United States Environmental Protection Agency

EPA Docket ID Number EPA-HQ-OAR-2009-0171

IN RE:
PROPOSED ENDANGERMENT AND
CAUSE OR CONTRIBUTE FINDINGS FOR
GREENHOUSE GASES UNDER SECTION 202(A)
OF THE CLEAN AIR ACT; PROPOSED RULE,
74 FR 18,886 (APR. 24, 2009)

Petition of the Competitive Enterprise Institute To Reopen This Proceeding on the Basis of New Evidence Concerning the Destruction of Data, and To Reopen the Comment Period for Public Response to This New Information

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Environmental Protection Agency
EPA Docket Center (EPA/DC)
Mailcode 6102T
Attention Docket ID No. EPA-HQ-OAR-2009-0171
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Washington, D.C. 20460

By electronic delivery to: GHG-Endangerment-Docket@epa.gov

Request for Reopening of the Record and Extension of the Comment Period,
Re: Proposed Endangerment and Cause or Contribute Findings for
Greenhouse Gases Under Section 202(a) of the Clean Air Act
Docket ID No. EPA-HQ-OAR-2009-0171

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To Whom It May Concern:

The Competitive Enterprise Institute (CEI), a non-profit, free-market public policy organization, hereby requests that EPA reopen the record in its Endangerment Proceeding to allow the filing of newly-uncovered information regarding the destruction and unreliability of crucial data being utilized by the agency. CEI also requests that the public comment period be reopened for a 30-day period, to allow for public responses to this information.

The information was not made public until mid-August, after the original comment period closed on June 23. As a result, this information was hidden from public view throughout the comment period.[1]

[1] In its "Proposed Endangerment" finding, EPA stated that "Comments on this proposed action must be received on or before June 23, 2009." 74 FR at 18,886.

This new information is directly relevant to one of the basic issues in this proceeding: "the data on which the proposed findings are based, [and] the methodology used in obtaining and analyzing the data." *Proposed Endangerment*, 74 FR 18,890. However, its unavailability until now has prevented the public at large from commenting on it, and it has prevented EPA from considering it.

As is explained below at pp. 5-8, the discovery of new and highly relevant may warrant the reopening of an administrative proceeding, especially when, as here, the agency has not yet issued its final decision. In this particular case, moreover, EPA is under no time constraints which might prevent it from considering this new evidence. [2]

I.
The Climate Research Unit's New Revelation That It Destroyed Its Raw Climate Data Is a Major Breach of Scientific Standards And Requires a Reexamination of the Studies Based on That Data

In mid-August an important new development occurred--the University of East Anglia's Climate Research Unit (CRU) revealed that it had destroyed the raw data for its data set of global surface temperatures.

The CRU's admission came in a statement posted on its website in mid-August:

> "The Climatic Research Unit (CRU) at the University of East Anglia (UEA) has, since 1982, made available gridded datasets of surface temperature data over land areas and averages for the Northern and Southern Hemispheres and the Globe. Until the development of the internet these were made available via various media. These datasets … have been developed from data acquired from weather stations around the world. …. ….
>
> "…. Since the 1980s, we have merged the data we have received into existing series or begun new ones, so it is impossible to say if all stations within a particular country or if all of an individual record should be freely available. Data storage availability in the 1980s meant that we were not able to keep the multiple sources for some sites, only the station series after adjustment for homogeneity issues. **We, therefore, do not hold the original raw data but only the value-added (i.e. quality controlled and homogenized) data.**"

http://www.cru.uea.ac.uk/cru/data/availability/ (emphasis added; attached as Attachment A).[3]

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[2] *See Massachusetts v. EPA*, No. 03-1361, Order, Document No. 0121688432, at 2 (D.C. Cir. June 26, 2008) (Tatel, J., concurring) ("nothing in section 202 [of the Clean Air Act], [or] the Supreme Court's decision in *Massachusetts v. EPA* . . imposes a specific deadline by which EPA must determine whether a particular air pollutant poses a threat to public health or welfare."); *SF Chapter of A. Philip Randolph Institute v. EPA*, No. C 07-04936 CRB, 2008 WL 859985, at *4, U.S. Dist. LEXIS 27794, at *10-11 (N.D. Cal. March 28, 2008) ("The Supreme Court was careful not to place a time limit on the EPA, and indeed did not even reach the question whether an endangerment finding had to be made at all.").

[3] *See Nebraska v. EPA*, 331 F.3d 995, 999 n.3 (D.C. Cir. 2003) (taking judicial notice of institution's web site).

As Dr. Patrick Michaels[4] explains in his attached declaration (Attachment B), this is a major and extremely disturbing revelation:

- CRU's records are one of the major compilations of global climate data, and were the sole basis for the 1996 Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). This Report marked the first time that the IPCC found a "discernible human influence on global climate." Attachment B at 1;

- Until CRU's revelation, it was widely believed that CRU still had its raw data. For this reason, CRU's announcement that it had destroyed its raw data is a major new element in the controversy over anthropogenic climate change;

- CRU's destruction of its raw data violates basic scientific norms regarding reproducibility, which are especially important in climatology;

- EPA expressly relied on the IPCC reports and thus on CRU's data. For this reason, EPA should invite public comment on this new issue and reexamine its position in light of CRU's revelation.

In Dr. Michaels' words, CRU's admission "violates basic scientific principles, and throws even more doubt onto the contention that anthropogenic greenhouse gas emissions endanger human welfare." Attachment B at 1.[5] As for CRU's claim of inadequate storage space, Dr. Michaels views it as "balderdash."[6]

EPA's Federal Register announcement makes it clear that its Endangerment proposal rests in large part on the IPCC reports and therefore on the CRU data:

> "*A. Approach in Utilizing the Best Available Scientific Information*
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> "EPA has developed a technical support document [TSD] which synthesizes major findings from the best available scientific assessments that have gone through rigorous and transparent peer review. The TSD therefore relies most heavily on the major

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[4] Dr. Michaels is a past president of the American Association of State Climatologists and was program chair for the Committee on Applied Climatology of the American Meteorological Society. Michaels was also a research professor of Environmental Sciences at University of Virginia for thirty years. Michaels is a contributing author and reviewer of the United Nations Intergovernmental Panel on Climate Change. *See Patrick J. Michaels*, http://www.cato.org/people/patrick-michaels.

[5] The World Meteorological Organization (WMO) states that climatologists are expected to "provide on a free and unrestricted basis essential data . . . particularly those basic data and products . . . required to describe and forecast accurately weather and climate." *WMO Policy and Practice For The Exchange of Meteorological and Related Date and Products Including Guidelines on Relationships in Commercial Meteorological Activities* http://www.nws.noaa.gov/im/wmor40.htm. The principle that data should be freely exchanged presupposes that such data is preserved.

[6] P. Michaels, *The Dog Ate Global Warming*, NationalReviewOnline, Sept. 23, 2009 ("All of the original data could easily fit on the 9-inch tape drives common in the mid-1980s."), http://article.nationalreview.com/?q=ZTBiMTRlMDQxNzEyMmRhZjU3ZmYzODI5MGY4ZWI5OWM=

> assessment reports of both the Intergovernmental Panel on Climate Change (IPCC) and the U.S. Climate Change Science Program (CCSP). EPA took this approach rather than conducting a new assessment of the scientific literature."
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> 74 FR 18,894.

