience in climate or related research.[168]

125. Announcing the Panel, Professor Trevor Davies, UEA's Pro-Vice-Chancellor for Research, said that:

> Our concern has been to bring together a distinguished group of independent scientists who understand the difference between assertion and evidence, and are familiar with using the latter to judge the validity of conclusions arising from science research. The panel members have the right mix of skills to understand the complex nature of climate research and the discipline-based expertise to scrutinise CRU's research. How they do this will be entirely down to the panel.
>
> The choice of scientists is sure to be the subject of discussion, and experience would suggest that it is impossible to find a group of eminent scientists to look at this issue who are acceptable to every interest group which has expressed a view in the last few months. Similarly it is unlikely that a group of people who have the necessary experience to assess the science, but have formed no view of their own on global warming, could be found.[169]

Public view of the climate science

126. There is no doubt that the e-mail disclosure from CRU in November 2009, and especially the extensive media coverage that has followed it ever since, has affected the general public view of climate science, both in the UK and further afield. Professor Bob Watson, Defra's Chief Scientific Adviser, told us that "the media has certainly portrayed the UEA issue as a crisis, so I think to the public it has been portrayed as a crisis".[170] Professor Peter Cox, a climate scientist and a lead-author on the last IPCC[171] Working Group, in his written submission to us, said as much: "I am concerned that public confidence in the science of climate change has been undermined by the email leak".[172] In its submission the Royal Society of Chemistry said that the:

> true nature of science dictates that research is transparent and robust enough to survive scrutiny. A lack of willingness to disseminate scientific information may infer that the scientific results or methods used are not robust enough to face scrutiny, even if this conjecture is not well-founded. This has far-reaching consequences for

168 "CRU Scientific Assessment Panel announced", UEA Press Release, 22 March 2010, www.uea.ac.uk/mac/comm/media/press/CRUstatements/SAPannounce

169 *As above*

170 Q 198

171 Intergovernmental Panel on Climate Change

172 Ev 132, para 1

> the reputation of science as a whole, with the ability to undermine the public's confidence in science.[173]

127. The majority of submissions submitted to our inquiry has been from those who stated that the disclosed e-mails confirmed their worries that the climate change orthodoxy has serious flaws and the actions of CRU seriously impugned the integrity of climate change research.[174] A representative example was the memorandum from Dr Phillip Bratby, "a semi-retired energy consultant", who said that having examined the disclosures:

> It is concluded that over at least a period of 20 years, climate science has been seriously compromised by the actions of a small group of scientists who have attempted to control the debate about climate change. The effects of this are potentially profound. For example a generation of work may have been corrupted and may be unreliable. A generation of students may have been corrupted and their work may be unreliable.[175]

128. Others offered a different perspective. Dr Timothy Osborn, a full-time member of staff at CRU, defended CRU:

> It is impossible to draw firm conclusions from the hacked documents and emails. They do not represent the complete record, and they are not a random selection from the complete record. They are clearly selected with a purpose in mind and it is easy for people to fall into the traps set by those who did the selection.[176]

129. Beyond CRU, Professor Hans von Storch and Dr Myles Allen, professional statistical climatologists, agreed that the publication of the hacked e-mails had initiated an intense debate about the credibility of climate science and that "unfortunately, this debate sometimes goes so far as to question a key result of climate science",[177] and the

> language used in some of these e-mails has created concern, among both scientists and the public, about the openness and integrity of the scientific process. But at the same time it is critical to point out that no grounds have arisen to doubt the validity of the thermometer-based temperature record since 1850, nor any results based upon it.[178]

130. We put the concerns about the threat to the reputation of science to the fifth panel who gave oral evidence: Professor John Beddington, Government Chief Scientific Adviser, Professor Julia Slingo, Chief Scientist, Met Office, and Professor Bob Watson, Chief Scientist, Department for Environment, Food and Rural Affairs. Professor Beddington did

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173 Ev 171, para 4

174 For examples, see Ev 68 [Richard S Courtney]; Ev 77 [Walter Radtke]; Ev 78 [Geoffrey Sherrington]; and Ev 93 [Clive Menzies]

175 Ev 92, para 21

176 Ev 130, para 3

177 Ev 172, para 1

178 *As above*

not consider that "UK science has been damaged".[179] The Met Office, in its written submission stated that

> the UK enjoys a reputation for strong and robust science on the international stage. In the field of climate research the Met Office is widely acknowledged as world leading.[180]

Professor Slingo confirmed in oral evidence that she has "absolute confidence in the science that we produce at the Met Office",[181] and Professor Watson, looking at the wider situation, attested that "there is absolutely no adverse effect on any of the conclusions of the IPCC."[182]

131. **In our view, reputation has to be built on the solid foundation of excellent, peer-reviewed science. The review of the science to be carried out by the Scientific Appraisal Panel, which UEA announced on 22 March, should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge that review.**

132. **Reputation does not, however, rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of CRU e-mails has damaged the reputation of UK climate science and, as views on global warming have become polarised, any deviation from the highest scientific standards will be pounced on. As we explained in chapter 2, the practices and methods of climate science are a key issue. If the practices of CRU are found to be in line with the rest of climate science, the question would arise whether climate science methods of operation need to change. In this event we would recommend that the scientific community should consider changing those practices to ensure greater transparency.**

Need for a single review

133. The final issue is whether the best interests of science are served by having two reviews or inquiries. We found this difficult to evaluate as details of the Scientific Appraisal Panel were released in a late stage in our inquiry. When we asked Sir Muir whether it would be better to have a single inquiry, he responded:

> It would have been possible, obviously, to have constructed an inquiry that looked at both aspects of that, and that was not what I was asked to do. Whether I would have been the right person to be asked to do it I do not know but certainly it obviously became clear to the Vice Chancellor that there was this different issue about the confidence that one should have not in all the methodological and handling issues but in the higher level set of conclusions about what was actually happening.[183]

134. The process of two reviews or inquiries is underway. In our view there is the potential for overlap between the two inquiries—for example, the question of the operation of peer

179 Q 194

180 Ev 46, para 1

181 Q 197

182 Q 198

183 Q 181

review needs to examine both methodology and quality of the science subject to review. **The two reviews or inquiries need to map their activities to ensure that there are no unmanaged overlaps or gaps. If there are, the whole process could be undermined.**

5 Conclusions

135. Consideration of the complaints and accusations made against CRU has led us to three broad conclusions.

136. Conclusion 1 **The focus on Professor Jones and CRU has been largely misplaced. On the accusations relating to Professor Jones's refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU.**

137. Conclusion 2 **In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones's alleged attempt to "hide the decline"—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus as expressed by Professor Beddington, that "global warming is happening [and] that it is induced by human activity".[184] It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid.**

138. Conclusion 3 **A great responsibility rests on the shoulders of climate science: to provide the planet's decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable.**

184 Q 191

Conclusions and recommendations

Datasets

1. We recognise that some of the e-mails suggest a blunt refusal to share data, even unrestricted data, with others. We acknowledge that Professor Jones must have found it frustrating to handle requests for data that he knew—or perceived—were motivated by a desire simply to seek to undermine his work. But Professor Jones's failure to handle helpfully requests for data in a field as important and controversial as climate science was bound to be viewed with suspicion. He was obviously frustrated by other workers in the field trying to "undermine" his work, but his actions were inevitably counterproductive. Professor Jones told us that the published e-mails represented only "one tenth of 1%" of his output, which amounts to one million e-mails, and that we were only seeing the end of a protracted series of e-mail exchanges. We consider that further suspicion could have been allayed by releasing all the e-mails. In addition, we consider that had the available raw data been available online from an early stage, these kinds of unfortunate e-mail exchanges would not have occurred. In our view, CRU should have been more open with its raw data and followed the more open approach of NASA to making data available. (Paragraph 38)

2. We are not in a position to set out any further the extent, if any, to which CRU should have made the data available in the interests of transparency, and we hope that the Independent Climate Change Email Review will reach specific conclusions on this point. However, transparency and accountability are of are increasing importance to the public, so we recommend that the Government reviews the rules for the accessibility of data sets collected and analysed with UK public money. (Paragraph 39)

3. We note that the research passed the peer review process of some highly reputable journals. However, we note that CRU could have been more open at that time in providing the detailed methodological working on its website. We recommend that all publicly funded research groups consider whether they are being as open as they can be, and ought to be, with the details of their methodologies. (Paragraph 45)

4. We therefore conclude that there is independent verification, through the use of other methodologies and other sources of data, of the results and conclusions of the Climate Research Unit at the University of East Anglia. (Paragraph 49)

5. Even if the data that CRU used were not publicly available—which they mostly are—or the methods not published—which they have been—its published results would still be credible: the results from CRU agree with those drawn from other international data sets; in other words, the analyses have been repeated and the conclusions have been verified. (Paragraph 51)

6. It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers. We think that this is problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable. We

therefore consider that climate scientists should take steps to make available all the data used to generate their published work, including raw data; and it should also be made clear and referenced where data has been used but, because of commercial or national security reasons is not available. Scientists are also, under Freedom of Information laws and under the rules of normal scientific conduct, entitled to withhold data which is due to be published under the peer-review process. In addition, scientists should take steps to make available in full their methodological workings, including the computer codes. Data and methodological workings should be provided via the internet. There should be enough information published to allow verification. (Paragraph 54)

7. Critics of CRU have suggested that Professor Jones's use of the word "trick" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominately caused by human activity. The balance of evidence patently fails to support this view. It appears to be a colloquialism for a "neat" method of handling data. (Paragraph 60)

8. Critics of CRU have suggested that Professor Jones's use of the words "hide the decline" is evidence that he was part of a conspiracy to hide evidence that did not fit his view that recent global warming is predominantly caused by human activity. That he has published papers—including a paper in *Nature*—dealing with this aspect of the science clearly refutes this allegation. In our view, it was shorthand for the practice of discarding data known to be erroneous. We expect that this is a matter the Scientific Appraisal Panel will address. (Paragraph 66)

9. The evidence that we have seen does not suggest that Professor Jones was trying to subvert the peer review process. Academics should not be criticised for making informal comments on academic papers. The Independent Climate Change Email Review should look in detail at all of these claims. (Paragraph 73)

Freedom of Information issues

10. We regret that the ICO made a statement to the press that went beyond that which it could substantiate and that it took over a month for the ICO properly to put the record straight. We recommend that the ICO develop procedures to ensure that its public comments are checked and that mechanisms exist to swiftly correct any mis-statements or misinterpretations of such statements. (Paragraph 91)

11. There is *prima facie* evidence that CRU has breached the Freedom of Information Act 2000. It would, however, be premature, without a thorough investigation affording each party the opportunity to make representations, to conclude that UEA was in breach of the Act. In our view, it is unsatisfactory to leave the matter unresolved simply because of the operation of the six-month time limit on the initiation of prosecutions. Much of the reputation of CRU hangs on the issue. We conclude that the matter needs to be resolved conclusively—either by the Independent Climate Change Email Review or by the Information Commissioner. (Paragraph 93)

12. If the Minister was correct to assert in July 2009 that the Government had no evidence that the current six-month time limit presents a systemic problem, then it is now clear that such evidence exists. Irrespective of whether or not CRU breached the Freedom of Information Act 2000, we recommend that the Government review the operation of section 77 of the 2000 Act and the six month limit on the initiation of prosecutions provided by section 127(1) of the Magistrates Court Act 1980. (Paragraph 95)

13. We have already recommended in paragraph 54 above that in future information, including data and methodology, should be published proactively on the internet wherever possible. However, a culture of withholding information—from those perceived by CRU to be hostile to global warming—appears to have pervaded CRU's approach to FOIA requests from the outset. We consider this to be unacceptable. (Paragraph 103)

14. We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to handle FOIA requests. Further, we found *prima facie* evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics. The failure of UEA to grasp fully the potential damage to CRU and UEA by the non-disclosure of FOIA requests was regrettable. UEA needs to review its policy towards FOIA and re-assess how it can support academics whose expertise in this area is limited. (Paragraph 104)

The Independent Climate Change Email Review

15. We accept the assurances that Sir Muir Russell has given about the independence of the Independent Climate Change Email Review and we expect him to be scrupulous in preserving its impartiality. We see no reason why the Review's conclusions and UEA's response have to be published together. Indeed, it could give the impression that UEA was being given an advantage when it comes to responding. We consider that the Review's conclusions and recommendations should not be conveyed to UEA in advance of publication. (Paragraph 113)

16. With regards to the terms of reference of the Review, we consider that as well as measuring CRU against current acceptable scientific practice, the Review should also make recommendations on best practice to be followed by CRU in the future. We invite Sir Muir Russell to respond formally to our Report to the extent that he sets out whether, on the basis of its contents, he finds the Terms of Reference of his inquiry need to be changed. (Paragraph 114)

17. It is unfortunate that the Independent Review got off to a bad start with the necessary resignation of Dr Campbell. The question of the operation of peer review is going to be a critical issue in the inquiry and the Review Team needs to take steps to ensure the insight and experience he would have brought are replaced. (Paragraph 119)

18. We conclude that, when the Independent Review holds oral hearings or interviews, they should be carried out in public wherever possible and that it should publish all the written evidence it receives on its website as soon as possible. (Paragraph 122)

The Scientific Appraisal Panel

19. In our view, reputation has to be built on the solid foundation of excellent, peer-reviewed science. The review of the science to be carried out by the Scientific Appraisal Panel, which UEA announced on 22 March, should determine whether the work of CRU has been soundly built and it would be premature for us to pre-judge that review. (Paragraph 131)

20. Reputation does not, however, rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of the CRU e-mails has damaged the reputation of UK climate science and, as views on global warming have become polarised, any deviation from the highest scientific standards will be pounced on. As we explained in chapter 2, the practices and methods of climate science are a key issue. If the practices of CRU are found to be in line with the rest of climate science, the question would arise whether climate science methods of operation need to change. In this event we would recommend that the scientific community should consider changing those practices to ensure greater transparency. (Paragraph 132)

The two inquiries

21. The two reviews or inquiries need to map their activities to ensure that there are no unmanaged overlaps or gaps. If there are, the whole process could be undermined. (Paragraph 134)

Conclusions

22. The focus on Professor Jones and CRU has been largely misplaced. On the accusations relating to Professor Jones's refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU. (Paragraph 136)

23. In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones's alleged attempt to "hide the decline"—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus as expressed by Professor Beddington, that "global warming is happening [and] that it is induced by human activity". It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid. (Paragraph 137)

24. A great responsibility rests on the shoulders of climate science: to provide the planet's decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of

living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable. (Paragraph 138)

Formal Minutes

Wednesday 24 March 2010

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell	Dr Brian Iddon
Dr Evan Harris	Graham Stringer

The Committee considered this matter.

Draft Report (The disclosure of climate data from the Climatic Research Unit at the University of East Anglia), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 46 read and agreed to.

Paragraph 47 read.

Question put, That the paragraph stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraphs 48 to 50 read and agreed to.

Paragraph 51 read.

Question put, That the paragraph stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraphs 52 to 65 read and agreed to.

Paragraph 66 read.

Amendment proposed, to leave out from the beginning to "We" in line 6 and insert "We have not taken enough evidence on this matter to come to a final conclusion".—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1	Noes, 3
Graham Stringer	Mr Tim Boswell
	Dr Evan Harris
	Dr Brian Iddon

Paragraph 66 agreed to.

Paragraphs 67 to 131 read and agreed to.

Paragraph 132 read.

Amendment proposed, to leave out from "science" in line 6 to the end and add "it would be necessary for the whole of climate science to increase its transparency and improve its scientific methodology".—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1	Noes, 3
Graham Stringer	Mr Tim Boswell
	Dr Evan Harris
	Dr Brian Iddon

Paragraph 132 agreed to.

Paragraph 133 read and agreed to.

Paragraph 134 read.

Amendment proposed, at the end of line 5 to insert "Given the increasingly hostile attitudes of both sides on this issue, it is vital that these two inquiries have at least one member each who is a reputable scientist, and is sceptical of anthropogenic climate change".—(*Graham Stringer.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 1	Noes, 3
Graham Stringer	Mr Tim Boswell
	Dr Evan Harris
	Dr Brian Iddon

Paragraphs 135 and 136 read and agreed to.

Paragraph 137 read.

Amendment proposed, after "answer" in line 3 add "**Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact.**"—(*Dr Evan Harris.*)

Question put, That the Amendment be made.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Question put, That the paragraph, as amended, stand part of the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Paragraph 138 read and agreed to.

Summary brought up and read.

Question put, That the summary be added to the Report.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Motion made, and Question put, That the Report be the Eighth Report of the Committee to the House.

The Committee divided.

Ayes, 3	Noes, 1
Mr Tim Boswell	Graham Stringer
Dr Evan Harris	
Dr Brian Iddon	

Resolved, That the Report be the Eighth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report, together with written evidence reported and ordered to be published on 24 February and 1 March 2010.

Written evidence was ordered to be reported to the House for placing in the Library and Parliamentary Archives.

[The Committee adjourned

Witnesses

Wednesday 1 March 2010

The Rt Hon Lord Lawson of Blaby, Chairman, and **Dr Benny Peiser,** Director, Global Warming Policy Foundation Ev 2

Richard Thomas CBE, former Information Commissioner Ev 11

Professor Edward Acton, Vice-Chancellor, University of East Anglia and **Professor Phil Jones,** Director of the Climatic Research Unit Ev 27

Sir Muir Russell, Head of the Independent Climate Change E-Mails Review Ev 41

Professor John Beddington, Government Chief Scientific Adviser, **Professor Julia Slingo OBE,** Chief Scientist, Met Office, and **Professor Bob Watson,** Chief Scientist, Defra Ev 58

List of written evidence

1	Andrew Montford	Ev 159
2	Anne Stallybrass	Ev 169
3	Aporia	Ev 98
4	Climate Change E-Mails Review Team	Ev 39
5	Clive Menzies	Ev 93
6	David Andrew Cockroft	Ev 168
7	David Holland	Ev 115
8	David Shaw	Ev 99
9	Douglas J. Keenan	Ev 181
10	Dr. Benny Peiser	Ev 164
11	Dr. D. R. Keiller	Ev 103
12	Dr. Michael Simons	Ev 97
13	Dr. Sonja Boehmer-Christiansen	Ev 124, Ev 127
14	Dr. Timothy J. Osborn	Ev 129
15	Edward Dilley	Ev 76
16	Eric Rasmusen	Ev 89
17	G R Ryan	Ev 78
18	Geoffrey Sherrington	Ev 78
19	Global Warming Policy Foundation	Ev 1
20	Godfrey Bloom MEP	Ev 92
21	Ian Goddard	Ev 82
22	Institute of Physics	Ev 167
23	J Ronan	Ev 197

24	John F Kelly	Ev 191
25	John Graham-Cumming	Ev 195
26	John Wadsworth	Ev 81
27	Lalu Hanuman	Ev 81
28	Martin Brumby	Ev 82
29	Met Office	Ev 46, Ev 64
30	Mike Haseler	Ev 133
31	Nicholas Barnes and David Jones	Ev 197
32	Peabody Energy Company	Ev 191
33	Peter Sinclair	Ev 82
34	Peter Taylor	Ev 186
35	Phillip Bratby	Ev 90
36	Professor Darrel Ince	Ev 152
37	Professor Hans von Storch and Dr. Myles R. Allen	Ev 172
38	Professor John Beddington, Government Chief Scientific Adviser	Ev 45, Ev 64
39	Professor Peter Cox	Ev 132
40	Professor Ross McKitrick	Ev 140
41	Public Interest Research Centre	Ev 176
42	Research Councils UK	Ev 175
43	Richard S Courtney	Ev 68
44	Richard Thomas CBE	Ev 7
45	Richard Tyrwhitt-Drake	Ev 162
46	Roger Helmer MEP	Ev 85
47	Ronald K Bolton	Ev 119, Ev 123
48	Royal Society of Chemistry	Ev 170
49	Royal Statistical Society	Ev 185
50	Stephen McIntyre	Ev 82, Ev 144
51	Stephen Prower	Ev 86
52	Steven Mosher	Ev 151
53	Stuart Huggett	Ev 77
54	Susan Ewens	Ev 83
55	University of East Anglia	Ev 16, Ev 17, Ev 25, Ev 34, Ev 37, Ev 38
56	Walter Radtke	Ev 77
57	Warwick Hughes	Ev 153

List of unprinted evidence

The following written evidence has been reported to the House, but has not been printed and copies have been placed in the House of Commons Library, where they may be inspected by Members. Other copies are in the Parliamentary Archives (www.parliament.uk/archives), and are available to the public for inspection. Requests for inspection should be addressed to The Parliamentary Archives, Houses of Parliament, London SW1A 0PW (tel. 020 7219 3074; e-mail archives@parliament.uk). Opening hours are from 9.30 am to 5.00 pm on Mondays to Fridays.

CRU 27 The Global Warming Policy Foundation annexes

CRU 58/58a Dr Nigel Dudley memoranda

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2009–10

First Report	The work of the Committee in 2008–09	HC 103
Second Report	Evidence Check 1: Early Literacy Interventions	HC 44 (HC 385)
Third Report	The Government's review of the principles applying to the treatment of independent scientific advice provided to government	HC 158-I (HC 384)
Fourth Report	Evidence Check 2: Homeopathy	HC 45
Fifth Report	The Regulation of Geoengineering	HC 221
Sixth Report	The impact of spending cuts on science and scientific research	HC 335-I
Seventh Report	Bioengineering	HC 220
Eighth Report	The disclosure of climate data from the Climatic Research Unit at the University of East Anglia	HC 387-I

Session 2008–09

First Report	Re-skilling for recovery: After Leitch, implementing skills and training policies	HC 48–I (HC 365)
Second Report	The Work of the Committee 2007–08	HC 49
Third Report	DIUS's Departmental Report 2008	HC 51–I (HC 383)
Fourth Report	Engineering: turning ideas into reality	HC 50–I (HC 759)
Fifth Report	Pre-appointment hearing with the Chair-elect of the Economic and Social Research Council, Dr Alan Gillespie CBE	HC 505
Sixth Report	Pre-appointment hearing with the Chair-elect of the Biotechnology and Biological Sciences Research Council, Professor Sir Tom Blundell	HC 506
Seventh Report	Spend, spend, spend? – The mismanagement of the Learning and Skills Council's capital programme in further education colleges	HC 530 (HC 989)
Eighth Report	Putting Science and Engineering at the Heart of Government Policy	HC 168–I (HC 1036)
Ninth Report	Pre-appointment hearing with the Chair-elect of the Science and Technology Facilities Council, Professor Michael Sterling	HC 887
Tenth Report	Sites of Special Scientific Interest	HC 717 (HC 990)
Eleventh Report	Students and Universities	HC 170–I (HC 991)

Session 2007–08

First Report	UK Centre for Medical Research and Innovation	HC 185 (HC 459)
Second Report	The work and operation of the Copyright Tribunal	HC 245 (HC 637)
Third Report	Withdrawal of funding for equivalent or lower level qualifications (ELQs)	HC 187–I (HC 638)
Fourth Report	Science Budget Allocations	HC 215 (HC 639)
Fifth Report	Renewable electricity-generation technologies	HC 216–I (HC 1063)
Sixth Report	Biosecurity in UK research laboratories	HC 360–I (HC 1111)

Seventh Report	Pre-legislative Scrutiny of the Draft Apprenticeships Bill	HC 1062–I (HC (2008–09)262)
First Special Report	The Funding of Science and Discovery Centres: Government Response to the Eleventh Report from the Science and Technology Committee, Session 2006–07	HC 214

Session 2007–08 (Continued)

Second Special Report	The Last Report: Government Response to the Thirteenth Report from the Science and Technology Committee, Session 2006–07	HC 244
Fourth Special Report	Investigating the Oceans: Government Response to the Science and Technology Committee's Tenth Report of Session 2006–07	HC 506 [incorporating HC 469–i]

CRU Scientific Assessment Panel announced

Lord Oxburgh FRS, a former chair of the Lords Select Committee on Science and Technology, is to chair an independent Scientific Assessment Panel to examine important elements of the published science of the Climatic Research Unit (CRU) at the University of East Anglia.

His appointment has been made on the recommendation of the Royal Society, which has also been consulted on the choice of the six distinguished scientists who have been invited to be members of the panel.

The panel will have access to any publications or materials it requests, and all information considered will be listed in the Report. The University, in consultation with the Royal Society, has suggested that the panel looks in particular at key publications, from the body of CRU's research referred to in the UEA submission to the Parliamentary Science and Technology Committee.

Announcing the appointment, Prof Trevor Davies, the University's Pro-Vice-Chancellor for Research, said: "CRU's scientific papers have been examined by scientists from other institutions through the peer review process before being accepted for publication by international journals. We have no reason to question the effectiveness of this process. Nevertheless, given the concerns about climate research expressed by some in the media, we decided to augment the Muir Russell review with an independent assessment of CRU's key publications in the areas which have been most subject to comment.

"We are delighted that a renowned scientist of the standing of Lord Oxburgh has agreed to chair this very strong independent panel and await its findings with great interest. Colleagues in CRU have committed themselves to providing any support required by the panel."

The panel members are: Prof Huw Davies, Professor of Physics at the Institute for Atmospheric & Climate Science at ETH Zürich; Prof Kerry Emanuel, Professor of Meteorology at Massachusetts Institute of Technology; Prof Lisa Graumlich, Director of the School of Natural Resources and the Environment at The University of Arizona; Prof David Hand, Professor of Statistics in the Department of Mathematics at Imperial College; Prof Herbert Huppert, Professor of Theoretical Geophysics at the University of Cambridge; and Prof Michael Kelly, Prince Philip Professor of Technology at the University of Cambridge.

"The shadow hanging over climate change and science more generally at present makes it a matter of urgency that we get on with this assessment. We will undertake this work and report as soon as possible," said Lord Oxburgh.

The panel will meet in Norwich in April and will have the opportunity to see original data and speak to those who did the work. It comprises of scientists who use techniques similar to those used in CRU but who largely apply them to other areas of research, as well as those with experience in climate or related research.

Prof Davies said: "Our concern has been to bring together a distinguished group of independent scientists who understand the difference between assertion and evidence,

and are familiar with using the latter to judge the validity of conclusions arising from science research. The panel members have the right mix of skills to understand the complex nature of climate research and the discipline-based expertise to scrutinise CRU's research. How they do this will be entirely down to the panel.

"The choice of scientists is sure to be the subject of discussion, and experience would suggest that it is impossible to find a group of eminent scientists to look at this issue who are acceptable to every interest group which has expressed a view in the last few months. Similarly it is unlikely that a group of people who have the necessary experience to assess the science, but have formed no view of their own on global warming, could be found.

"We are grateful to the Royal Society for helping us to identify such a strong panel and to the members for dedicating their time to this important matter."

Their report will be submitted to the Vice-Chancellor. His response, and the report itself, together with the list of publications assessed,will be published in full.

Notes to Editors:

1. Lord Oxburgh is not available for interview at present, but interviews may be arranged with Prof Trevor Davies via the University of East Anglia Press Office by calling 01603 592764.

2. **Prof Ron Oxburgh FRS (Lord Oxburgh of Liverpool)** trained originally as a geologist and has worked as an academic, a civil servant and in business. Between 1987 and 1993 he was Chief Scientific Adviser to the Ministry of Defence and from 1993 to 2001 Rector of Imperial College. He was non-executive Chairman of Shell Transport and Trading until the Company merged with Royal Dutch Petroleum to form Royal Dutch Shell in 2005. He is currently President of the Carbon Capture and Storage Association and Chairman of Falck Renewables. He is a former Chairman of the Trustees of the Natural History Museum and of the House of Lords Select Committee on Science and Technology. He is Foreign member of the US, Australian and German Academies of Science.

3. **The panel:**
   Prof Huw Davies was Professor of Atmospheric Dynamics at the ETH in Zürich where he served as both Director of the Institute for Atmospheric & Climate Science and Head of the Department of Environmental Sciences. He graduated from the University of Wales, studied for his doctorate at Imperial College London, and lectured at the University of Reading. He is a member of the Academia Europaea, and was President of the International Association of Meteorology & Atmospheric Science (IAMAS). Currently he is a member of the Natural Environment Research Council (NERC), and on the executive committee of the International THORPEX programmes. He was listed as a reviewer in the 1990 IPCC WG1 report. His research is in the fields of atmospheric dynamics and short-term climate variability.

   Prof Kerry Emanuel is Professor of Meteorology at the Massachusetts Institute of Technology and was elected a Member of the US National Academy of

Sciences in 2007. He specialises in atmospheric convection, tropical cyclones and the mechanisms acting to intensify hurricanes, coining the term "hypercane" in 1994. His research group at MIT has developed a promising technique for inferring tropical cyclone activity from climate models. Prof Emanuel was asked to review a small portion of the IPCC report of 2007 dealing with tropical cyclones. He was named one of the 100 influential people of 2006 by Time Magazine.

Prof Lisa Graumlich is Director of the School of Natural Resources and the Environment at The University of Arizona. As a researcher, she investigates how ecosystems and human societies adapt to climate change, with a special focus on severe and persistent droughts. She started her career at The University of Arizona in the Laboratory of Tree-Ring Research and was first Director of the University of Arizona's Institute for the Study of Planet Earth. In 1999, she moved to Montana State University to direct the Big Sky Institute, returning to Arizona to take up her current post in 2007.

Prof David Hand FBA is Professor of Statistics in the Department of Mathematics at Imperial College. He is also Chief Scientific Adviser to Winton Capital Management, and President of the Royal Statistical Society. He has broad research interests, including multivariate statistics, classification methods, pattern detection, the interface between statistics and computing, and the foundations of statistics. He has wide-ranging consultancy experience to organisations ranging from banks, through pharmaceutical companies, to governments.