Given EPA's extensive reliance on reports that rest, directly or indirectly, on CRU data, CRU's revelation of data destruction is clearly major new evidence that requires EPA to reexamine its entire approach.[7]

II.
If EPA Fails To Reopen This Proceeding To Take Account of CRU's Destruction of Data, It Will Be Acting on an Utterly Misleading Administrative Record

Failure to reopen the record to include CRU's new would result in a fundamentally misleading administrative record. That record would falsely suggest that the climate-change data relied upon by EPA has evidentiary support when in fact it fails EPA's own data quality standards. Moreover, since the underlying data no longer exist, the record would falsely suggest that CRU's claims are reliable.

An agency must reopen its proceedings where necessary to take into account new facts,[8] and "must not ignore evidence placed before it." As the Supreme Court long ago noted, an agency must take account of new facts which create "a new situation, a radically different one, which had supervened since the record before [it] had been closed …." *Atchison T. & F.R. Co. v. United States*, 284 U.S. 248, 260 (1932) (overturning agency's order, and remanding a case for reopening of evidentiary proceedings, based on new facts that made the record behind the order stale). [9]

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[7] In late September, yet another controversy over CRU arose, this time concerning its tree ring data. This data had been used over the last decade, to construct several hockey-stick shaped graphs which supposedly showed that global temperatures had been stable for nearly a millennium before suddenly soaring up in the last century. After being withheld from outside researchers, the data were finally made available this past year. New analyses of this data indicates a severe case of cherry-picking:

> "Thus the key ingredient in most of the studies that have been invoked to support the Hockey Stick, namely the Briffa Yamal [tree data] series, depends on the influence of a woefully thin subsample of trees and the exclusion of readily-available data for the same area. Whatever is going on here, it is not science."

R.McKitrick, *Defects in Key Climate Data Are Uncovered*, Financial Post, Oct. 1, 2009, http://network.nationalpost.com/np/blogs/fpcomment/archive/2009/10/01/ross-mckitrick-defects-in-key-climate-data-are-uncovered.aspx

[8] *See also Ohio Bell Telephone Co. v. Public Utilities Commission*, 301 U.S. 292 (1937); *Missouri Pub. Serv. Comm'n v. F.E.R.C.*, 337 F.3d 1066, 1075 & n.8 (D.C. Cir. 2003) (noting that agency "would have had to articulate a non-arbitrary reason for ignoring . . . new facts," and citing cases authorizing agencies to "reopen the record" based on "changes in condition of fact or law").

[9] *See also Consumers Union of U. S. v. Consumer Product Safety Commission*, 491 F.2d 810, 812 (2d Cir. 1974); *Ethyl Corp. v. EPA*, 541 F.2d 1, 36 (D.C. Cir. 1976), *cert. denied*, 426 U.S. 941 (1976). *Accord FCC v. Fox Television Stations*, 129 S.Ct. 1800, 1824 (2009) (Kennedy, J., concurring) ("An agency cannot simply . . . ignore inconvenient facts"); *NLRB v. E-Systems, Inc., Garland Div.*, 103 F.3d 435, 439 (5th Cir. 1997) (A court is "free to disregard the agency's findings when it ignores relevant evidence without explaining and justifying its decision to do so").

In *Atchison*, moreover, the agency had already issued its final order. Here, in contrast, EPA has yet to do so, making the case for reopening this proceeding all the more compelling.

A. CRU's Destruction of Climate Data Makes Any Endangerment Findings Based on Them Unreliable, Violating the Information Quality Act, EPA's Implementing Guidelines, and Due Process.

The Information Quality Act, together with EPA's own data-quality guidelines, require that the agency act only on the basis of data whose "objectivity," "utility," "integrity" and "reproducibility" is assured.[10] At a minimum, the last two criteria, those of integrity and reproducibility, are by definition lacking when the underlying or original data have been destroyed or lost.[11] Nor can their "objectivity" be assured, as the Information Quality Act requires, given the inability to vet the original and supporting data.[12]

The underlying data central to an agency's decision should be made available for examination and rebuttal.[13] Here, that is not possible, since they have been destroyed and no longer exist. Moreover, due process forbids an agency from using evidence in a way that forecloses an opportunity to offer a contrary presentation.[14] "It is not consonant with the purpose of a rule-making proceeding to promulgate rules on the basis of inadequate data, or on data that, [to a] critical degree, is known only to the agency."[15] It is even worse to promulgate rules based on data, like the destroyed CRU data, that is not even known by the agency itself, and cannot be vetted by anyone.

As one analyst explains,

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[10] *See Public Law No. 106-554, Section 515 (requiring that federal agencies take steps* "ensuring and maximizing the quality, objectivity, utility, and integrity of information" which they rely upon or otherwise disseminate); *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency*, at pg. 15 (requiring "integrity"), pg. 20 (requiring "reproducibility") **(**EPA/260R-02-008, October 2002) (available at http://www.epa.gov/quality/informationguidelines/documents/EPA_InfoQualityGuidelines.pdf; *see also* Office of Management and Budget, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Republication*, 67 FR 8452, 8453 (Feb. 22, 2002) (requiring "utility," "objectivity" and "integrity"); id at 8460 (requiring "integrity" and "reproducibility").

[11] *See* Marlo Lewis, *No Data, No Science*, Sept. 24, 2009, at 1:35 p.m. (available at http://www.globalwarming.org/2009/09/24/no-data-no-science/).

[12] *See* Office of Management and Budget, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Republication*, 67 FR at 8459 (''objectivity' involves a focus on ensuring accurate, reliable, and unbiased information. In a scientific, financial, or statistical context, *the original and supporting data shall be generated, and the analytic results shall be developed, using sound statistical and research methods*) (emphasis added).

[13] *Washington Trollers Ass'n v. Kreps*, 645 F.2d 684, 686 (9th Cir. 1981) (although agency was permitted to act based on summaries of information, it still should have made the underlying information central to its decision available).

[14] *Ohio Bell Telephone Co. v. Public Utilities Commission*, 301 U.S. 292 (1937).

[15] *American Radio Relay League, Inc. v. F.C.C.*, 524 F.3d 227, 237 (D.C. Cir. 2008) (agency could not rely on redacted agency studies), *quoting Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375, 393 (D.C. Cir. 1973) (EPA failed to make available in timely fashion the test results and procedures which formed partial basis for the emission control level that it adopted).