Prof Herbert Huppert FRS has been Professor of Theoretical Geophysics and Foundation Director, Institute of Theoretical Geophysics, at the University of Cambridge since 1989 and Fellow of King's College Cambridge since 1970. He was elected Fellow of the Royal Society in 1987. His area of expertise is general fluid mechanics, in particular as applied to the Earth Sciences. Current areas of active research include: phase changes between fluid and solids (solidification and melting); formation of ice in the Arctic and Antarctic; propagation of gravity currents; particle-driven flows; turbidites and pyroclastic flows; flow of granular media; volcanic eruption dynamics; natural ventilation; slow viscous motions; flow in porous media and carbon dioxide sequestration.

Prof Michael Kelly FRS is Prince Philip Professor of Technology at the University of Cambridge, where during 2003-05 he was also executive director of the Cambridge-MIT Institute. He was a member of the research staff of GEC during 1981-1992, and professor of physics and electronics at the University of Surrey during 1992-2002, and head of its School of Electronics and Physical Sciences during 1996-2001. He is also a non-executive director of the Laird Group plc. He is a fellow of the Royal Societies of London and New Zealand and of the Royal Academy of Engineering, the Institute of Physics and the Institute of Engineering and Technology. He was chief scientific adviser to the Department of Communities and Local Government from 2006 to 2009.

4. The University's submission to the Parliamentary Science and Technology Committee can be seen at:

http://www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/memo/climatedata/uc0002.pdf

Suggested peer-reviewed publications for assessment and assessors volunteered.

Publication	Assessor(s) volunteered
1. Brohan, P., Kennedy, J., Harris, I., Tett, S.F.B. and Jones, P.D., 2006: Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850. *J. Geophys. Res.* **111**, D12106.	Huw Davies
2. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, S. G. Shiyatov, and E. A. Vaganov. 1998a. Reduced sensitivity of recent tree-growth to temperature at high northern latitudes. *Nature* **391**:678-682.	Michael Kelly
3. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, I. C. Harris, S. G. Shiyatov, E. A. Vaganov, and H. Grudd, 1998b. Trees tell of past climates: but are they speaking less clearly today? *Philosophical Transactions of the Royal Society of London Series B – Biological Sciences* 353, 65-73.	Michael Kelly
4. Briffa, K. R. 2000. Annual climate variability in the Holocene: interpreting the message of ancient trees. *Quaternary Science Reviews* **19**, 87-105.	Michael Kelly
5. Briffa, K.R., Osborn, T.J., Schweingruber, F.H., Harris, I.C., Jones, P.D., Shiyatov, S.G. and Vaganov, E.A., 2001: Low-frequency temperature variations from a northern tree-ring density network. *J. Geophys. Res.* **106**, 2929-2941.	Michael Kelly
6. Briffa, K. R., V. V. Shishov, T. M. Melvin, E. A. Vaganov, H. Grudd, R. M. Hantemirov, M. Eronen, and M. M. Naurzbaev. 2008. Trends in recent temperature and radial tree growth spanning 2000 years across northwest Eurasia. *Philosophical Transactions of the Royal Society B-Biological Sciences* **363**, 2271-2284.	Michael Kelly
7. Jones, P.D. and Moberg, A., 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *J. Climate* **16**, 206-223.	Huw Davies
8. Jones, P.D., Raper, S.C.B., Bradley, R.S., Diaz, H.F., Kelly, P.M. and Wigley, T.M.L., 1986a: Northern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 161-179.	Huw Davies
9. Jones, P.D., Raper, S.C.B. and Wigley, T.M.L., 1986b: Southern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 1213-1230.	Huw Davies David Hand
10. Jones, P.D., Groisman, P.Ya., Coughlan, M., Plummer, N., Wang, W-C. and Karl, T.R., 1990: Assessment of urbanization effects in time series of surface air temperature over land. Nature 347, 169-172.	Lisa Graumlich David Hand
11. Jones, P.D., Lister, D.H. and Li, Q., 2008: Urbanization effects in large-scale temperature records, with an emphasis on China. Journal of Geophysical Research, 113, D16122.	Lisa Graumlich David Hand
David Hand has indicated he is happy to change around.	
No preference expressed	Hubert Huppert
No preference expressed	Kerry Emanuel

Report of the International Panel set up by the University of East Anglia to examine the research of the Climatic Research Unit.

Introduction

1. The Panel was set up by the University in consultation with the Royal Society to assess the integrity of the research published by the Climatic Research Unit in the light of various external assertions. The Unit is a very small academic entity within the School of Environmental Sciences. It has three full time and one part time academic staff members and about a dozen research associates, PhD students and support staff. The essence of the criticism that the Panel was asked to address was that climatic data had been dishonestly selected, manipulated and/or presented to arrive at pre-determined conclusions that were not compatible with a fair interpretation of the original data. The members of the Panel are listed in Appendix A at the end of this report.

2. The Panel was not concerned with the question of whether the conclusions of the published research were correct. Rather it was asked to come to a view on the integrity of the Unit's research and whether as far as could be determined the conclusions represented an honest and scientifically justified interpretation of the data. The Panel worked by examining representative publications by members of the Unit and subsequently by making two visits to the University and interviewing and questioning members of the Unit. Not all the panel were present on both occasions but two members were present on both occasions to maintain continuity. About fifteen person/days were spent at the University discussing the Unit's work.

3. The eleven representative publications that the Panel considered in detail are listed in Appendix B. The papers cover a period of more than twenty years and were selected on the advice of the Royal Society. All had been published in international scientific journals and had been through a process of peer review. CRU agreed that they were a fair sample of the work of the Unit. The Panel was also free to ask for any other material that it wished and did so. Individuals on the panel asked for and reviewed other CRU research materials.

4. The Panel's work began with a detailed reading of the published work. Every paper was read by a minimum of three Panel members at least one of whom was familiar with the general area to which the paper related. At least one of the other two was a generalist with no special climate science expertise but with experience of some of the general techniques and methods employed in the work. Most of the members of the Panel read all the publications. The publications provided a platform from which to gain a deeper understanding of the Unit's research and enabled the Panel to probe particular questions in more detail.

5.B roadly the work of the Unit falls into two parts:

- Construction and interpretation of tree ring chronologies extending over some thousands of years with a view to gaining information about past climates:
- Studies of temperatures over the last few hundred years from direct observations.

Dendroclimatology

1.Tre e growth is sensitive to very many factors including climate. By piecing together growth records from different trees, living or dead, it is possible to determine the temporal variation of growth patterns going back many hundreds of years. The dendroclimatological work at CRU seeks to go beyond this and to extract from the dated growth patterns the local and regional history of temperature variations. The Unit does virtually no primary data acquisition but has used data from published archives and has collaborated with people who have collected data.

2.The main effort of the dendroclimalogists at CRU is in developing ways to extract climate information from networks of tree ring data. The data sets are large and are influenced by many factors of which temperature is only one. This means that the effects of long term temperature variations are masked by other more dominant short term influences and have to be extracted by statistical techniques. The Unit approaches this task with an independent mindset and awareness of the interplay of biological and physical processes underlying the signals that they are trying to detect.

3.Althoug h inappropriate statistical tools with the potential for producing misleading results have been used by some other groups, presumably by accident rather than design, in the CRU papers that we examined we did not come across any inappropriate usage although the methods they used may not have been the best for the purpose. It is not clear, however, that better methods would have produced significantly different results. The published work also contains many cautions about the limitations of the data and their interpretation.

4.Chronolog ies (transposed composites of raw tree data) are always work in progress. They are subject to change when additional trees are added; new ways of data cleaning may arise (e.g. homogeneity adjustments), new measurement methods are used (e.g. of measuring ring density), new statistical methods for treating the data may be developed (e.g. new ways of allowing for biological growth trends).

5.This is i llustrated by the way CRU check chronologies against each other; this has led to corrections in chronologies produced by others. CRU is to be commended for continuously updating and reinterpreting their earlier chronologies.

6. With very noisy data sets a great deal of judgement has to be used. Decisions have to be made on whether to omit pieces of data that appear to be aberrant. These are all matters of experience and judgement. The potential for misleading results arising from selection bias is very great in this area. It is regrettable that so few professional statisticians have been involved in this work because it is fundamentally statistical. Under such circumstances there must be an obligation on researchers to document the judgemental decisions they have made so that the work can in principle be replicated by others.

7. CRU accepts with hindsight that they should have devoted more attention in the past to archiving data and algorithms and recording exactly what they did. At the time the work was done, they had no idea that these data would assume the importance they have today and that the Unit would have to answer detailed inquiries on earlier work. CRU and, we are told, the tree ring community generally, are now adopting a much more rigorous approach to the archiving of chronologies and computer code. The difficulty in releasing program code is that to be understood by anyone else it needs time-consuming work on documentation, and this has not been a top priority.

8. After reading publications and interviewing the senior staff of CRU in depth, we are satisfied that the CRU tree-ring work has been carried out with integrity, and that allegations of deliberate misrepresentation and unjustified selection of data are not valid. In the event CRU scientists were able to give convincing answers to our detailed questions about data choice, data handling and statistical methodology. The Unit freely admits that many data analyses they made in the past are superseded and they would not do things that way today.

9. We have not exhaustively reviewed the external criticism of the dendroclimatological work, but it seems that some of these criticisms show a rather selective and uncharitable approach to information made available by CRU. They seem also to reflect a lack of awareness of the ongoing and dynamic nature of chronologies, and of the difficult circumstances under which university research is sometimes conducted. Funding and labour pressures and the need to publish have meant that pressing ahead with new work has been at the expense of what was regarded as non-essential record keeping. From our perspective it seems that the CRU sins were of omission rather than commission. Although we deplore the tone of much of the criticism that has been directed at CRU, we believe that this questioning of the methods and data used in dendroclimatology will ultimately have a beneficial effect and improve working practices

Temperatures from Historical Instrumental Records

1. The second main strand of work at CRU has been the collection and collation of instrumental land temperature records from all over the world and the construction of regional, hemispherical and global scale temperature records. These records are irregularly distributed in space and time. Modern records come largely from land-based meteorological stations but their geographical distribution is uneven and strongly biased in favour of the northern hemisphere

where most of the Earth's land masses are located. Oceans cover two thirds of the Earth's surface and away from the main shipping routes coverage is thin. For earlier centuries the record is much sparser. Deriving estimates of past temperatures on a global, hemispheric and regional scale from incomplete data sets is one of the problems faced by the Unit and in consequence an important current interest is the discovery of useable old temperature records from a variety of sources.

2. In the latter part of the 20th century CRU pioneered the methods for taking into account a wide range of local influences that can make instrumental records from different locations hard to compare. These methods were very labour intensive and were somewhat subjective. Much of this work was supported by the US Department of Energy and was published with the details of station corrections several times a year. Since the 1980s the Unit has done no more of this work and have concentrated on the merging and interpretation of data series corrected by others. There have been various analyses of similar publicly available data sets by different international groups. Although there are some differences in fine detail that reflect the differences in the analytical methods used, the results are very similar.

3. The Unit has devoted a great deal of effort to understanding how instrumental observations are best combined to derive the surface temperature on a variety of time and space scales. It has become apparent from a number of studies that there is elevation of the surface temperature in and around large cities and work is continuing to understand this fully.

4. Like the work on tree rings this work is strongly dependent on statistical analysis and our comments are essentially the same. Although there are certainly different ways of handling the data, some of which might be superior, as far as we can judge the methods which CRU has employed are fair and satisfactory. Particular attention was given to records that seemed anomalous and to establishing whether the anomaly was an artefact or the result of some natural process. There was also the challenge of dealing with gaps in otherwise high quality data series. In detailed discussion with the researchers we found them to be objective and dispassionate in their view of the data and their results, and there was no hint of tailoring results to a particular agenda. Their sole aim was to establish as robust a record of temperatures in recent centuries as possible. All of the published work was accompanied by detailed descriptions of uncertainties and accompanied by appropriate caveats. The same was true in face to face discussions.

5. We believe that CRU did a public service of great value by carrying out much time-consuming meticulous work on temperature records at a time when it was unfashionable and attracted the interest of a rather small section of the scientific community. CRU has been among the leaders in international efforts to determining the overall uncertainty in the derived temperature records and where work is best focussed to improve them.

TR017 – Bradley, R.S., Kelly, P.M., Jones, P.D., Goodess, C.M. and Diaz, H.F., 1985: A Climatic Data Bank for Northern Hemisphere Land Areas, 1851-1980, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TRO17*, 335 pp.

TR022 – Jones, P.D., Raper, S.C.B., Santer, B.D., Cherry, B.S.G., Goodess, C.M., Kelly, P.M., Wigley, T.M.L., Bradley, R.S. and Diaz, H.F., 1985: A Grid Point Surface Air Temperature Data Set for the Northern Hemisphere, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TRO22*, 251 pp.

TR027 – Jones, P.D., Raper, S.C.B., Cherry, B.S.G., Goodess, C.M. and Wigley, T.M.L., 1986: A Grid Point Surface Air Temperature Data Set for the Southern Hemisphere, 1851-1984, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TR027*, 73 pp.

APPENDIX B

Peer-reviewed publications for assessment.

1. Brohan, P., Kennedy, J., Harris, I., Tett, S.F.B. and Jones, P.D., 2006: Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850. *J. Geophys. Res.* **111**, D12106.

2. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, S. G. Shiyatov, and E. A. Vaganov. 1998a. Reduced sensitivity of recent tree-growth to temperature at high northern latitudes. *Nature* **391**:678-682.

3. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, I. C. Harris, S. G. Shiyatov, E. A. Vaganov, and H. Grudd, 1998b. Trees tell of past climates: but are they speaking less clearly today? *Philosophical Transactions of the Royal Society of London Series B – Biological Sciences* 353, 65-73.

4. Briffa, K. R. 2000. Annual climate variability in the Holocene: interpreting the message of ancient trees. *Quaternary Science Reviews* **19**, 87-105.

5. Briffa, K.R., Osborn, T.J., Schweingruber, F.H., Harris, I.C., Jones, P.D., Shiyatov, S.G. and Vaganov, E.A., 2001: Low-frequency temperature variations from a northern tree-ring density network. *J. Geophys. Res.* **106**, 2929-2941.

6. Briffa, K. R., V. V. Shishov, T. M. Melvin, E. A. Vaganov, H. Grudd, R. M. Hantemirov, M. Eronen, and M. M. Naurzbaev. 2008. Trends in recent temperature and radial tree growth spanning 2000 years across northwest Eurasia. *Philosophical Transactions of the Royal Society B-Biological Sciences* **363**, 2271-2284.

7. Jones, P.D. and Moberg, A., 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *J. Climate* **16**, 206-223.

8. Jones, P.D., Raper, S.C.B., Bradley, R.S., Diaz, H.F., Kelly, P.M. and Wigley, T.M.L., 1986a: Northern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 161-179.

9. Jones, P.D., Raper, S.C.B. and Wigley, T.M.L., 1986b: Southern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 1213-1230.

10. Jones, P.D., Groisman, P.Ya., Coughlan, M., Plummer, N., Wang, W-C. and Karl, T.R., 1990: Assessment of urbanization effects in time series of surface air temperature over land. Nature 347, 169-172.

11. Jones, P.D., Lister, D.H. and Li, Q., 2008: Urbanization effects in large-scale temperature records, with an emphasis on China. Journal of Geophysical Research, 113, D16122.