> "The claim that the latter half of the 20th century was warmer than any comparable period during the past 1300 is largely based on surface temperature records subject to several well-known warming biases. Urbanization generates artificial 'heat islands.' Agriculture and irrigation in places like California's Central Valley also produce local warming effects. Retired meteorologist Anthony Watts has documented that nearly nine out of every 10 U.S. weather stations fail to meet the U.S. Weather Service's minimum requirement that temperature sensing equipment be placed at least 30 meters (about 100 feet) away from artificial heat sources such as air conditioner exhaust vents, waste water treatment plants, and parking lot pavements.
>
> "Michaels now exposes the shocking fact that the data allegedly underpinning the most influential surface temperature record are missing and apparently have been destroyed. The record is known as Jones-Wigley for its authors, Phil Jones of the University of East Anglia Climate Research Unit (CRU) and Tom Wigley of the National Center for Atmospheric Research (NCAR). The IPCC relied exclusively on this record until its most recent (2007) report.
>
> ….
>
> "Use of the Jones-Wigley temperature record in a rulemaking clearly flouts federal data quality standards. Under OMB guidelines implementing the Federal Data Quality Act, data quality consists of four elements: objectivity, utility to users, integrity of information, and reproducibility in the case of 'influential scientific or statistical information.'
>
> "Now, if the original Jones-Wigely data have been destroyed, then it is impossible to assure 'integrity of information.' For all we know, Jones and Wigley goofed in their calculations or choice of methodologies, or even manipulated the data to produce a pre-determined result. By the same token, it is impossible to 'reproduce' the Jones-Wigley temperature record, because there are no data to reproduce it from. Yet, as a factual basis of both the IPCC reports and the EPA endangerment finding, Jones-Wigley indisputably qualifies as 'influential scientific or statistical information.' . . .

Marlo Lewis, *No Data, No Science*, Sept. 24, 2009, at 1:35 p.m. (attached hereto as Attachment C; also available at http://www.globalwarming.org/2009/09/24/no-data-no-science/).

B. CRU's Conflicting Claims About Its Data Make Any Reliance On It Unjustifiable

CRU long implied that it possessed the raw data; only now, after the EPA's Endangerment record formally closed, did it reveal that it had destroyed the that data. These conflicting claims form yet another reason for viewing its claims as inherently unreliable and unworthy of credence.[16]

[16] *See Washington v. Garrett*, 10 F.3d 1421 (9th Cir. 1993) (when employer gives conflicting non-discriminatory explanations for why it fired an employee, that is evidence that each explanation was false and thus a pretext for discrimination against the employee."); *Dominguez-Cruz v. Suttle Carible, Inc.*, 202 F.3d 424, 432 (1st Cir. 2000) ("[W]hen a company, at different times, gives different and arguably inconsistent explanations, a jury may infer that

C. CRU's Destruction of the Data Gives Rise to An Inference That the Data Was Adverse to Its Claims About the Existence of Anthropogenic Climate Change

Because CRU destroyed this data, despite the fact that it was perfectly practicable for it to preserve it, gives rise to an inference that the data contradicted its claims about anthropogenic global warming. That is especially true given that its destruction of the data was highly suspicious because it violated basic scientific and professional norms. When "raw data" is destroyed, it is appropriate to "draw unfavorable inferences against the party responsible for the loss or destruction of the original evidence."[17] This is true even where the expert who destroyed the data claims special expertise, since "an expert should not be permitted intentionally or negligently to destroy such evidence and then substitute his or her own description of it."[18]

D. Because EPA Is a Funder of CRU, It Should Consider Using an Outside, Impartial Adjudicator to Evaluate This Petition

CRU acknowledges that it receives government funding from the United States, and lists both the Department of Energy and EPA as being among its funders. See CRU, "*History of the Climatic Research Unit--Acknowledgments*," http://www.cru.uea.ac.uk/cru/about/history/

EPA may well be embarrassed by the fact that one of its funding recipients has engaged in such a serious breach of scientific ethics. For this reason, it should consider using an outside party with no funding or other relationship with CRU to evaluate this Petition.

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the articulated reasons are pretextual."); *Thurman v. Yellow Freight Sys.*, Inc., 90 F.3d 1160, 1167 (6th Cir. 1996) ("An employer's changing rationale for making an adverse employment decision can be evidence of pretext."); *EEOC v. Ethan Allen, Inc.*, 44 F.3d 116, 119 (2d Cir. 1994) (holding that a jury could infer that defendant's reasons were pretextual based on shifting or inconsistent explanations, developed by defendant over time); *Kobrin v. University of Minn*., 34 F.3d 698, 703 (8th Cir. 1994)("Substantial changes over time in the employer's proffered reason for its employment decision support a finding of pretext."); *Castleman v. Acme Boot Co*., 959 F.2d 1417, 1422 (7th Cir. 1992).

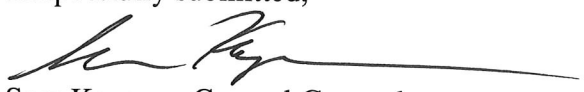
[17] *Livingston v. Isuzu Motors, Ltd.*, 910 F.Supp. 1473, 1494 (D.Mont. 1995) (appropriate to "draw an adverse inference from the destruction or spoliation against the party or witness responsible for" the destruction of the "raw data"); *Vodusek v. Bayliner Marine Corp.*, 71 F.3d 148, 156 (4th Cir.1995) (upholding verdict for defendant where plaintiff destroyed the original evidence; court could "draw unfavorable inferences against the party responsible for the loss or destruction of the original evidence").

[18] *Family Ins. Co. v. Village Pontiac GMC, Inc.*, 585 N.E.2d 1115, 1118 (Ill.App.Ct.1992).

CONCLUSION

For the foregoing reasons, EPA should reopen its Endangerment proceeding to consider CRU's destruction of data, and as well as the implications of CRU's breach of scientific standards. EPA should invite public comment on these issues as well, in a new 30-day comment period.

Respectfully submitted,



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October 5, 2009

ATTACHMENT A

http://www.cru.uea.ac.uk/cru/data/availability/

CRU Data Availability

The Climatic Research Unit (CRU) at the University of East Anglia (UEA) has, since 1982, made available gridded datasets of surface temperature data over land areas and averages for the Northern and Southern Hemispheres and the Globe. Until the development of the internet these were made available via various media. These datasets (the latest being CRUTEM3 http://www.cru.uea.ac.uk/cru/data/temperature/) have been developed from data acquired from weather stations around the world. Almost all these weather stations are run by National Meteorological Services (NMSs) and they exchange these data over the CLIMAT network, which is part of the World Meteorological Organization's (WMO) Global Telecommunications System (GTS). Much of the original data in the early 1980s came from publications entitled 'World Weather Records'. We also make use of data available from the National Climatic Data Center in Asheville, North Carolina (their Global Historical Climatology Network, GHCN). We are also constantly striving to find additional, and homogenized data from a wide range of sources (see details of earlier work in the publications below). Both the gridded datasets and the station data archive have evolved over the years and we developed dataset version numbers in the early 1990s. The methodology we have used in developing the gridded datasets has been described in numerous publications in the climate literature (see list at the end of this document and also http://www.cru.uea.ac.uk/cru/data/temperature/ and the linked FAQs).

Since the early 1980s, some NMSs, other organizations and individual scientists have given or sold us (see Hulme, 1994, for a summary of European data collection efforts) additional data for inclusion in the gridded datasets, often on the understanding that the data are only used for academic purposes with the full permission of the NMSs, organizations and scientists and the original station data are not passed onto third parties. Below we list the agreements that we still hold. We know that there were others, but cannot locate them, possibly as we've moved offices several times during the 1980s. Some date back at least 20 years. Additional agreements are unwritten and relate to partnerships we've made with scientists around the world and visitors to the CRU over this period. In some of the examples given, it can be clearly seen that our requests for data from NMSs have always stated that we would not make the data available to third parties. We included such statements as standard from the 1980s, as that is what many NMSs requested.

The inability of some agencies to release climate data held is not uncommon in climate science. The Dutch Met Service (KNMI) run the European Climate Assessment and Dataset (ECA&D, http://eca.knmi.nl/) project. They are able to use much data in their numerous analyses, but they cannot make all the original daily station temperature and precipitation series available because of restrictions imposed by some of the data providers. A series of workshops (see Peterson and Manton, 2008 for details) has been held in diverse regions of the world to produce analyses of trends in extremes. NMSs are generally happy to release derived products from their data, even if they restrict access to their digital climate archives. A third example is the Global Precipitation Climatology Centre (http://gpcc.dwd.de), run by the German Weather Service (DWD) who make various versions of gridded precipitation datasets freely available, but due to restrictions imposed

by data providers are not able to give access to any of the station monthly precipitation totals. The problem is a generic issue and arises from the need of many NMSs to be or aim to be cost neutral (i.e. sell the data to recoup the costs of making observations and preparing the data).

We receive numerous requests for these station data (not just monthly temperature averages, but precipitation totals and pressure averages as well). Requests come from a variety of sources, often for an individual station or all the stations in a region or a country. Sometimes these come because the data cannot be obtained locally or the requester does not have the resources to pay for what some NMSs charge for the data. These data are not ours to provide without the full permission of the relevant NMSs, organizations and scientists. We point enquirers to the GHCN web site. We hope in the future that we may be able to provide these data, jointly with the UK Met Office Hadley Centre, subject to obtaining consent for making them available from the rights holders. In developing gridded temperature datasets it is important to use as much station data as possible to fully characterise global- and regional-scale changes. Hence, restricting the grids to only including station data that can be freely exchanged would be detrimental to the gridded products in some parts of the world.

We are not in a position to supply data for a particular country not covered by the example agreements referred to earlier, as we have never had sufficient resources to keep track of the exact source of each individual monthly value. Since the 1980s, we have merged the data we have received into existing series or begun new ones, so it is impossible to say if all stations within a particular country or if all of an individual record should be freely available. Data storage availability in the 1980s meant that we were not able to keep the multiple sources for some sites, only the station series after adjustment for homogeneity issues. We, therefore, do not hold the original raw data but only the value-added (i.e. quality controlled and homogenized) data. The priorities we use when merging data from the same station from different sources are discussed in some of the literature cited below. Parts of series may have come from restricted sources, whilst the rest came from other sources. Furthermore, as stated in http://www.cru.uea.ac.uk/cru/data/landstations/ we have never kept track of changes to country names, as it is only the location and the station's data that are important. So, extracting data for a single country isn't always a simple task.

We rely on the CLIMAT network for updating CRU data series in near-real time. After quality control at the Hadley Centre these data are made available (since 2000) at http://hadobs.metoffice.com/crutem3/data/station_updates/. Much climate data are now additionally available through the internet from NMSs, but these are often difficult to use as data series often refer to national numbering systems, which must be related back to WMO Station Identifiers. Furthermore a number of NMSs make homogenized data (after adjustments for example for site moves, instrument improvements and changes in the way averages are calculated) available in delayed mode over the internet. Some that provide both raw and homogenized versions, generally do not link the two sets of data together.

Some years ago, WMO enacted Resolution 40 (http://www.map.meteoswiss.ch/map-doc/WMO/WMOresol40.htm) which covers the exchange of meteorological data and many data products and services produced by NMSs. This resolution applies only to NMSs and whilst Annex 1 implies that much data should be freely available for research and operational uses

(commercial is discussed separately in the resolution), many still impose conditions and charge for access (see the earlier discussion related to KNMI and GPCC).

The HadCRUT3 product is a blend of land surface (CRUTEM3) and sea surface temperatures (HadSST2), CRU developing the land series and the Hadley Centre the SST series. Real-time updates of both components are performed at the Hadley Centre (data available at http://hadobs.metoffice.com/ and also on the CRU site). The collaboration has been ongoing for more than 20 years. A similar set of publications on the Hadley Centre site document the development of the SST datasets.

Files

- Data agreements

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ATTACHMENT B

THE SCIENTIFIC RATIONALE FOR RE-OPENING THE ENVIRONMENTAL PROTECTION AGENCY'S ENDANGERMENT PROCEEDING, 74 FR 18,886 (April 24, 2009)

The Implications of the Climate Research Unit's Destruction of Its Original Climate Data

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The public comment period on the Environmental Protection Agency's Endangerment Proceeding ended on June 23, 2009. In mid-August, however, an important new development occurred concerning the reproducibility of important aspects of climate change science. The University of East Anglia's Climate Research Unit (CRU) *revealed that it had lost or destroyed the foundation data for surface temperature*s used by the United Nations' Intergovernmental Panel on Climate Change (IPCC) to make its first determination of a human influence on climate. This is a totally new element in the Endangerment debate. It violates basic scientific principles, and throws even more doubt onto the contention that anthropogenic greenhouse gas emissions endanger human welfare.

I.

CRU's Climate Data Have Played a Fundamental Role In Supporting the Claim That Anthropogenic Carbon Dioxide Emissions Pose A Global Threat

The IPCC first determined that human activity was affecting the climate in its 1996 "Second Assessment Report" (SAR; IPCC, 1996), stating that "the balance of evidence suggests a discernible human influence on global climate". At that time, the IPCC relied almost exclusively on one surface climate record: the combined land/ocean temperature history first published by Jones et al. (1986ab), which later was named the "HadCRU" record, and maintained by Dr. Phil Jones, who is the Director of the CRU. This record, in fact, was the only one available on the IPCC website for several years

after the publication of its Second Assessment. For that very reason, it is commonly referred to by climate scientists as "the IPCC Record". [1]

EPA has openly stated that the IPCC reports and, by implication, the CRU data are one of the two major bases for its Endangerment proposal. To quote from that proposal,

> "*A. Approach in Utilizing the Best Available Scientific Information*
>
> EPA has developed a technical support document [TSD] which synthesizes major findings from the best available scientific assessments that have gone through rigorous and transparent peer review. The TSD therefore relies most heavily on the major assessment reports of both the Intergovernmental Panel on Climate Change (IPCC) and the U.S. Climate Change Science Program (CCSP)…"

74 FR 18,894.

CRU states that it "is regarded as an authoritative source of information on both the science and policy aspects of climate change by the media and maintains a high public profile." (http://www.cru.uea.ac.uk/cru/about/) As is shown above, EPA is clearly one of those entities that regards CRU as authoritative. For that reason, as amplified below, EPA should re-open and reexamine its Endangerment Proceeding in light of CRU's recent revelation.

II.