Supporting documentation

Briffa and Melvin (2009) which is online at
http://www.cru.uea.ac.uk/cru/people/briffa/yamal2009/

APPENDIX A
PANEL MEMBERSHIP

Chair: Prof Ron Oxburgh FRS (Lord Oxburgh of Liverpool)

Prof Huw Davies, ETH Zürich
Prof Kerry Emanuel, Massachusetts Institute of Technology
Prof Lisa Graumlich, University of Arizona.
Prof David Hand FBA, Imperial College, London.
Prof Herbert Huppert FRS, University of Cambridge
Prof Michael Kelly FRS, University of Cambridge

6. The Unit has demonstrated that at a global and hemispheric scale temperature results are surprisingly insensitive to adjustments made to the data and the number of series included.

7. Recent public discussion of climate change and summaries and popularizations of the work of CRU and others often contain over-simplifications that omit serious discussion of uncertainties emphasized by the original authors. For example, CRU publications repeatedly emphasize the discrepancy between instrumental and tree-based proxy reconstructions of temperature during the late 20th century, but presentations of this work by the IPCC and others have sometimes neglected to highlight this issue. While we find this regrettable, we could find no such fault with the peer-reviewed papers we examined

Conclusions

1. We saw no evidence of any deliberate scientific malpractice in any of the work of the Climatic Research Unit and had it been there we believe that it is likely that we would have detected it. Rather we found a small group of dedicated if slightly disorganised researchers who were ill-prepared for being the focus of public attention. As with many small research groups their internal procedures were rather informal.

2. We cannot help remarking that it is very surprising that research in an area that depends so heavily on statistical methods has not been carried out in close collaboration with professional statisticians. Indeed there would be mutual benefit if there were closer collaboration and interaction between CRU and a much wider scientific group outside the relatively small international circle of temperature specialists.

3. It was not the immediate concern of the Panel, but we observed that there were important and unresolved questions that related to the availability of environmental data sets. It was pointed out that since UK government adopted a policy that resulted in charging for access to data sets collected by government agencies, other countries have followed suit impeding the flow of processed and raw data to and between researchers. This is unfortunate and seems inconsistent with policies of open access to data promoted elsewhere in government.

4. A host of important unresolved questions also arises from the application of Freedom of Information legislation in an academic context. We agree with the CRU view that the authority for releasing unpublished raw data to third parties should stay with those who collected it.

Submitted to the University 12 April 2010

INPUT FOR THE CRU REVIEW: M J Kelly 25.III.10

Comments on Briffa Papers (nos 2-6 on list)

Initial Response after First Reading: (will reread and comment on each)

All papers are involved with trying to extract past climate information from tree-ring data. There are two stages in this, the first trying to take the raw data and remove features that have their origin outside what is known or thought to be relevant, such as that older trees tend to grow more slowly. At this stage the choice of initial data accepted is also important. Because of other factors (precipitation, hours of sunlight, attitude (north facing etc)) all have a bearing on tree growth whatever the climate, trees are used only from high latitudes and near the tree-line where any actual climate dependence is likely to be more prominent. The second stage is to try to extract climatic inferences from this suitably prepared input data.

My overriding impression that this is a continuing and valiant attempt via a variety of statistical methods to find possible signals in very noisy and patchy data when several confounding factors may be at play in varying ways throughout the data. It would take an expert in statistics to comment on the appropriateness of the various techniques as they are used. The descriptions are couched within an internal language of dendrochronology, and require some patience to try and understand.

There is no evidence, as far as I am concerned, of anything other than a straightforward scientific exercise within the confines described above. The papers are full of suitable qualifications about the limitations of the data and the strength of the inferences to be drawn from them. I find no evidence of blatant mal-practice. That is not to say that, working within the current paradigm, choices of data and analysis approach might be made in order to strain to get more out of the data than a dispassionate analysis might permit.

There are however some more detailed qualifications:

(i) I take real exception to having simulation runs described as experiments (without at least the qualification of 'computer' experiments). It does a disservice to centuries of real experimentation and allows simulations output to be considered as real data. This last is a very serious matter, as it can lead to the idea that real 'real data' might be wrong simply because it disagrees with the models! That is turning centuries of science on its head.

(ii) The reading of the papers was made rather harder by the quality of the diagrams, and the description of the vertical axes on a number of graphs. When numbers on the vertical axis go from -2 to +2 without being explicitly labelled as percentage deviations, temperature excursions, or scaled correlation coefficients, there is potential for confusion.

(iii) I think it is easy to see how peer review within tight networks can allow new orthodoxies to appear and get established that would not happen if papers were written for and peer-reviewed by a wider audience. I have seen it happen elsewhere. This finding may indeed be an important outcome of the present review.

More detailed comments on the Briffa papers, by paper, on a second reading:

(2) 'Reduced sensitivity of recent tree-growth to temperatures at high northern latitudes', K R Briffa et al, Nature 391 678-82 (1998)

This is a short contribution to the 'divergence debate'. Samples are taken from 300 sites, although there is no hard-and-fast rule that is used to discriminate what is and what is not included. A range of statistical analyses are done, with particular correlations ranging from 34% to 85% (with average 60%) in the period 1881-1960 which drop by about 20% when the period is extended to 1881-1981. To an untrained eye, the raw data is very noisy, and even then the raw data has been detrended of age-trends in individual trees, and the subsequent data is scaled to have zero average and unit variance over the time period before being plotted. This means that correlations can only be qualitative and temporal. A variety of suggestions are made for the growing divergence of the tree-ring and the instrumental record over the last 50 years, each of which could be convolved in the data further back, but no one thing is concluded to be the primary cause. While it may be a laudable intent to make these correlations, it would be easy to remain sceptical as to their real value, and especially if one tried to make and insist upon quantitative conclusions.

(3) 'Trees tell of past climates: but are they speaking less clearly today', K R Briffa et al, Phil. Trans. Roy. Soc. London. B 353 65-73 (1998)

This is a longer version of the previous paper. 'Inferring the details of past climate variability from tree-ring data remains a largely empirical exercise, but one that goes hand-in-hand with the development of techniques that seek to identify and isolate the confounding influence of local and larger-scale non-climatic factors.' Figure 2 shows dramatic differences in long time-scale temperature information reconstructed from the same tree-ring data using two different techniques to removed localized age biases – they differ by a factor of five in scale! Because the one with the larger excursion retains greater long-time-scale changes, (e.g. the medieval warm period and the little ice age) it is regarded as superior. I remain worried about how the actual absolute scale of temperature excursion is decided upon, as shown in Figure 3. Figure 5 has no vertical axis description: it says it is a plot of standardised anomalies, but it has an average of -0.3 and a standard deviation of 1.1, but what? Section 5 raises the 'divergence' issue. Section 6 looks at basal area increments and maximum density, showing that the former rises linearly from 1850 to 1950 and flattens, while the latter is flat from 1850 to 1950 and then falls. It is hard directly to correlate this aspect with the anthropogenic hypothesis of climate warming. Some features do correlate – others don't – so where is the rigorous test of the significance of correlation or lack of it?

(4) 'Annual climate variability in the Holocene: interpreting the message of ancient trees', K R Briffa, Quaternary Sciences Reviews 19 87-105 (2000)

This is a major paper reviewing and updating his work over the 1990s. Referring to dendroclimatology supporting the notion that the last 100 years have been unusually warm in the context of the last 2000 years, Briffa says: 'However, this evidence should not be considered unequivocal.' He also states 'The interrelationships between large-scale patterns of temperature, precipitation and atmospheric pressure variability also mean that networks of climate sensitive tree-ring chronologies can be used to make statistical inferences about the past behaviour of circulation patterns or important circulation indices.' The Figure 1 shows several selected reconstructions of summer temperatures over the last 2000 years. I am not sure just how the vertical scale (temperature) is calibrated, other perhaps (but not stated explicitly) than by correlation with the recent instrument record. I have trouble with the vertical axis of Figure 3, relating to moisture reconstructions. The major sections 3 and 4 of this paper work to reconstruct the major circulation patterns in the northern and southern hemisphere in so far as this can be done from tree-ring data. In terms of a chronology of events (e.g. volcanic eruptions) there are some correlations, but the actual excursions of temperature etc are less convincing. He points out the need for more data from the Himalayas and other regions. He also points out that the 20th century data seems anomalous, and speculates on what is happening, but does not conclude why it is happening.

(5) 'Low-frequency temperature variations from a northern tree-ring density set' K R Briffa et al, Journal of Geophysical Research 106 2929-41 (2001)

This paper uses a new statistical technique 'age band decomposition' to examine northern hemisphere climate change over the last 600 years with the intent of preserving some of the longer-timescale variability that is lost by other techniques. The reconstruction results in generally lower temperatures for earlier times, notably the 17th century, but the northern Siberia had 15th century summers warmer than those in the 20th century. The Figure 1 shows the full gamut of raw data which is described as climate signal + age signal + noise, and what happens when all the data from tress that are 21-40 and 51-70 years old are averaged, and then combined. This is yet another technique for detecting a weak signal in noisy and patchy data. Plate 2 contains averaged data from 9 different regions, and there is really not much inter-correlation signifying either short events or multidecadal events. Further on, plate 4 shows a range of reconstructions compatible with the same input data, and while results from 1700 to 1950 look mutually consistent, the results before then or after are certainly not. Their plate 3 is an often quoted diagram of six large-scale reconstructions, with a standard deviation of 0.1C variability at 1900, increasing to 0.3C at 1700.

(6) 'Trends in recent temperature and radial tree growth spanning 2000 years across northwest Eurasia', K R Briffa et al, Phil. Trans. R. Soc. B 363 2271-84 (2008).

The first sentence of the text refers to climate model experiments, which offends me! This more recent paper looks at regional reconstructions over the last 2000 years, showing strong regional variations. 'A set of long tree-ring chronologies provides empirical evidence of

association between inter-annual tree growth and local, primarily summer, temperature variability at each location. These data show no evidence for the recent breakdown in this association as has been found at other high-latitude Northern Hemisphere locations.' That means, there is no divergence here! Yet another technique, Kendall's concordance, is used to 'show strong evidence that the extent of recent widespread warming across northwest Eurasia, with respect to 100- to 200- year trends, is unprecedented in the last 2000 years.' This involves data from three regions, Fennoscandia, Yamal and Avam-Taimyr. Many of the vertical scales are described as 'index values' so that the chronologies can show events but the absolute excursion amplitudes of any parameters are not calibrated. Figure 5 show that the various trend parameters and means show that the observations that are two or more standard deviations positive are mainly from 1900-1946. In section 5 it is shown how correlation plots between the regional curve standardized chronologies and (i) monthly mean temperatures over 1950-1994 and (ii) a sequence of temperatures averaged over successive periods of five days. In the final section, one reads: 'These results are superficially consistent with the expected patterns of increasing high-latitude warming suggested by GCM simulations of possible future climates under enhanced atmospheric GHG emissions. However, a simple analysis of one such experiment, under natural and GHG forcing for the last 250 years, while showing consistently increasing concordance between simulated temperatures in the regions of our chronologies, failed to produce results that could be distinguished from the results of a similar experiment driven only with natural (i.e. non-anthropogenic) forcings.' The line between positive conclusions and the null hypothesis is very fine in my book.

Comments on Jones Papers (7-9) 25.III.10

(7) 'Hemispheric and Large-scale surface air temperature variations: an extensive revision and an update to 2001', P D Jones et A Moberg, Journal of Climate 16 209-223 (2003)

The title describes the contents. Section 2 focuses on data, section 3 on interpolation onto a grid, section 4 analyses the land data and section 5 looks at combined marine and land data. I worry about the sheer range and the ad hoc/subjective nature of all the adjustments, homogenisations etc of the raw data from different places. If Australia changes its way of calculating average temperature (from the average of max and min daily temperatures to a hourly or three-hourly average of the data) and get a -0.2C change, how representative is that change over the times before and after the switch in method of calculation? What if some of the eliminated outliers are genuine? There is plenty of openness about the limitations of the data. There is no evidence of overt scientific malpractice. That is not to absolve the authors of conscious or unconscious bias in making all the choices referred to above.

(8) 'Northern Hemisphere surface air temperature variations: 1851-1984', P D Jones et al, *Journal of Climate and Applied Meteorology* 25, 161-179 (1986a)

An attempt to get a database of 5(lat)x10(long) gridded temperature time series for the Northern Hemisphere over the period given. A long section 2 deals with inhomogeneity in the data and changes in the way data is calculated and presented, and urban heat island effects. Section 3 assesses the homogeneity of the data, and 4 presents the homogeneity results. Section 5 grids the temperatures data, 6 compares the results with other sources, 7 is concerned with incomplete data in earlier years, and 8 draws conclusions. All this happens before the latest concerns about rising temperature, so the main point of note was that 1921-1984 was 0.4C warmer than 1851-1920!

(9) 'Southern Hemisphere surface air temperature variations: 1851-1984', P D Jones et al, *Journal of Climate and Applied Meteorology* 25, 1213-1230 (1986b)

An attempt to get a database of 5(lat)x10(long) gridded temperature time series for the Southern Hemisphere over the period given, a companion and complement to the previous paper. Section 2 deals with the previous work, which is scarce and not as well characterised as for the NH. The section 3 deals with the data, its homogenization and gridding, section 4 discusses the effects of incomplete data. Section 5 deals with the results under headings such as comparisons with other temperature estimates, high-latitude and low latitude links, inter-hemisphere comparisons and temperature trends. Section 6 concludes. I am concerned about section 4: only 27% of the area is covered by land or adjacent land. Then there are correlations within models by selecting subsets of data showing downward trends as the 'distance' in time increases. I would be surprised at anything else. The handling of Antarctica is crude. Section 5c points out a number of correlations, and concludes that fluctuations in the NHT data do not need to be heeded too much. Even though only a few months later in submission there is a big change in emphasis on the global warming implications, showing no hint of significant cooling anywhere in the southern hemisphere. In neither of these papers is there any overt malpractice, but one can't eliminate the possibility

of conscious or unconscious bias in the choices of data. I just do wonder if a different hypothesis was being tested whether the same approach could give a very different answer.

Subsequent thoughts:

(1) My second reading reinforces my initial observations and concerns.

(2) On a personal note, I chose to study the theory of condensed matter physics, as opposed to cosmology, precisely on the grounds that I could systematically control and vary the boundary conditions of my object of study as an integral part of making advances. An elegant theory which does not fit good experimental data is a bad theory. Here the starting data is patchy and noisy, and the choices made are in part aesthetic, or designed to help a conclusion, rather than neutral. This all colours my attitude to the limited value of complex simulations that cannot by exhaustively tested against 'real' data from independent experiments that control all but one of the variables.

(3) Up to and throughout this exercise, I have remained puzzled how the real humility of the scientists in this area, as evident in their papers, including all these here, and the talks I have heard them give, is morphed into statements of confidence at the 95% level for public consumption through the IPCC process. This does not happen in other subjects of equal importance to humanity, e.g. energy futures or environmental degradation or resource depletion. I can only think it is the 'authority' appropriated by the IPCC itself that is the root cause.