Background Of CRU's Revelation That It Had Destroyed Its Raw Data

Until mid-August, it had been commonly assumed that CRU had maintained its raw data. In fact, a number of communications from CRU suggested exactly that. Several scientists had recently requested the original data from Dr. Phil Jones, the CRU Director. Several CRU responses stated that the data could not be provided because of confidentiality agreements with the contributing countries, or that they *would not* be

[1] Since then, two other surface records have been used by the IPCC; one by the Goddard Institute for Space Studies ("GISS"; Hansen et al, 2001) and another from the U.S. National Climatic Data Center (Smith et al., 2008). There are, however, some significant differences between these various surface records, especially with respect to their consistency with the distribution of climate trends "forecast" by the 21 "midrange" emission scenario climate models (Michaels and Knappenberger, 2009). With the destruction of the CRU raw data, it has become impossible to determine the reason for these differences.

provided, out of fear of criticism, implying that the data were still in existence.[2] But on August 13, 2009, CRU responded to a data request by Dr. Roger Pielke, Jr., of University of Colorado with a recent web posting that said, in part:

> "We are not in a position to supply data for a particular country not covered by the example agreements referred to earlier, as we have never had sufficient resources to keep track of the exact source of each individual monthly value. Since the 1980s, we have merged the data we have received into existing series or begun new ones, so it is impossible to say if all stations within a particular country or if all of an individual record should be freely available. Data storage availability in the 1980s meant that we were not able to keep the multiple sources for some sites, only the station series after adjustment for homogeneity issues. **We, therefore, do not hold the original raw data** but only the value-added (i.e. quality controlled and homogenized) data. [emphasis added]"

(http://www.cru.uea.ac.uk/cru/data/availability/)

CRU revealed this only after the Endangerment comment period closed on June 23. However, the fact that the data were destroyed or lost was clearly known to the CRU beforehand.

III.

CRU's Failure to Maintain Important Raw Data Is A Major Scientific Breach

Reproducibility and replication are the hallmarks of science. This is particularly true in climatology, where the production of global climatic histories is extremely complicated. "Raw" climate data, taken at individual stations, are often adjusted for changes in site quality (such as construction of a nearby building), urbanization and consequent "artificial" heating, instrumentation changes, and missing data. Because the CRU data differs in at least one important aspect from other, subsequent records (see Footnote 1), it is incumbent upon scientists to be able to determine the cause of this difference, which may in fact be a result of the way in which the raw data were adjusted.

The Board on Atmospheric Sciences and Climate of the National Oceanic and Atmospheric Administration (2006) states that "All data that are well documented, are of

[2] In a February 21, 2005 response to a request for the original data by Australian climatologist Warwick Hughes, Phil Jones, the senior author of the original academic papers describing the IPCC history wrote, "We have 25 years or so 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?" This clearly indicates that the data existed at least as of that time.

known quality, and represent systematic collections or characterizations of the state of the environment should be archived in their most primitive useful form. … Original Data … represent the most obvious data type to consider for long-term archiving …" (http://books.nap.edu/openbook.php?record_id=11659&page=11, =12). Adjudication of differences in adjusted datasets is an obvious reason for this priority.

I believe this new information regarding CRU's actions is a critical comment on the science underlying EPA's Proposed Endangerment, and that the docket needs to be re-opened so such commentary can be submitted for the record. Moreover, this needs to take place prior to any official finding of endangerment.

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Association of American Geographers, 2003, co-author of climate science “Paper of the Year”.

COURSES OF INSTRUCTION

EVSC 100A/USEM 172: The Greenhouse Effect and Public Policy
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2000. Global Warming: An Issue Whose Time is Past. ENO Transportation Forum, Washington DC, 15pp.***

2000. Climate Change and Atmospheric Circulation in the Pacific. 81st Ann. Mtg., AAAS Pacific Division, Ashland OR (R.E. Davis, Senior Author).**

2000. Natural Signals in the MSU Lower Tropospheric Temperature Record. Geophysical Research Letters 27, 2905-2908.*

2000. AARST Science Policy Forum, New York. Social Epistemology 14, 133-186. (J.E. Hansen, Senior Author).*

2001. Assessment of Uncertainties of predicted global climate change modelling: Panel 1. Technology 7, 231-256. (R.Balling, Senior Author)*

2000. Decadal Shifts in Summer Weather/Mortality Relationships in the United States by Region, Demography, and Cause of Death. 14th Conf. On Biometeorology and Aerobiology, American Meteorological Society, Davis CA, 250-251.**

2001 Development of a Discriminant Analysis Mixed Precipitation (DAMP) Forecast Model for Mid-Atlantic Winter Storms. Weather and Forecsting 16, 248-259. (J. D. Hux, Senior Author)*

2001 A Spatial Comparison of Decadal Trends in Weather-Human Mortality Relationships across the Continental United States. Invited Paper, 97th Annual Meeting of the Association of American Geographers, New York. **

2001 The Nature of Observed Climate Changes across the United States during The 20th Century. Climate Research 17, 45-53.*

2001 Integrated Projections of Future Warming based upon Observed Climate During the Greenhouse Enhancement. 1st Intl. Conf on Global Warming and The Next Ice Age, American Meteorological Society, Halifax NS, 162-167**

2001 Global Warming Converage Melts Down. World and I 16, 68-73.***

2001 Global Warming: An Objective Overview. In Eaton, D.J., Ed., Global Warming and the Kyoto Accord. Lyndon Johnson School of Public Affairs, University of Texas-Austin, 17-26.*

2002 On Seasonal Differences in weather-related mortality trends in the United States. 13th Conf. On Applied Climatology, American Meteorological Society, Portland OR, 326-330.** (R.E. Davis, Senior Author)

2002 Rational Analysis of Trends in Extreme Temperature and Precipitation. 13th Conf. On Applied Climatology, American Meteorological Society, Portland OR, 153-158**

2002 Changes in Heat-related Human Mortality in the Eastern United States. Climate Research 22, 175-184.* (R.E. Davis, Senior Author)

2002 Revised 21st Century Temperature Predictions. Climate Research 23, 1-9*.

2002 Abrupt Climate Noise. Energy and Environment 13, 19-20.*

2002 Development of a Discriminant Analysis Mixed Precipitation (DAMP) Forecast Model for mid-Atlantic Winter Storms. 13th Conf. On Applied Climatology, American Meteorological Society, Portland OR, 106-111** (J.D. Hux, Senior Author)

2002 Climate Change Adaptations: Trends in Human Mortality Responses to Summer Heat in the United States. 15th conf on Biometeorology, Aerobiology, Kansas City, Paper 9B1.** (R.E. Davis, Senior Author).

2002 Spatial Pattern of Human Mortality Seasonality in U.S. Cities since 1964. 15th Conf. Of Biometeorology, Aerobiology, Kansas City, Paper 2B2** (R.E. Davis, Senior Author).

2003 Do Facts Matter Anymore? Energy and Environnment 14, 323-326.*

2003 Science or Political Science? An Assessment of the U.S. National Assessment of the Potential Consequences of Climate Variability and Change. In Gough, M., Ed., *Politicizing Science: The Alchemy of Policymaking*. Hoover, Palo Alto. 313pp.*

2003 Das logische Paradigma einer gemaisigen glbalen Erwarming. VDI-Gesellschaft Energietecknik, Koln, Germany, 1-38.**

2003 Test for harmful collinearity among predictor variables used in modeling global temperature. Climate Research 24, 15-18.* (D.H. Douglass, Senior Author)

2003 Decadal changes in summer mortality in U.S. cities. Inter. Jour Biomet. 47, 166-175* (R. E. Davis, Senior Author).

2003 Changing heat-related mortality in the United States. Envir. Health Perspectives 111, 1712-1718.* (R.E. Davis, Senior Author) ***Climate Science "Paper of the Year", Association of American Geographers*.**

2003 Winter mortality, climate, and climate change in U.S. Cities. 37th Canadian Met. And Ocean. Soc. Cong., Ottawa, Ontario, Canada.*** (R.E. Davis, senior author)

2004 Trends in Precipitation on the Wettest Days of the Year across the Contiguous United States. Int. J. Climatology 24, 1873-1882.*

2004 Meltdown: The Predictable Distortion of Global Warming by Scientists, Politicians and the Media. Cato Books, Washington DC.* 272pp + illustrations.

2004 Economic Signals in Global Temperature Histories. 14th Conf. on Applied Climatology, American Meteorological Society, Seattle WA. Paper no. J1.1.

2004 A Test for Corrections for Extraneous Signals in Gridded Surface Temperature Data.* (R. McKittrick, Senior Author)Climate Research 26, 159-174.

2004 Changing Heatwave Mortality in U.S. Cities.** (R.E. Davis, Senior Author) 14th Conf. on Applied Climatology, American Meteorological Society, Seattle WA. Paper no J8.4.

2004 Seasonality of Climate-human Mortality Relationships in U.S. Cities and Impacts of Climate Change.* (R.E. Davis, Senior Author) Climate Research 26, 61-76.

2004 Heat Wave Mortality in Large U.S. Cities.** (R.E. Davis, Senior Author) 16th Conf. on Biometeorology and Aerobiology, American Meteorological Society, Vancouver BC. Paper no A6.3.

2004 Disparity of Tropospheric and Surface Temperature Trends: New Evidence. (D.H. Douglass, Senior Author) Geophysical Res. Lett. 31 doi: 10.1029/2004GL0212*

2005 Extended Comment On: "Impacts of CO2-Induced Warming on Simulated Hurricane Intensity and Precipitation: Sensitivity to the Choice of Model and Convective Scheme". *Journal of Climate*, 18, 5179-5182.*

Michaels, P.J., (Ed.), 2005. *Shattered Consensus: The True State of Global Warming*. Rowman and Littlefield, Lanham MD. 304pp.*

2005 False Impressions: Misleading Statements, Glaring Omissions, and Erroneous Conclusions in the IPCC's Summary for Policymakers, 2001. In *Shattered Consensus*, pp 1-9.*

2005 Sea Surface Temperature and Tropical Cyclone Intensity: Breaking the Paradigm. (R.E. Davis, Senior Author) 15th Conference On Applied Climatology, American Meteorological Society, Savannah GA, June 19-23. Paper 2.4.**

2005 Changing Heat Wave Sensitivity in U.S. Cities. 15th Conference On Applied Climatology, American Meteorological Society, Savannah GA, June 19-23. Paper 4.6.**

2005 Ozone: Unrealistic Scenarios (J. Schwartz, Senior Author). *Environmental Health Perspectives* 113, A86-87.

2005 Evidence of Adaptation to Increasing Heat Wave Intensity and Duration in U.S. Cities (R.E. Davis, Senior Author). 17th International Congress on Biometeorology, Garmisch-Partenkirchen, Bavaria, Germany, September 5-9 (conference presentation). *

2006 Global Warming and Atlantic Hurricanes (R.E. Davis, Senior Author). 2006 Annual Meeting, Association of American Geographers, Chicago IL, March 7-11 (conference presentation).

2006 Sea-surface Temperatures and Tropical Cyclones in the Atlantic Basin. *Geophysical Research Letters* 33, L09708, doi;: 10.1029/2006GL025757.*

2006 Observed Changes in North Atlantic Hurricane Frequency and Intensity using a Multivariate Model (R.E. Davis, Senior Author). Annual Meeting, Association of American Geographers, San Francisco (conference presentation).

2007 Reply to "Comments on 'Sea-surface Temperatures and Tropical Cyclones in the Atlantic Basin. *Geophysical Research Letters* 34, L06703. doi: 10.1029/2006GL27527.*

2007 A Mortality-Based Heat Wave Climatology for U.S. Cities (R.E. Davis, Senior Author). 16th Conference on Applied Climatology, American Meteorological Society, San Antonio TX (conference presentation).

2007 Quantifying the Influence of Anthropogenic Surface Processes and Inhomogeneities on Gridded Global Climate Data (R.R. McKitrick, Senior Author). *Journal of Geophysical Research* 112, D24S09, doi:10.1029/2007JD008465.

2008 Evidence for "Publication Bias" Concerning Global Warming in *Science* and *Nature*. *Energy & Environment* 19, 287-301.

2008 Confronting the Political and Scientific Realities of Global Warming. G-8 Summit Official Venue Publication, Prestige Media, 31-51.

2008 Global Warming: Correcting the Data. *Regulation*, 31 (3), 46-52.

2008 A Reconstructed 1784-2007 Time Series of Greenland Melt Extent. Fall Meeting, *American Geophysical Union*, San Francisco CA (conference presentation).

2008 Inclusive Science. *Harvard International Review*, 30 (3).

2008 Shaky Science: Inconvenient Truths Ignored by EPA in its Proposal to Regulate Carbon Dioxide Emissions. http://www.cato.org/pubs/articles/michaels_ANPR_EPA.pdf (185pp).

2009 Global Warming and Climate Change. *Cato Handbook for Policymakers*, Cato Institute, Washington DC, 475-485.

2009 Climate of Extremes: Global Warming Science They Don't Want You to Know. Cato Books, Washington. 267pp.

INVITED LECTURES AND TESTIMONY

Environmental Sciences Department Seminar, l980, 1986 (Univ. of Virginia)
New Mexico State University, 1981 (Las Cruces NM)
Virginia Farm Bureau, l981, l982, l983
Virginia Small Grains Conference, l981, 1988 (Fredericksburg, Williamsburg)
Environmental Sciences Undergraduate Seminar, l982, l983, 1985, 1987, 1990, 1992 (Univ. of Virginia)
Sigma Xi, University of Virginia, l982
Economics Honor Society, J. Madison University, l983 (Harrisonburg)
Colorado State University, Atm. Sci. Dept. Seminar 1983 (Fort Collins CO)
Virginia Tech Short Course on Viticulture, l984 (Charlottesville)
American Meteorological Society, Central Virginia Chapter, l984 (Charlottesville)
National Academy of Sciences, Commission on Life Life Sciences, l985 (Toronto)
University of Virginia Institute of Government, l985
University of Virginia Blandy Experimental Farm, 1986 (Boyce)
Virginia Mosquito Control Commission, 1986 (Williamsburg)
Virginia Water Resources Research Center, l986 (2), 1988 (Blacksburg)
Virginia Air Pollution Control Board, 1986 (Virginia Beach)
Virginia Tech Extension Service, l987, 1988 (Williamsburg)
Cooperative Institute for Research in the Atmosphere, Colorado State University, 1987 (Fort Collins)
Virginia Agricultural Chemical and Soil Fert. Assn. 1988 (Norfolk)
U.S. Geological Survey, Advisory Committee on Water Data, 1988 (New Orleans)
University of Delaware, Geography Dept. Seminar 1988 (Newark DE)
Moderator, U.S. Drought Symposium, The Weather Channel, 1988 (Atlanta)
U.S. National Climate Program, Panel on Climate Trends, 1988 (Washington)
Lynchburg College Special Lecture, 1988 (Lynchburg)
Sigma Xi, U.S. Department of Energy, l988 (Germantown MD)
American Society of Chemical Engineers, 1988 (Charlottesville)
South Carolina Water Resources Commission, 1988 (Columbia SC)
Virginia Mathematics and Science Center, 1988 (Richmond)