(4) Our review takes place in a very febrile atmosphere. If we give a clean bill of health to what we regard as sound science without qualifying that very narrowly, we will be on the receiving end of justifiable criticism for exonerating what many people see as indefensible behaviour. Three of the five MIT scientists who commented in the week before Copenhagen on the leaked emails, (see http://mitworld.mit.edu/video/730) thought that they saw prima facie evidence of unprofessional activity.

(5) I think we should consider using the opportunity to make entirely positive recommendations that would improve the situation, such as (i) wider peer review to prevent narrow and premature orthodoxies being developed unchallenged and (ii) more effective engagement with the end-users of their findings beyond politicians and policy makers. Engineers seem more sceptical that others on the implications of the findings to date.

(6) There is late-breaking news about attempts to suborn the workings of the Journal of Geophysical Research, which I think we should examine and comment upon having heard from one of the co-authors before I was approached on this mission.

See http://icecap.us/images/uploads/McLeanetalSPPIpaper2Z-March24.pdf

MJK

My overall sympathy is with Ernest Rutherford: "If your experiment needs statistics, you ought to have done a better experiment."

Questions to Jones

(1) How can we be reassured about the choice of which raw data from which stations are to be homogenised and then included in the gridded temperature data bases? Is there an algorithm that establishes the inclusion/exclusion of particular stations? If I were setting out to establish the lowest possible net temperature rise over the last century is consistent with the available data, what fraction of stations would then be included/excluded? Indeed, could the same data be 'coerced' to support a null hypothesis on global warming? Incidentally, how much lower could that temperature be?

(2) What is a sceptical outsider to make of 'degrees of rigour of homogenisation' of the data, and also the variety of adjustments that have to be made on an ad hoc basis? How do you ensure that adjustment of adjustments do not introduce biases that are a significant fraction of the century temperature rise?

(3) When updating database and redoing calculations, the scientific sceptics can point to adjustments of past data starting look like rewriting history (c.f. http://wallstreetpit.com/20710-climategate-goes-back-to-1980). How do you respond?

(4) How does the initial formation and subsequent management of the various databases compare with best practice in general, and in the sector?

(5) In presenting data and graphs, do you have a policy of always using the latest and best data, no matter what the message you are trying to convey? A 2006 Met Office diagram of central England Temperature, and not yet showing any turnover or turn down in 5-year averaged temperatures was used in an official report in 2009, when data showing the turn down was already available.

(6) How, over time, have the overall results trended as more reliable data from Antarctica has been incorporated into the calculations? Has this incorporation made much difference?

(7) Given that the outputs of your work are being used to promote the largest revolution mankind has ever contemplated, do you have any sense of the extent to which the quality control and rigour of approach must be of the highest standards in clear expectation of deep scrutiny?

(8) Your critique of the paper by McLean, Freitas and Carter (2009) hinges on arcane aspects of statistical analysis, and they stand by their comments. I have recommended publication of data with a controversial explanation precisely to get the debate going. In other areas of science the best winds out by attrition: why not here?

Questions to: Briffa

(1) How can we be reassured about the choice of which raw data from which stations are to be selected, detrended and then included in the tree-ring data bases? Is there an algorithm that establishes the inclusion/exclusion? If I were setting out to establish the lowest possible net temperature rise over the last century is consistent with the available data, what fraction of tree-ring-data would then be included/excluded? Could I coerce the data to support a null hypothesis on global warming?

(2) In the range of papers we have reviewed, you have used a variety of statistical techniques in what is a heroic effort to get signals from noisy and patchy data. To what extent has this variety of techniques be reviewed and commented upon by the modern statistical community for their effectiveness, right use and possible weaknesses?

(3) Precisely how do you take a chronology and establish the actual amplitude of temperature excursions at a given time, especially at times that are outside the instrumental record.

(4) Do you think that if your papers had been regularly reviewed by a wider scientific community (i.e. outside dendrochronology) some of the current orthodoxies might have been tested more robustly? I am thinking of the comments raised by Gerd Burger in Science in 2007.

(5) What responsibility do you think that we, as a scientific community, have to ensure that the caveats in our papers are not glossed over by our scientific colleagues trying to formulate policy agendas?

(6) Have you had the opportunity to cross-correlate any of your findings with analogous studies of coral, giant claims, or any other temperature proxies? If so, what has emerged?

(7) Given that the outputs of your work are being used to promote the largest revolution mankind has ever contemplated, do you have any sense of the extent to which the quality control and rigour of approach must be of the highest standards in clear expectation of deep scrutiny?

Comments on Briffa Papers (nos 2-6 on list) 22.03.10

M J Kelly

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This is a major paper reviewing and updating his work over the 1990s. Referring to dendroclimatology supporting the notion that the last 100 years have been unusually warm in the context of the last 2000 years, Briffa says: 'However, this evidence should not be considered unequivocal.' He also states 'The interrelationships between large-scale patterns of temperature, precipitation and atmospheric pressure variability also mean that networks of climate sensitive tree-ring chronologies can be used to make statistical inferences about the past behaviour of circulation patterns or important circulation indices.' The Figure 1 shows several selected reconstructions of summer temperatures over the last 2000 years. I am not sure just how the vertical scale (temperature) is calibrated, other perhaps (but not stated explicitly) by correlation with the recent instrument record. I have trouble with the vertical axis of Figure 3, relating to moisture reconstructions. The major sections 3 and 4 of this paper work to reconstruct the major circulation patterns in the northern and southern hemisphere in so far as this can be done from tree-ring data. In terms of a chronology of events (e.g. volcanic eruptions) there are some correlations, but the actual excursions of temperature etc are less convincing. He points out the need for more data from the Himalayas and other regions. He also points out that the 20th century data seems anomalous, and speculates on what is happening, but does not conclude why it is happening.

(5) 'Low-frequency temperature variations from a northern tree-ring density set' K R Briffa et al, Journal of Geophysical Research 106 2929-41 (2001)

This paper uses a new statistical technique 'age band decomposition' to examine northern hemisphere climate change over the last 600 years with the intent of preserving some of the longer-timescale variability that is lost by other techniques. The reconstruction results in generally lower temperatures for earlier times, notably the 17th century, but the northern Siberia had 15th century summers warmer than those in the 20th century. The Figure 1 shows the full gamut of raw data which is described as climate signal + age signal + noise, and what happens when all the data from tress that are 21-40 and 51-70 years old are averaged, and then combined. This is another technique for detecting a weak signal in noisy and patchy data. Plate 2 contains averaged data from 9 different regions, and there is really not much inter-correlation signifying either short events or multidecadal events. Further on, plate 4 shows a range of reconstructions compatible with the same input data, and while results from 1700 to 1950 look mutually consistent, the results before then or after are certainly not. Their plate 3 is an often quoted diagram of six large-scale reconstructions, with a standard deviation of 0.1C variability at 1900, increasing to 0.3C at 1700.

(6) 'Trends in recent temperature and radial tree growth spanning 2000 years across northwest Eurasia', K R Briffa et al, Phil. Trans. R. Soc. B 363 2271-84 (2008).

The first sentence of the text refers to climate model experiments, which offends me! This more recent paper looks at regional reconstructions over the last 2000 years, showing strong regional variations. 'A set of long tree-ring chronologies provides empirical evidence of

association between inter-annual tree growth and local, primarily summer, temperature variability at each location. These data show no evidence for the recent breakdown in this association as has been found at other high-latitude Northern Hemisphere locations.' That means, there is no divergence here! Yet another technique, Kendall's concordance, is used to 'show strong evidence that the extent of recent widespread warming across northwest Eurasia, with respect to 100- to 200- year trends, is unprecedented in the last 2000 years.' This involves data from three regions, Fennoscandia, Yamal and Avam-Taimyr. Many of the vertical scales are described as 'index values' so that the chronologies can show events but the absolute excursion amplitudes of any parameters are not calibrated. Figure 5 show that the various trend parameters and means show that the observations that are two or more standard deviations positive are mainly from 1900-1946. In section 5 it is shown how correlation plots between the regional curve standardized chronologies and (i) monthly mean temperatures over 1950-1994 and (ii) a sequence of temperatures averaged over successive periods of five days. In the final section, one reads: 'These results are superficially consistent with the expected patterns of increasing high-latitude warming suggested by GCM simulations of possible future climates under enhanced atmospheric GHG emissions. However, a simple analysis of one such experiment, under natural and GHG forcing for the last 250 years, while showing consistently increasing concordance between simulated temperatures in the regions of our chronologies, failed to produce results that could be distinguished from the results of a similar experiment driven only with natural (i.e. non-anthropogenic) forcings.'

Subsequent thoughts:

(1) My second reading reinforces my initial observations and concerns.

(2) On a personal note, I chose to study the theory of condensed matter physics, as opposed to cosmology, precisely on the grounds that I could systematically control and vary the boundary conditions of my object of study as an integral part of making advances. An elegant theory which does not fit the experimental data is a bad theory. This particularly colours my attitude to the limited value of complex simulations that cannot by exhaustively tested against real data from independent experiments that control all but one of the variables. Here the starting data is patchy and noisy and choices are in part aesthetic, or designed to help a conclusion, rather than neutral.

(3) Up to and throughout this exercise, I have remained puzzled how the real humility of the scientists in this area, as evident in their papers, including all these here, and the talks I have heard them give, is morphed into statements of confidence at the 95% level for public consumption through the IPCC process. This does not happen in other subjects of equal importance to humanity, e.g. energy futures or environmental degradation or resource depletion. I can only think it is the 'authority' appropriated by the IPCC itself that is the root cause.

(4) Our review takes place in a very febrile atmosphere. If we give a clean bill of health to what we regard as sound science without qualifying that very narrowly, we will be on the receiving end of justifiable criticism for exonerating what many people see as indefensible behaviour. Three of the five MIT scientists who commented in the week before Copenhagen on the leaked emails, (see http://mitworld.mit.edu/video/730) thought that they saw prima facie evidence of unprofessional activity.

(5) I think we should consider using the opportunity to make entirely positive recommendations that would improve the situation, such as (i) wider peer review to prevent narrow and premature orthodoxies being developed unchallenged and (ii) more effective engagement with the end-users of their findings beyond politicians and policy makers. Engineers are more sceptical that others on the implications of the findings to date.

RA-10 Inquiry Report: Concerning the Allegations of Research Misconduct Against Dr. Michael E. Mann, Department of Meteorology, College of Earth and Mineral Sciences, The Pennsylvania State University

February 3, 2010

RA-10 Inquiry Committee for the Case of Dr. Michael E. Mann:

Henry C. Foley, Ph.D.
Vice President for Research and Dean of the Graduate School

Alan W. Scaroni, Ph.D.
Associate Dean for Graduate Education and Research,
College of Earth and Mineral Sciences

Ms. Candice A. Yekel, M.S., CIM,
Director, Office for Research Protections
Research Integrity Officer

Beginning on and about November 22, 2009, The Pennsylvania State University began to receive numerous communications (emails, phone calls and letters) accusing Dr. Michael E. Mann of having engaged in acts that included manipulating data, destroying records and colluding to hamper the progress of scientific discourse around the issue of anthropogenic global warming from approximately 1998. These accusations were based on perceptions of the content of the widely reported theft of emails from a server at the Climatic Research Unit of the University of East Anglia in Great Britain.

Given the sheer volume of the communications to Penn State, the similarity of their content and their sources, which included University alumni, federal and state politicians, and others, many of whom had had no relationship with Penn State, it was concluded that the matter required examination by the cognizant University official, namely Dr. Eva J. Pell, then Senior Vice President for Research and Dean of the Graduate School. The reason for having Dr. Pell examine the matter was that the accusations, when placed in an academic context, could be construed as allegations of *research misconduct*, which would constitute a violation of Penn State policy.

Under The Pennsylvania State University's policy, Research Administration Policy No. 10, (hereafter referred to as RA-10), *Research Misconduct* is defined as:

> (1) fabrication, falsification, plagiarism or other practices that seriously deviate from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities;
>
> (2) callous disregard for requirements that ensure the protection of researchers, human participants, or the public; or for ensuring the welfare of laboratory animals;

(3) failure to disclose significant financial and business interest as defined by Penn State Policy RA20, *Individual Conflict of Interest*;

(4) failure to comply with other applicable legal requirements governing research or other scholarly activities.

RA-10 further provides that "research misconduct does not include disputes regarding honest error or honest differences in interpretations or judgments of data, and is not intended to resolve bona fide scientific disagreement or debate."

On November 24, 2009, Dr. Pell decided that the matter should be examined by the process articulated in RA-10. Dr. Pell then took the first steps in implementing the RA-10 review by initiating a meeting with the Dean of the College of Earth and Mineral Sciences (Dr. William Easterling), the Associate Dean for Graduate Education and Research from the College of Earth and Mineral Sciences (Dr. Alan Scaroni), the Director of the Office for Research Protections, (Ms. Candice Yekel) and the Head of the Department of Meteorology (Dr. William Brune). At this meeting, all were informed of the situation and of the decision to respond to the matter with an inquiry under RA-10. Dr. Pell then discussed the responsibilities that each individual would be expected to have according to policy. At this time, Dean Easterling recused himself from the inquiry for personal reasons. As the next administrator in the line of management for the college, Dr. Alan Scaroni was asked to take on Dean Easterling's function in the ensuing inquiry.

Therefore, the committee assigned to conduct the inquiry into the matter consisted of Dr. Pell in her role as Senior Vice President for Research, Ms. Candice Yekel in her role as the Director of the Office for Research Protections and Dr. Scaroni in his role as the Associate Dean for Graduate Education and Research from the College of Earth and Mineral Sciences. Dr. William Brune, in his role as the Head of the Department of Meteorology, was to serve in a consulting capacity for the committee. Dr. Henry C. Foley, then Dean of the College of Information Sciences and Technology, was added to the inquiry committee in an ex-officio role for the duration of 2009, since he had been named to succeed Dr. Pell as the next Vice President for Research, beginning January 1, 2010.

At the time of initiation of the inquiry, and in the ensuing days during the inquiry, no formal allegations accusing Dr. Mann of research misconduct were submitted to any University official. As a result, the emails and other communications were reviewed by Dr. Pell and from these she synthesized the following four formal allegations. To be clear, these were not allegations that Dr. Pell put forth, or leveled against Dr. Mann, but rather were her best effort to reduce to allegation form the many different accusations that were received from parties outside of the University. The four synthesized allegations were as follows:

1. Did you engage in, or participate in, directly or indirectly, any actions with the intent to suppress or falsify data?

2. Did you engage in, or participate in, directly or indirectly, any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to AR4, as suggested by Phil Jones?

3. Did you engage in, or participate in, directly or indirectly, any misuse of privileged or confidential information available to you in your capacity as an academic scholar?

4. Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?

On November 29, 2009, Dr. Pell and Dr. Foley met with Dr. Mann to let him know personally that he was accused of research misconduct and that an inquiry under RA-10 would take place. On November 30, 2010, a letter was delivered by Dr. Pell to Dr. Mann to notify him formally of these allegations and Dr. Pell's decision to conduct an inquiry under RA-10.

From November 30 to December 14, 2009, staff in the Office for Research Protections culled through approximately 1075 of the emails that were purloined from a server at the University of East Anglia. Emails were reviewed if they were sent by Dr. Mann, were sent to Dr. Mann, were copied to Dr. Mann, or discussed Dr. Mann (but were neither addressed nor copied to him). In summary, the following were found:

- 206 emails that contained a message/text from Dr. Mann somewhere in the chain;
- 92 emails that were received by Dr. Mann, but in which he did not write/participate in the discussion; and
- 79 that dealt with Dr. Mann, his work or publications; he neither authored nor was he copied on any of these.

From among these 377 emails, the inquiry committee focused on 47 emails that were deemed relevant. On December 17, 2009, the inquiry committee (Pell, Scaroni, Yekel), Dr. Brune and Dr. Foley met to review the emails, discuss the RA-10 inquiry process and go over what their respective activities would be. It was agreed that these individuals would meet again in early January and that they would use the time until that meeting to review the relevant information, including the above mentioned e-mails, journal articles, OP-ED columns, newspaper and magazine articles, the National Academy of Sciences report entitled "Surface Temperature Reconstructions for the Last 2,000 Years," ISBN: 0-309-66144-7 and various blogs on the internet.

On January 4, 2010, Dr. Foley, in his capacity as the new Vice President for Research and Dean of the Graduate School, became the convener of the inquiry committee as Dr. Pell had left the University to become the Under-Secretary of Science for the Smithsonian Institution. On January 8, 2010, Dr. Foley convened the inquiry committee to discuss their present thinking on the evidence presented in the emails and other publically available materials. At this meeting, it was decided that each committee member would send Dr. Foley specific questions that would be added to the four formal allegations and that would be used by the committee during the interview of Dr. Mann. These were compiled into one document. It was also decided that during

the upcoming interview of Dr. Mann, Dr. Foley would ask each of the initial questions with follow up questions coming from the other committee members, and he would moderate the interview.

On January 12, 2010, the inquiry committee (Foley, Yekel, Scaroni) and Dr. Brune met with Dr. Mann to interview him. Dr. Mann was asked to address the four allegations leveled against him and to provide answers to the fifteen additional questions that the committee had compiled. In an interview lasting nearly two hours, Dr. Mann addressed each of the questions and follow up questions. A recording was made of the meeting, and this recording was transcribed. The committee members asked occasional follow-up questions. Throughout the interview, Dr. Mann answered each question carefully:

- He explained the content and meaning of the emails about which we inquired;
- He explained that he had never falsified any data, nor had he had ever manipulated data to serve a given predetermined outcome;
- He explained that he never used inappropriate influence in reviewing papers by other scientists who disagreed with the conclusions of his science;
- He explained that he never deleted emails at the behest of any other scientist, specifically including Dr. Phil Jones, and that he never withheld data with the intention of obstructing science; and
- He explained that he never engaged in activities or behaviors that were inconsistent with accepted academic practices.

On January 15, 2010, and on behalf of the inquiry committee, Dr. Foley conveyed via email an additional request of Dr. Mann, who was asked to produce all emails related to the fourth IPCC report ("AR4"), the same emails that Dr. Phil Jones had suggested that he delete.

On January 18, 2010, Dr. Mann provided a zip-archive of these emails and an explanation of their content. In addition, Dr. Mann provided a ten page supplemental written response to the matters discussed during his interview.

On January 22, 2010, the inquiry committee and Dr. Brune met again to review the evidence, including but not limited to Dr. Mann's answers to the committee's questions, both in the interview and in his subsequent submissions. All were impressed by Dr. Mann's composure and his forthright responses to all of the queries that were asked of him. At this point, Dr. Foley reviewed the relevant points of his conversation with Dr. Gerald North, a professor at Texas A&M University and the first author of the NAS' 2006 report on Dr. Mann's research on paleoclimatology. Dr. Foley also relayed the sentiment and view of Dr. Donald Kennedy of Stanford University and the former editor of Science Magazine about the controversy currently swirling around Dr. Mann and some of his colleagues. Both were very supportive of Dr. Mann and of the credibility of his science. Once Dr. Brune had given his opinions and suggestions for next steps of the process, he was dismissed from further discussion as his role per policy RA-10 was that of providing consultation to the rest of the members; his role was not that of making a decision at the inquiry phase.

On January 26, 2010, Dr. Foley convened the inquiry committee along with University counsel, Mr. Wendell Courtney, Esq. in case issues of procedure arose.
After a careful review of all written material, and information obtained from the purloined emails, the interview of Dr. Mann, the supplemental materials provided by Dr. Mann and all the information from other sources, the committee found as follows with respect to each allegation:

Allegation 1: Did you engage in, or participate in, directly or indirectly, any actions with the intent to suppress or falsify data?

Finding 1. After careful consideration of all the evidence and relevant materials, the inquiry committee finding is that there exists no credible evidence that Dr. Mann had or has ever engaged in, or participated in, directly or indirectly, any actions with an intent to suppress or to falsify data. While a perception has been created in the weeks after the CRU emails were made public that Dr. Mann has engaged in the suppression or falsification of data, there is no credible evidence that he ever did so, and certainly not while at Penn State. In fact to the contrary, in instances that have been focused upon by some as indicating falsification of data, for example in the use of a "trick" to manipulate the data, this is explained as a discussion among Dr. Jones and others including Dr. Mann about how best to put together a graph for a World Meteorological Organization (WMO) report. They were not falsifying data; they were trying to construct an understandable graph for those who were not experts in the field. The so-called "trick"[1] was nothing more than a statistical method used to bring two or more different kinds of data sets together in a legitimate fashion by a technique that has been reviewed by a broad array of peers in the field.

Decision 1. As there is no substance to this allegation, there is no basis for further examination of this allegation in the context of an investigation in the second phase of RA-10.

Allegation 2: Did you engage in, or participate in, directly or indirectly, any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to AR4, as suggested by Phil Jones?

Finding 2. After careful consideration of all the evidence and relevant materials, the inquiry committee finding is that there exists no credible evidence that Dr. Mann had ever engaged in, or participated in, directly or indirectly, any actions with intent to delete, conceal or otherwise destroy emails, information and/or data related to AR4, as suggested by Dr. Phil Jones. Dr. Mann has stated that he did not delete emails in response to Dr. Jones' request. Further, Dr. Mann produced upon request a full archive of his emails in and around the time of the preparation of AR4. The archive contained e-mails related to AR4.

[1] The word trick as used in this email has stirred some suspicion. However, *trick* is often used in context to describe a mathematical insight that solves the problem. For example, see in a classic text on quantum mechanics by David Parks: "The foregoing explanation of the velocity paradox involves no new assumptions; the basic *trick*, the representation of a modulated wave as the superposition of two (or more) unmodulated ones, has already been used to explain interference phenomena..." pg. 21, **Introduction to Quantum Theory**, David Parks, Third Edition, Dover 1992.

Decision 2. As there is no substance to this allegation, there is no basis for further examination of this allegation in the context of an investigation in the second phase of RA-10.

Allegation 3: Did you engage in, or participate in, directly or indirectly, any misuse of privileged or confidential information available to you in your capacity as an academic scholar?

Finding 3. After careful consideration of all the evidence and relevant materials, the inquiry committee finding is that there exists no credible evidence that Dr. Mann had ever engaged in, or participated in, directly or indirectly, any misuse of privileged or confidential information available to him in his capacity as an academic scholar. In media reports and blogs about Dr. Mann and other paleoclimatologists, those who are named in the CRU email files are purported to have been engaged in conspiratorial discussions indicative of a misuse of privileged or confidential information. Although it is not clear where the exact accusation lies in this with respect to Dr. Mann, it is inferred that the emails prove the case. Those who have formed this view-feel that, in their capacity as reviewers, Dr. Mann and his colleagues had early access to manuscripts from other authors with whom they disagreed, and that they could somehow act on those to reject them for publication. Actually, when one does due diligence on this matter, and asks about what papers were involved, one finds that enormous confusion has been caused by interpretations of the emails and their content. In some cases, the discussion and related debate centered on papers that were about to emerge which members of the purported conspiracy had written, but which were simply under embargo. In other cases, the discussion and related debate centered on papers that have emerged in otherwise notable scientific journals, which they deemed to have been published with a lower standard of scholarly and scientific scrutiny. The committee found no research misconduct in this. Science often involves different groups who have very different points of view, arguing for the intellectual dominance of their viewpoint, so that that viewpoint becomes the canonical one. We point to Kuhn[2] as an authority on how science is done, before it is accepted as "settled."

Decision 3. As there is no substance to this allegation, there is no basis for further examination of this allegation in the context of an investigation in the second phase of RA-10.

Allegation 4. Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?

Finding 4. After careful consideration of all the evidence and relevant materials, the inquiry committee could not make a definitive finding whether there exists any evidence to substantiate that Dr. Mann did engage in, or participate in, directly or indirectly, any actions that deviated from accepted practices within the academic community for

[2] Thomas Kuhn, **The Structure of Scientific Revolutions**, The University of Chicago Press, Chicago, 1962.

proposing, conducting, or reporting research or other scholarly activities. It is the case that there has been a public outcry from some quarters that Dr. Mann and his colleagues did deviate from what some observers claim to be standard academic practice. All disciplines and scientific fields work within broad bounds of "accepted scientific" practice that apply to all researchers. However, within different disciplines of science there are additional elements of accepted practice that may be specific to those disciplines and therefore are different from those of other disciplines and fields. For example, accepted practices in a field of pure mathematics, such as number theory, may differ markedly from those in a field such as socio-biology. This is axiomatic. That said, the committee could not make a definitive finding on this allegation for reasons that follow.

Policy RA-10 speaks not just of research ***misconduct*** but also of research ***conduct*** and is explicit regarding the responsibility that we have as scientists to maintain the public trust. The preamble is as follows:

"Public trust in the integrity and ethical behavior of scholars is essential if research and other scholarly activities are to play their proper role in the University and in society. The maintenance of high ethical standards is a central and critical responsibility of faculty and administrators of academic institutions. Policy AD-47 sets forth statements of general standards of professional ethics within the academic community."

Furthermore, the preamble speaks to the high ethical expectations that Penn State has for its faculty and administrators. These expectations are embodied in another document, Policy AD-47 General Standards of Professional Ethics. The purpose of AD-47 is stated as follows:

"To set forth statements of general standards of professional ethics to serve as a reminder of the variety of obligations assumed by all members of the academic community."

The full document is publically available (see http://guru.psu.edu/policies/ad47.html). Here we will simply excerpt those parts of AD-47 that are most relevant to our finding and from which our decision on the allegation flowed.

I. Professors, guided by a deep conviction of the worth and dignity of the advancement of knowledge, recognize the special responsibilities placed upon them. Their primary responsibility to their respective subjects is to seek and to state the truth as they see it. To this end, they devote their energies to developing and improving their scholarly competence. They accept the obligation to exercise critical self-discipline and judgment in using, extending, and transmitting knowledge. They practice intellectual honesty. Although they may follow subsidiary interests, these interests must never seriously hamper or compromise their freedom of inquiry.

III. As researchers/scholars, professors recognize that their goal is to discover, develop, and communicate new understanding. This goal is rarely achieved without making use of knowledge gained from others. Researchers must always

exercise gracious and appropriate recognition of published work in the literature, conversations with colleagues, and the efforts of students who work under the researchers' guidance. They must be scrupulous in presentation of their own data; it must be verifiable as a result of the highest standards in data gathering techniques. They must be extremely careful in the use of data reported by others, especially if used in the formation of broad comparative or contradictory hypotheses, since they may not know of any compromising circumstances in such data gathering. They must be comprehensive in consideration of work with human subjects; they must have thoroughly researched all procedures, must have informed individuals involved of all aspects of their cooperation, and must report all responses accurately, both positive and negative results. As open-minded researchers, when evaluating the work of others, they must recognize the responsibility to allow publication of theories or experiments that may contradict their own findings, as only by free inquiry and dissemination of all facts will the fruits of the labor of the whole community be allowed to mature.

IV. As colleagues, professors have obligations that derive from common membership in the community of scholars. They respect and defend the free inquiry of their associates. In the exchange of criticism and ideas they show due respect for the opinions of others. They acknowledge their academic debts and strive to be objective in their professional judgment of colleagues. They accept their share of faculty responsibilities for the governance of their institution.

VI. As members of the community, professors have the rights and obligations of all citizens. They measure the urgency of these obligations in the light of their responsibilities to their respective subjects, to their students, to their profession, and to their institution. When they speak or act as private persons they avoid creating the impression that they speak or act for their respective colleges or the University. As citizens engaged in a profession that depends upon freedom for its health and integrity, professors have a particular obligation to promote conditions of free inquiry and to further public understanding of academic freedom.

It is clear to those who have followed the media and blogs over the last two months that there are two distinct and deeply polarized points of view that have emerged on this matter. One side views the emails as evidence of a clear cut violation of the public trust and seeks severe penalties for Dr. Mann and his colleagues. The other side sees these as nothing more than the private discussions of scientists engaged in a hotly debated topic of enormous social impact.

We are aware that some may seek to use the debate over Dr. Mann's research conduct and that of his colleagues as a proxy for the larger and more substantive debate over the science of anthropogenic global warming and its societal (political and economic) ramifications. We have kept the two debates separate by only considering Dr. Mann's conduct.

The allegation inquires about whether Dr. Mann seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities. In 2006, similar questions were asked about Dr. Mann and these questions motivated the National Academy of Sciences to undertake an in depth investigation of his research. The committee that wrote the report on surface temperature reconstructions found that Dr. Mann's science did fall well within the bounds of accepted practice. What has changed since that time is that private emails have come to our attention and that of the public at large, and these give us a glimpse into the behind the scenes workings of Dr. Mann and many of his colleagues in the conduct of their science.

Decision 4. Given that information emerged in the form of the emails purloined from CRU in November 2009, which have raised questions in the public's mind about Dr. Mann's conduct of his research activity, given that this may be undermining confidence in his findings as a scientist, and given that it may be undermining public trust in science in general and climate science specifically, the inquiry committee believes an investigatory committee of faculty peers from diverse fields should be constituted under RA-10 to further consider this allegation.

In sum, the overriding sentiment of this committee, which is composed of University administrators, is that allegation #4 revolves around the question of accepted faculty conduct surrounding scientific discourse and thus merits a review by a committee of faculty scientists. Only with such a review will the academic community and other interested parties likely feel that Penn State has discharged it responsibility on this matter.

An investigatory committee of faculty members with impeccable credentials will consider this matter and present its findings and recommendations to Dr. Henry C. Foley within 120 days of being charged. The committee will consist of the following five faculty members:

1. Dr. Mary Jane Irwin, Evan Pugh Professor, Department of Computer Science and Electrical Engineering;
2. Dr. Alan Walker, Evan Pugh Professor, Department of Anthropology and Department of Biology;
3. Dr. A. Welford Castleman, Evan Pugh Professor, Department of Chemistry and Department of Physic;
4. Dr. Nina G. Jablonski, Head, Department of Anthropology; and
5. Dr. Sarah M. Assmann, Waller Professor, Department of Biology.