Scripps Institute of Oceanography, 1988 (Lake Arrowhead CA)
Virginia State Air Pollution Control Board, 1989 (Virginia Beach)
Virginia State Feed Association, 1989 (Williamsburg)
U.S. House of Representatives, Subcommittee on Energy and Power, 1989
Brookings Institution, 1989 (Williamsburg)
American Society of Civil Engineers, 1989 (Richmond)
Federal Executive Institute Alumni Association, 1989 (Rosslyn VA)
Executive Board, National Coal Association, 1989 (Phoenix AZ)
U.S. Senate, Committee on Foreign Relations, 1989
U.S. Department of State, Foreign Service Institute, 1989 (Rosslyn VA)
Virginia Department of Agriculture and Consumer Services, 1989 (Richmond)
National Association of Home Builders, 1989 (Washington)
American Meteorological Society, Committee on Broadcast Meteorology, 1989 (Ft. Lauderdale FL)
Georgia and North Carolina Textile Manufacturing Association, 1989 (Naples FL)
The Eris Society, 1989 (Aspen CO)
University of Texas, Conference on Energy Futures, 1989 (Arlington TX)
Western Fuels Association Annual Meeting, 1989 (Denver)
7th International Pittsburgh Coal Conference, 1989
U. S. Department of State, Seminar on Current Affairs, 1989 (Rosslyn VA)
Edison Electric Institute, 1989. (Washington)
Virginia Soil and Water Conservation Association, 1989 (Charlottesville)
University of Illinois, Annual Energy Conference, 1989 (Chicago)
The Keystone Center, 1989 (Washington)
National Governor's Conference, 1989 (United Nations NY)
Basin Electric Power Cooperative, 1989 (Bismarck ND)
Bennington College, Bennington in New York Seminar, 1989 (New York NY)
Virginia Tech Turkey Days, 1989 (Harrisonburg)
North Carolina State University MEAS Seminar, 1990 (Raleigh NC)
Illinois Power Corporation, 1990 (Decatur IL)
Georgia Southern University, Conference on Global Issues, 1990 (Statesboro GA)
Virginia Division of Forestry, 1990 (Wakefield)
West Richmond's Businessmen's Association, 1990
Southeastern Climate Symposium, 1990 (Charleston SC)
American Meteorological Society, 1990 (Washington)
Virginia Council on the Environment/Virginia Education Association, 1990 (Wakefield)
American Meteorological Society, 1990 (Richmond)
Virginia Mathematics and Science Center, 1990 (Richmond)
Missouri Governor's Conference on Natural Resources, 1990 (Columbia MO)
Consumer Alert, National Press Club, 1990 (Washington)*
Virginia Emergency Services Conference on Severe Weather, 1990 (Roanoke)
North Carolina Coal Institute, 1990 (Southern Pines NC)
The Brookings Institution, 1990 (Williamsburg)
Pacific Research Institute, 1990 (San Francisco CA)
Virginia Soil and Water Conservation Association, 1990 (Winchester)
American Association of State Climatologists, 1990 (Atlantic City NJ)
Grand Rounds, Western State Hospital, 1990 (Staunton)
Penn Ag Industries Annual Meeting, 1990 (State College PA)
Kentucky Coal Operators Association, 1990 (Pikeville KY)
Council of Industrial Boilermakers, 1990 (Orlando FL)

Chemical Manufacturers Association, 1990 (Washington)
Maryland Chemical Industry Council, 1990 (Baltimore)
American Water Resources Association, 1990 (Denver)
Hillsdale College, 1990 (Hillsdale MI)
National Coal Association, 1990 (Washington)
Virginia Division of Forestry, 1991 (Luray)
American Meteorological Society, 1991 (Richmond)
Virginia Coal Council, 1991 (Richmond)
Virginia Tech, Corn and Soybean Conference, 1991 (Williamsburg)
Virginia Mosquito Control Association, 1991 (Williamsburg)
National Press Club, 1991 (Washington)*
American Association for the Advancement of Science, 1991 (Washington)
U.S. House of Representatives, Subcommittee on Health and the Environment, 1991
Brookings Institution, 1991 (Williamsburg)
Strategy Europe, 1991 (London, England)
U.S. Senate, Committee on the Environment and Public Works, 1991
U.S. Geological Survey, Annual Global Change Meeting, 1991 (Reston)
Virginia Tech, Horticulture Department Seminar, 1991 (Blacksburg)
Lynchburg College, 1991 (Lynchburg)
U. Of Nevada, Distinguished Civil Engineering Lecture, 1991 (Reno)
Resource Data International, 1991 (Myrtle Beach SC)
Smithsonian Institution, 1991 (Edgewater MD)
Chesapeake Bay Environmental Association, 1991 (Annapolis MD)
U.S. Environmental Protection Agency, 1991 (Washington)
Cato Institute, 1991 (Washington)
Nova Scotia Minister's Task force on Clean Air, 1991 (Halifax, NS)
North Carolina Coal Institute, 1991 (Myrtle Beach SC)
National Rural Electric Cooperative Association, 1991 (Washington DC)
AMAX Energy Corporation, 1991 (French Lick IN)
Virginia, Maryland, Delaware Assn. of Electric Cooperatives,1991 (Hot Springs VA)
Consolidation Coal Corporation,1991 (Hidden Valley PA)
United Nations Intergovernmental Panel on Climate Change, 1991 (Asheville NC)
American Meteorological Society, Comm. on Applied Climatology, 1991 (Salt Lake City UT)
Brookings Institution, 1991 (Williamsburg)
Cincinnati Gas and Electric, 1991 (Lexington KY)
Doctors for Disaster Preparedness, 1991 (Las Vegas NV)
Virginia Mining and Reclamation Association, 1991 (Powell Valley)
Chief Executive Conference on Global Warming, 1991 (Minneapolis)
Southern Minnesota Municipal Power, Annual Meeting, 1991 (Minneapolis)
AMAX Energy Corporation Executive Conference, 1991 (Sheridan WY)
West Virginia Coal Conference, 1991 (Charleston WV)
Virginia State Corporation Commission, 1991 (Williamsburg)
American Meteorological Society,Raleigh, 1991
North Carolina Science Teachers Association, 1991 (Raleigh NC)
Norfolk International Coal Conference, 1991
AMAX Energy Corporation Executive Conference (Indianapolis IN)
National Association of Manufacturers, 1991 (New Orleans)*
Science Museum of Western Virginia, 1991 (Roanoke)
Norfolk Southern Corporation Executive Conference, 1992 (Charleston SC)
University of Arizona, College of Law, 1992 (Tucson)
Chief Operating Executive Conference on Global Warming, 1992 (Phoenix AZ)
National Aerosol Association, 1992 (Naples FL)