Ms. Candice Yekel, as Director of the Office for Research Protections and as the University's Research Integrity Officer, will provide administrative support and assistance to the committee.

The investigatory committee's charge will be to consider what are the bounds of accepted practice in this instance and whether or not Dr. Mann did indeed engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the

academic community for proposing, conducting, or reporting research or other scholarly activities.

In accordance with policy RA-10, Dr. Mann will receive a printed copy of this inquiry report, and he will be welcome to provide written comment on this report for the record if he wishes.

NOTE: Dr. Michael E. Mann has consented to the public release of this report.

Henry C. Foley 02/03/2010

Henry C. Foley, Ph.D.
Vice President for Research and Dean of the Graduate School

Alan W Scaroni 02/03/2010

Alan W. Scaroni, Ph.D.
Associate Dean for Graduate Education and Research
College of Earth and Mineral Sciences

Candice A. Yekel 02/03/2010

Ms. Candice A. Yekel, M.S., CIM,
Director, Office for Research Protections
Research Integrity Officer

PROGRAMME OF MEETINGS
SCIENCE REVIEW PANEL
29 – 31 March, 2010

Monday 29 March 7.30 p.m.	 Lord Oxburgh, David Hand and Lisa Graumlich meet and Private Dinner at Caistor Hall
Tuesday 30 March 8.15 am 8.45 am	 Taxi from Caistor Hall to UEA Arrival at UEA Registry reception Met by PVC Trevor Davies, walk to CRU
9.00 am	Tour round CRU
9.15-10.45 am	Meeting with Keith Briffa and CRU tree ring team in CRU Library 30 minute presentation by Keith Briffa followed by questions
10.45-11.10 am	Coffee joined by other colleagues in CRU
11.10-11.30 am	Machine and general discussion round sections/cores
11.30-1.00 pm	Discussion about papers
1.00-2.15 pm	LUNCH
2.15-3.45 pm	Round-table discussion involving [redacted]
3.45-4.30 pm	Panel private session
4.30-5.30 pm	Wrap-up with CRU
5.30 pm	[redacted]to take panel back to Registry and taxis
Weds 31 March 9.00 am	 Departure for Lisa Graumlich from Caistor Hall Hotel

TRAVEL/ACCOMMODATION DETAILS
FOR SCIENCE REVIEW PANEL

6 – 8 APRIL, 2010

Attendees: Professor (Lord) Ron Oxburgh Professor Michael Kelly Professor Herbert Huppert Professor Kerry Emanuel Prof Huw Davies Professor David Hand	**Caistor Hall Hotel:** **Caistor St Edmund** **NORWICH** **NR14 3QN** **Telephone: 01508 494998** **http://www.caistorhall.com/**
Travel Details:	
Professor Kerry Emanuel Monday 5 April Departing Boston at 06:50 Tuesday 6 April Arrive Amsterdam 08:00 Depart Amsterdam 10:05 Arrive Norwich 09:55 Friday 9 April Depart Norwich at 10:35 Arrive Amsterdam 12:30 Depart Amsterdam 14:00 Arrive Boston 15:50	**Tuesday 6 April:** **09:55 Goldstar Taxi booked to collect Prof Emanuel from the airport and take to Caistor Hall (Telephone: 01603 700700 – booked on Vice-Chancellor's Account no payment required)** **Booked hotel accommodation for Kerry for nights of 6th/7th/8th April – can access his room on arrival on 6th April. Check dinner requirements for the night of 8th April.**
Professor Herbert Huppert* Tuesday 6 April Arriving Norwich Railway Station at Approximately 18:30 from Cambridge Thursday 8 April Depart Norwich on 15:40 train to Cambridge * Alternative rail strike arrangements: will drive	**18:30 Goldstar taxi booked to collect Lord Oxburgh/Professor Huppert from Norwich Railway Station and take to Caistor Hall (Telephone: 01603 700700 – booked on Vice-Chancellor's Account no payment required)** **Booked hotel accommodation for nights of 6th/7th April.**

Professor Lord Ron Oxburgh* Tuesday 6 April Arriving Norwich Railway Station at Approximately 18:30 from Cambridge Thursday 8 April Depart Norwich on 15:40 train to Cambridge * Alternative rail strike arrangements: will drive	**18:30 Goldstar taxi booked to collect Lord Oxburgh/Professor Huppert from Norwich Railway Station and take to Caistor Hall (Telephone: 01603 700700 – booked on Vice-Chancellor's Account no payment required)** **Booked hotel accommodation for nights of 6th/7th April.**
Professor Huw Davies* Tuesday 6 April Travelling by train from Wales – arriving Norwich in time for dinner * Alternative rail strike arrangements: will drive Thursday 8 April Depart Norwich – [redacted] to organise taxi?	**If travelling by train, please call Goldstar taxis (Telephone: 01603 700700 – book on Vice-Chancellor's Account no payment required) for onward journey to 18:30 Goldstar Caistor Hall Hotel** **Booked hotel accommodation for nights of 6th/7th April**
Professor Michael Kelly Tuesday 6 April Travelling independently and will arrive in time for dinner Thursday 8 April Depart Norwich	**Booked hotel accommodation for nights of 6th/7th April**
Professor David Hand Tuesday 6 April Travelling by train and will arrive in time for dinner Alternative rail strike arrangements: will drive Thursday 8 April Depart Norwich – [redacted] to organise taxi?	**If travelling by train please call Goldstar taxis (01603 700700 – book on Vice-Chancellor's account – no payment required) for onward journey to Caistor Hall Hotel.** **Booked hotel accommodation for nights of 6th/7th April**

31.3.10

TRAVEL/ACCOMMODATION DETAILS
FOR SCIENCE REVIEW PANEL

6 – 8 APRIL, 2010

Attendees: Professor (Lord) Ron Oxburgh Professor Michael Kelly Professor Herbert Huppert Professor Kerry Emanuel Prof Huw Davies Professor David Hand	**Caistor Hall Hotel:** **Caistor St Edmund** **NORWICH** **NR14 3QN** **Telephone: 01508 494998** **http://www.caistorhall.com/**
Travel Details:	
Professor Kerry Emanuel Monday 5 April Departing Boston at 06:50 Tuesday 6 April Arrive Amsterdam 08:00 Depart Amsterdam 10:05 Arrive Norwich 09:55 Friday 9 April Depart Norwich at 10:35 Arrive Amsterdam 12:30 Depart Amsterdam 14:00 Arrive Boston 15:50	**09:55 Goldstar Taxi booked to collect Prof Emanuel from the airport and take to Caistor Hall (Telephone: 01603 700700 – booked on Vice-Chancellor's Account no payment required)** **Booked hotel accommodation for Kerry for nights of 6th/7th/8th April – can access his room on arrival on 6th April. Check dinner requirements for the night of 8th April.**
Professor Herbert Huppert* Tuesday 6 April Pick up from work by UEA 1 driver [redacted] Approximately 17:00 from Kings College, Cambridge corner Wilberforce and Clarkson Road, and given ten minutes advance warning on 07814 582 707 Thursday 8 April Depart Norwich on 15:40 train to Cambridge* * Alternative rail strike arrangements: [redacted] to drive	**Booked hotel accommodation for nights of 6th/7th April.**

Professor Lord Ron Oxburgh* Tuesday 6 April Pick up from home by UEA 1 driver [redacted] Approximately 17:00 from home address Thursday 8 April Depart Norwich on 15:40 train to Cambridge* * Alternative rail strike arrangements: Peter to drive	**Booked hotel accommodation for nights of 6th/7th April.**
Professor Huw Davies* Tuesday 6 April Travelling by train from Wales – arriving Norwich in time for dinner * Alternative rail strike arrangements: will drive Thursday 8 April Depart Norwich – [redacted] to organise taxi?	**If travelling by train, please call Goldstar taxis (Telephone: 01603 700700 – book on Vice-Chancellor's Account no payment required) for onward journey to 18:30 Goldstar Caistor Hall Hotel** **Booked hotel accommodation for nights of 6th/7th April**
Professor Michael Kelly Tuesday 6 April Travelling independently and will arrive in time for dinner. (May decide to travel with Lord Oxburgh and Herbert Huppert in UEA car.) Thursday 8 April Depart Norwich	**Booked hotel accommodation for nights of 6th/7th April**
Professor David Hand Tuesday 6 April Travelling by train and will arrive in time for dinner Alternative rail strike arrangements: will drive Thursday 8 April Depart Norwich – [redacted] organise taxi?	**If travelling by train please call Goldstar taxis (01603 700700 – book on Vice-Chancellor's account – no payment required) for onward journey to Caistor Hall Hotel.** **Booked hotel accommodation for nights of 6th/7th April**

[redacted]

TAXIS: In the event that you need to book a taxi please call Goldstar taxis 01603 700700 – book on Vice-Chancellor's account – no payment required for onward journey to Caistor Hall Hotel.

UEA Contacts:

[redacted]

Prof Peter Liss, Acting Director CRU [redacted]
([redacted]

[redacted]

1.4.10

TRAVEL/ACCOMMODATION DETAILS
FOR SCIENCE REVIEW PANEL

29 – 31 March, 2010

Attendees: Professor (Lord) Ron Oxburgh Professor David Hand Dr Lisa Graumlich	**Accommodation booked:** **Lord Oxbugh – 29 April** **David Hand – 29th April** **Lisa Graumlich – 29th/30th April** **Caistor Hall Hotel:** **Caistor St Edmund** **NORWICH** **NR14 3QN** **Telephone:** [redacted] **http://www.caistorhall.com/**
Travel Details:	**29 April, 2010**
Lord Oxburgh	**Arriving on 17:55 train to Norwich** **Goldstar taxi booked for 17:55 for collection from the station and journey to Caistor Hall Hotel**
David Hand	**Arriving on 18:42 train to Norwich** **Goldstar taxi booked for 18:45 for collection from the station and journey to Caistor Hall Hotel**
Lisa Graumlich	**Arriving Norwich airport 13:20 on flight KL 1507** **Goldstar taxi booked for 13:30 for collection from the airport and journey to Caistor Hall Hotel**
Dinner Arrangements:	
Lord Oxburgh **David Hand** **Lisa Graumlich**	**7.30 p.m.** **Dinner in main dining room of Caistor Hall Hotel – corner table to enable private discussion**

TUESDAY 30TH MARCH, 2010

Meetings at UEA	
Lord Oxburgh **David Hand**	**Confirm departure timings for taxis to be booked – Hotel or UEA?**
Lisa Graumlich 	**Confirm timings for taxi to hotel from UEA** **Dinner arrangements?**

WEDNESDAY 31ST MARCH, 2010

Lisa Graumlich	**Departs Caistor Hall Hotel** **Goldstar taxi booked for 09:00 for Norwich airport to catch 10:35 flight to Amsterdam**

24.03.10

Report of the International Panel set up by the University of East Anglia to examine the research of the Climatic Research Unit.

Introduction

1. The Panel was set up by the University in consultation with the Royal Society to assess the integrity of the research published by the Climatic Research Unit in the light of various external assertions. The Unit is a very small academic entity within the School of Environmental Sciences. It has three full time and one part time academic staff members and about a dozen research associates, PhD students and support staff. The essence of the criticism that the Panel was asked to address was that climatic data had been dishonestly selected, manipulated and/or presented to arrive at pre-determined conclusions that were not compatible with a fair interpretation of the original data. The members of the Panel are listed in Appendix A at the end of this report.

2. The Panel was not concerned with the question of whether the conclusions of the published research were correct. Rather it was asked to come to a view on the integrity of the Unit's research and whether as far as could be determined the conclusions represented an honest and scientifically justified interpretation of the data. The Panel worked by examining representative publications by members of the Unit and subsequently by making two visits to the University and interviewing and questioning members of the Unit. Not all the panel were present on both occasions but two members were present on both occasions to maintain continuity. About fifteen person/days were spent at the University discussing the Unit's work.

3. The eleven representative publications that the Panel considered in detail are listed in Appendix B. The papers cover a period of more than twenty years and were selected on the advice of the Royal Society. All had been published in international scientific journals and had been through a process of peer review. CRU agreed that they were a fair sample of the work of the Unit. The Panel was also free to ask for any other material that it wished and did so. Individuals on the panel asked for and reviewed other CRU research materials.

4. The Panel's work began with a detailed reading of the published work. Every paper was read by a minimum of three Panel members at least one of whom was familiar with the general area to which the paper related. At least one of the other two was a generalist with no special climate science expertise but with experience of some of the general techniques and methods employed in the work. Most of the members of the Panel read all the publications. The publications provided a platform from which to gain a deeper understanding of the Unit's research and enabled the Panel to probe particular questions in more detail.

5. Broadly the work of the Unit falls into two parts:
    - Construction and interpretation of tree ring chronologies extending over some thousands of years with a view to gaining information about past climates:
    - Studies of temperatures over the last few hundred years from direct observations.

Dendroclimatology

1. Tree growth is sensitive to very many factors including climate. By piecing together growth records from different trees, living or dead, it is possible to determine the temporal variation of growth patterns going back many hundreds of years. The dendroclimatological work at CRU seeks to go beyond this and to extract from the dated growth patterns the local and regional history of temperature variations. The Unit does virtually no primary data acquisition but has used data from published archives and has collaborated with people who have collected data.

2. The main effort of the dendroclimalogists at CRU is in developing ways to extract climate information from networks of tree ring data. The data sets are large and are influenced by many factors of which temperature is only one. This means that the effects of long term temperature variations are masked by other more dominant short term influences and have to be extracted by statistical techniques. The Unit approaches this task with an independent mindset and awareness of the interplay of biological and physical processes underlying the signals that they are trying to detect.

3. Although inappropriate statistical tools with the potential for producing misleading results have been used by some other groups, presumably by accident rather than design, in the CRU papers that we examined we did not come across any inappropriate usage although the methods they used may not have been the best for the purpose. It is not clear, however, that better methods would have produced significantly different results. The published work also contains many cautions about the limitations of the data and their interpretation.

4. Chronologies (transposed composites of raw tree data) are always work in progress. They are subject to change when additional trees are added; new ways of data cleaning may arise (e.g. homogeneity adjustments), new measurement methods are used (e.g. of measuring ring density), new statistical methods for treating the data may be developed (e.g. new ways of allowing for biological growth trends).

5. This is illustrated by the way CRU check chronologies against each other; this has led to corrections in chronologies produced by others. CRU is to be commended for continuously updating and reinterpreting their earlier chronologies.

6. With very noisy data sets a great deal of judgement has to be used. Decisions have to be made on whether to omit pieces of data that appear to be aberrant. These are all matters of experience and judgement. The potential for misleading results arising from selection bias is very great in this area. It is regrettable that so few professional statisticians have been involved in this work because it is fundamentally statistical. Under such circumstances there must be an obligation on researchers to document the judgemental decisions they have made so that the work can in principle be replicated by others.

7. CRU accepts with hindsight that they should have devoted more attention in the past to archiving data and algorithms and recording exactly what they did. At the time the work was done, they had no idea that these data would assume the importance they have today and that the Unit would have to answer detailed inquiries on earlier work. CRU and, we are told, the tree ring community generally, are now adopting a much more rigorous approach to the archiving of chronologies and computer code. The difficulty in releasing program code is that to be understood by anyone else it needs time-consuming work on documentation, and this has not been a top priority.

8. After reading publications and interviewing the senior staff of CRU in depth, we are satisfied that the CRU tree-ring work has been carried out with integrity, and that allegations of deliberate misrepresentation and unjustified selection of data are not valid. In the event CRU scientists were able to give convincing answers to our detailed questions about data choice, data handling and statistical methodology. The Unit freely admits that many data analyses they made in the past are superseded and they would not do things that way today.

9. We have not exhaustively reviewed the external criticism of the dendroclimatological work, but it seems that some of these criticisms show a rather selective and uncharitable approach to information made available by CRU. They seem also to reflect a lack of awareness of the ongoing and dynamic nature of chronologies, and of the difficult circumstances under which university research is sometimes conducted. Funding and labour pressures and the need to publish have meant that pressing ahead with new work has been at the expense of what was regarded as non-essential record keeping. From our perspective it seems that the CRU sins were of omission rather than commission. Although we deplore the tone of much of the criticism that has been directed at CRU, we believe that this questioning of the methods and data used in dendroclimatology will ultimately have a beneficial effect and improve working practices

Temperatures from Historical Instrumental Records

1. The second main strand of work at CRU has been the collection and collation of instrumental land temperature records from all over the world and the construction of regional, hemispherical and global scale temperature records. These records are irregularly distributed in space and time. Modern records come largely from land-based meteorological stations but their geographical distribution is uneven and strongly biased in favour of the northern hemisphere

where most of the Earth's land masses are located. Oceans cover two thirds of the Earth's surface and away from the main shipping routes coverage is thin. For earlier centuries the record is much sparser. Deriving estimates of past temperatures on a global, hemispheric and regional scale from incomplete data sets is one of the problems faced by the Unit and in consequence an important current interest is the discovery of useable old temperature records from a variety of sources.

2. In the latter part of the 20th century CRU pioneered the methods for taking into account a wide range of local influences that can make instrumental records from different locations hard to compare. These methods were very labour intensive and were somewhat subjective. Much of this work was supported by the US Department of Energy and was published with the details of station corrections several times a year. Since the 1980s the Unit has done no more of this work and have concentrated on the merging and interpretation of data series corrected by others. There have been various analyses of similar publicly available data sets by different international groups. Although there are some differences in fine detail that reflect the differences in the analytical methods used, the results are very similar.

3. The Unit has devoted a great deal of effort to understanding how instrumental observations are best combined to derive the surface temperature on a variety of time and space scales. It has become apparent from a number of studies that there is elevation of the surface temperature in and around large cities and work is continuing to understand this fully.

4. Like the work on tree rings this work is strongly dependent on statistical analysis and our comments are essentially the same. Although there are certainly different ways of handling the data, some of which might be superior, as far as we can judge the methods which CRU has employed are fair and satisfactory. Particular attention was given to records that seemed anomalous and to establishing whether the anomaly was an artefact or the result of some natural process. There was also the challenge of dealing with gaps in otherwise high quality data series. In detailed discussion with the researchers we found them to be objective and dispassionate in their view of the data and their results, and there was no hint of tailoring results to a particular agenda. Their sole aim was to establish as robust a record of temperatures in recent centuries as possible. All of the published work was accompanied by detailed descriptions of uncertainties and accompanied by appropriate caveats. The same was true in face to face discussions.

5. We believe that CRU did a public service of great value by carrying out much time-consuming meticulous work on temperature records at a time when it was unfashionable and attracted the interest of a rather small section of the scientific community. CRU has been among the leaders in international efforts to determining the overall uncertainty in the derived temperature records and where work is best focussed to improve them.

6. The Unit has demonstrated that at a global and hemispheric scale temperature results are surprisingly insensitive to adjustments made to the data and the number of series included.

7. Recent public discussion of climate change and summaries and popularizations of the work of CRU and others often contain over-simplifications that omit serious discussion of uncertainties emphasized by the original authors. For example, CRU publications repeatedly emphasize the discrepancy between instrumental and tree-based proxy reconstructions of temperature during the late 20th century, but presentations of this work by the IPCC and others have sometimes neglected to highlight this issue. While we find this regrettable, we could find no such fault with the peer-reviewed papers we examined

Conclusions

1. We saw no evidence of any deliberate scientific malpractice in any of the work of the Climatic Research Unit and had it been there we believe that it is likely that we would have detected it. Rather we found a small group of dedicated if slightly disorganised researchers who were ill-prepared for being the focus of public attention. As with many small research groups their internal procedures were rather informal.

2. We cannot help remarking that it is very surprising that research in an area that depends so heavily on statistical methods has not been carried out in close collaboration with professional statisticians. Indeed there would be mutual benefit if there were closer collaboration and interaction between CRU and a much wider scientific group outside the relatively small international circle of temperature specialists.

3. It was not the immediate concern of the Panel, but we observed that there were important and unresolved questions that related to the availability of environmental data sets. It was pointed out that since UK government adopted a policy that resulted in charging for access to data sets collected by government agencies, other countries have followed suit impeding the flow of processed and raw data to and between researchers. This is unfortunate and seems inconsistent with policies of open access to data promoted elsewhere in government.

4. A host of important unresolved questions also arises from the application of Freedom of Information legislation in an academic context. We agree with the CRU view that the authority for releasing unpublished raw data to third parties should stay with those who collected it.

Submitted to the University 12 April 2010

APPENDIX A
PANEL MEMBERSHIP

Chair: Prof Ron Oxburgh FRS (Lord Oxburgh of Liverpool)

Prof Huw Davies, ETH Zürich
Prof Kerry Emanuel, Massachusetts Institute of Technology
Prof Lisa Graumlich, University of Arizona.
Prof David Hand FBA, Imperial College, London.
Prof Herbert Huppert FRS, University of Cambridge
Prof Michael Kelly FRS, University of Cambridge

APPENDIX B

Peer-reviewed publications for assessment.

1. Brohan, P., Kennedy, J., Harris, I., Tett, S.F.B. and Jones, P.D., 2006: Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850. *J. Geophys. Res.* **111**, D12106.

2. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, S. G. Shiyatov, and E. A. Vaganov. 1998a. Reduced sensitivity of recent tree-growth to temperature at high northern latitudes. *Nature* **391**:678-682.

3. Briffa, K. R., F. H. Schweingruber, P. D. Jones, T. J. Osborn, I. C. Harris, S. G. Shiyatov, E. A. Vaganov, and H. Grudd, 1998b. Trees tell of past climates: but are they speaking less clearly today? *Philosophical Transactions of the Royal Society of London Series B – Biological Sciences* 353, 65-73.

4. Briffa, K. R. 2000. Annual climate variability in the Holocene: interpreting the message of ancient trees. *Quaternary Science Reviews* **19**, 87-105.

5. Briffa, K.R., Osborn, T.J., Schweingruber, F.H., Harris, I.C., Jones, P.D., Shiyatov, S.G. and Vaganov, E.A., 2001: Low-frequency temperature variations from a northern tree-ring density network. *J. Geophys. Res.* **106**, 2929-2941.

6. Briffa, K. R., V. V. Shishov, T. M. Melvin, E. A. Vaganov, H. Grudd, R. M. Hantemirov, M. Eronen, and M. M. Naurzbaev. 2008. Trends in recent temperature and radial tree growth spanning 2000 years across northwest Eurasia. *Philosophical Transactions of the Royal Society B-Biological Sciences* **363**, 2271-2284.

7. Jones, P.D. and Moberg, A., 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *J. Climate* **16**, 206-223.

8. Jones, P.D., Raper, S.C.B., Bradley, R.S., Diaz, H.F., Kelly, P.M. and Wigley, T.M.L., 1986a: Northern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 161-179.

9. Jones, P.D., Raper, S.C.B. and Wigley, T.M.L., 1986b: Southern Hemisphere surface air temperature variations: 1851-1984. *Journal of Climate and Applied Meteorology* **25**, 1213-1230.

10. Jones, P.D., Groisman, P.Ya., Coughlan, M., Plummer, N., Wang, W-C. and Karl, T.R., 1990: Assessment of urbanization effects in time series of surface air temperature over land. Nature 347, 169-172.

11. Jones, P.D., Lister, D.H. and Li, Q., 2008: Urbanization effects in large-scale temperature records, with an emphasis on China. Journal of Geophysical Research, 113, D16122.

Supporting documentation

Briffa and Melvin (2009) which is online at
http://www.cru.uea.ac.uk/cru/people/briffa/yamal2009/

TR017 – Bradley, R.S., Kelly, P.M., Jones, P.D., Goodess, C.M. and Diaz, H.F., 1985: A Climatic Data Bank for Northern Hemisphere Land Areas, 1851-1980, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TRO17*, 335 pp.

TR022 – Jones, P.D., Raper, S.C.B., Santer, B.D., Cherry, B.S.G., Goodess, C.M., Kelly, P.M., Wigley, T.M.L., Bradley, R.S. and Diaz, H.F., 1985: A Grid Point Surface Air Temperature Data Set for the Northern Hemisphere, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TRO22*, 251 pp.

TR027 – Jones, P.D., Raper, S.C.B., Cherry, B.S.G., Goodess, C.M. and Wigley, T.M.L., 1986: A Grid Point Surface Air Temperature Data Set for the Southern Hemisphere, 1851-1984, U.S. Dept. of Energy, Carbon Dioxide Research Division, *Technical Report TR027*, 73 pp.

EMBARGOED TO 11.00 14 April 2010

University of East Anglia

Response by the University of East Anglia to the Report by Lord Oxburgh's Science Assessment Panel

UEA welcomes the Report by the Lord Oxburgh's Independent Panel, both in respect of the Climatic Research Unit (CRU) being cleared of any scientific impropriety and dishonesty, and the suggestions made for improvement in some other areas.

The Oxburgh findings are the result of the latest scrutiny of CRU's research. The first was the original peer review which led to publication in some of the world's leading international science journals; the second was the Inquiry by the Parliamentary Science and Technology Committee. Taken together, these must represent one of the most searching examinations of any body of scientific research. The veracity of CRU's research remains intact after this examination.

It is gratifying to us that the Oxburgh Report points out that CRU has done a public service of great value by carrying out meticulous work on temperature records when it was unfashionable and attracted little scientific interest, and that the Unit has been amongst the leaders in international efforts to determine the overall uncertainty in the derived temperature records. Similarly, the Report emphasises that all of CRU's published research on the global land-based instrumental temperature record included detailed descriptions of uncertainties and appropriate caveats. We also welcome the confirmation that, although some have accused CRU of trying to mislead, the Unit's published research emphasises the late 20th Century discrepancy between tree-based proxy reconstructions of temperature and instrumental observations.

The Report points out where things might have been done better. One is to engage more with professional statisticians in the analysis of data. Another, related, point is that more efficacious statistical techniques might have been employed in some instances (although it was pointed out that different methods may not have produced different results). Specialists in many areas of research acquire and develop the statistical skills pertinent to their own particular data analysis requirements. However, we do see the sense in engaging more fully with the wider statistics community to ensure that the most effective and up-to-date statistical techniques are adopted and will now consider further how best to achieve this.

Another area for suggested improvement is in the archiving of data and algorithms, and in recording exactly what was done. Although no-one predicted the import of this pioneering research when it started in the mid-1980's, it is now clear that more effort needs to be put into this activity. CRU, and other parts of the climate science community, are already making improvements in these regards, and the University will continue to ensure that these imperatives are maintained.

The Independent Climate Change E-mail Review investigation is underway, and therefore some important issues are still under active consideration. This document is our immediate written response to the Oxburgh Report. In the coming weeks we shall be considering precisely how we act upon the detailed findings of the Oxburgh Report, together with the findings of the parliamentary select committee and, in due course, the Independent Muir Russell review report.

We are grateful to Lord Oxburgh, and his international expert team, for the fair, efficient and prompt way in which they conducted their Assessment.

PROGRAMME OF MEETINGS
SCIENCE REVIEW PANEL
6th, 7th and 8th APRIL, 2010

Tuesday 6 April **7.30 p.m.**	**All Panel Members arrive** **Private Dinner at Caistor Hall**
Wednesday 7 April **9:30 a.m.** **9.45 a.m.**	**Taxi to CRU (drop off Zicer Layby)** **Met by Acting Director, CRU Prof Peter Liss and [redacted], VCO** **Coffee and Tour round CRU**
9.45 a.m. – 10.45 a.m.	**Meeting with [redacted] and team in CRU Library** **30 minute presentation by [redacted] followed by questions**
10.45-11.00 am	**Coffee served in CRU library**
11.00-12:30 pm	**Discussion – CRU Library**
12:30-1:30 pm	**LUNCH for panel members – room number 00.2 CRU**
1:30-3:30 pm	**Discussion - CRU Library**
3.30-4.30 pm	**If needed: follow-up meeting with [redacted] and Peter Liss**
4.30-5.30 pm	**Panel private meeting**
5.30 pm	**Peter Liss to chaperone Panel to Zicer Layby for taxis to hotel**
7.00 p.m.	**Working Dinner at Caistor Hall**

Thursday 8 April **8.45am** **9.00 a.m.**	 **Taxi to CRU (drop off Zicer Layby)** **Met by Acting Director, CRU Prof Peter Liss** **Coffee in CRU**
9.15 a.m. – 10.45 a.m.	**Meeting with [redacted] and team in CRU Library**
10.45-11.00 am	**Coffee served in CRU library**
11.00-12:30 pm	**Discussion – CRU Library**
12:30-1:30 pm	**LUNCH for panel members – Sainsbury Centre, Garden Restaurant – [redacted] to collect and escort**
1.30 p.m. – 3.00 p.m.	**Final Meeting**
3.00 p.m. – 3.30 p.m.	**Coffee + Depart in taxis from Zicer Layby**

PROGRAMME OF MEETINGS
SCIENCE REVIEW PANEL
6th, 7th and 8th APRIL, 2010

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9.15 a.m. – 10.45 a.m.	**Meeting with [redacted], [redacted] [redacted]nd team in CRU Library** **30 minute presentation by [redacted] [redacted]ollowed by questions**
10.45-11.00 am	**Coffee served in CRU library**
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1.30 p.m. – 3.00 p.m.	**Final Meeting**
3.00 p.m. – 3.30 p.m.	**Coffee + Depart in taxis from Zicer Layby**

Dear Fiona,

There has been some misrepresentation of my views, which have not changed and which are the following. Mann et al (1998) used a non-standard statistical method, but the papers and reports I have examined which explore the impact of this suggest to me that it is unlikely that the qualitative conclusion will be affected by a more appropriate analysis, though clearly the precise impact depends on which series are included and any assumptions underlying the analysis.

Hope that clarifies things.

Thanks

David

Addendum to report:

For the avoidance of misunderstanding in the light of various press stories, it is important to be clear that the neither the panel report nor the press briefing intended to imply that any research group in the field of climate change had been deliberately misleading in any of their analyses or intentionally exaggerated their findings. Rather, the aim was to draw attention to the complexity of statistics in this field, and the need to use the best possible methods.