United Ski Industries Association, 1992 (1) Mt. Snow VT, 2) Squaw Creek CA)
National Association of Manufacturers, 1992 (Naples FL)*
Dartmouth College, Seminar on Environmental Issues, 1992
North Dakota State University, National Agromarketing Association, 1992 (Fargo)
Massie Coal Corporation, Executive Conference, 1992 (Charleston WV)
American Feed Grain Association Annual Meeting, 1992 (Palm Springs CA)
Blue Ridge Community College Horticulture Seminar, 1992
National Rural Electric Cooperative Association, 1992 (Hilton Head SC)
Indiana Coal Mining Institute, 1992 (Owensboro KY)
Arizona Electric Power Cooperative, 1992 (Tuscon AZ)
U.S. Chamber of Commerce, 1992 (Washington DC)*
Virginia Petroleum Council, 1992 (Richmond)
Society of American Foresters, 1992 (Waynesboro VA)
Eastern Fuel Buyers Association, 1992 (Williamsburg)
U.S. House of Representatives, Subcommittee on the Environment, 1992
American Farm Bureau Annual Meeting, 1992 (Washington)
Economic Club of Detroit 1992*
Illinois Chamber of Commerce, 1992 (Chicago)
Experimental Aircraft Association, 1992 (Staunton VA)
U.S. House of Representatives, Republican Study Group, 1992
Heritage Foundation, 1992 (Washington DC)
American Legislative Exchange Council, 1992 (Harrisburg PA)
Pacific Northwest Grain and Feed Association, 1992 (Spokane WA)
Wyoming Mining Association, 1992 (Jackson WY)
Teachers on the Bay Program, 1992 (Tappahannock VA)
IEEE Nuclear Effects Conference, 1992 (New Orleans)
West Virginia University/Dept. of Energy, 1992 (Morgantown WV)
Norfolk Southern Corporation, 1992 (Norfolk VA)
National Park Service, Seminar on Global Change Research Strategies, 1992, UVa
Virginia Power, 1992 (Richmond)
University of North Dakota, Energy and Environment Research Center, 1992 (Bismarck ND)
Amax Energy Corporation, 1992 (Evansville IN)
Pennsylvania Highway User's Council, 1992 (Harrisburg)
American Electric Power, 1992 (Columbus OH)
Indiana Energy Forum, 1992 (Indianapolis)
Burlington Northern Industries Executive Conference, 1992 (Fort Worth TX)
Association of American Railroads, Legislative Conference, 1992 (Palm Beach FL)
Sand County Foundation, 1992 (Baraboo WI)
Society of Professional Journalists, Section on Environmental Journalism, 1992 (Baltimore)
Edison Electric Institute, 1992 (Washington)
Cato Institute, 1992 (Washington)
Alabama Electric Power Cooperative, 1/93 (Orange Beach AL)
American Policy Center, 2/93 (Washington)
Cato Institute, Annual Benefactors Meeting, 2/93 (Palm Springs CA)
World Coal Conference, 2/93 (New Orleans)
American Public Power Association, 2/93 (Washington DC)
Virginia Tech Bordeaux Seminar 3/93 (Charlottesville)
Washington University 4/93 (St. Louis)
American Mining Congress 4/93 (Pittsburgh)
Maine Conservation Rights Institute 4/93 (Bangor)

American Legislative Exchange Council 4/93 (Orange Beach AL)
Millers National Federation 5/93 (Williamsburg)
James Madison University 5/93
University of North Dakota 5/93 (St. Louis MO)
Cato Institute 5/93 (Washington)
Mid-America Regulatory Conference 6/93 (Austin TX)
European Academy of Ecology 6/93 (Mannheim, Germany)
Summit University, 7/93 (Corwin Springs, MT)
Virginia Forage and Grassland Council, 7/93 (Blacksburg)
American Legislative Exchange Council, 8/93 (Traverse City MI)
Virginia Tech, Department of Geology and Geophysics, 9/93
The Federalist Society, 9/93 (Washington DC)
Undergraduate Seminar, University of Virginia, 9/93
5th Natural Gas Industry Forum, 9/93 (Quebec City)
Minimax Conference, U.S. Dept of Commerce, 9/93 (College Park MD)
University of Delaware, Geography Department, 9/93
National Order of Women Legislators, 10/93 (New York)
Commonwealth of Virginia, Department of Environmental Quality, 10/93 (Richmond)
Virginia Division of Forestry, 10/93 (Charlottesville)
Annual Meeting, Amvest Corporation, 10/93 (Charlottesville)
Virginia Association of Science Teachers, 11/93 (Williamsburg)
Kentucky Mining Institute, 11/93 (Lexington)
Denver Coal Club, 11/93
Annual Meeting, Ashland Oil Corporation, 11/93 (Cincinnati)
American Legislative Exchange Council, National Orientation Seminar, 12/93 (Washington)
Virginia Tech, Department of Crop and Soil Environmental Sciences, 12/93
Virginia Tech, Science and Technology Studies, 12/93
Committee on the Environment, Missouri General Assembly, 1/94 (Jefferson City)
Virginia Feed Association, 1/94 (Williamsburg)
Global Climate Coalition, 1/94 (Washington)
Kansas State Corporation Commission, 2/94 (Topeka)
Indiana Mineral Aggregates Association, 2/94 (Indianapolis)
Virginia Corn and Soybean Association, 2/94 (Williamsburg)
Richmond Astronomical Society, 3/94
Illinois Commerce Commission, 3/94 (Springfield)
Air and Waste Management Association, 4/94 (Phoenix)
Reinhardt College, 4/94 (San Antonio)
American Legislative Exchange Council, 4/94 (San Antonio)
New College, University of Virginia, 4/94
American Feed Industries Association, 5/94 (San Antonio)
National Association of Regulatory Utility Commissioners, 5/94 (Kalispell MT)
Virginia Legislative Tour, 6/94
Virginia Governor's School, 7/94 (Richlands)
Purdue University, Air Conditioning and Refrigeration Institute, 7/94
American Legislative Exchange Council, 8/94 (Tampa)
Eris Society, 8/94 (Aspen)
National Generation and Transmission Managers Association, 8/94 (Kansas City)
Dixy Lee Ray Memorial Symposium, 8/94 (Seattle)
Accuracy in Media, 9/94 (Tyson's Corner)
Southern Minnesota Municipal Power, Annual Meeting, 10/94 (Rochester)
Ciba Foundation, 10/94 (London)

Virginia Soil and Water Conservation Society, 10/94 (Edinburg)
American Water Works Association, Virginia Section, 10/94 (Charlottesville)
U.S. Department of Commerce Interactive Conf. on Global Change, 11/94 (Williamsburg)
Ethics and Public Policy Center, 11/94 (Washington)
American Legislative Exchange Council Task Force on Environment, 12/94 (Washington)
American Legislative Exchange Council Annual Orientation Meeting, 12/94 (Washington)
George Mason University, Center for Market Processes, 12/94 (Alexandria)
Electric Power Research Institute, 12/94 (Menlo Park CA)
American Legislative Exchange Council Task Force on Environment 2/95 (Washington)
Minnesota Legislature, ALEC (2/95)
Jefferson Regional Council on Sustainable Development (2/95)
Virginia Military Institute (2/95)
United States Navy Environmental Health Center 3/95 (Hampton VA)
Campbell University Assembly Seminar (3/95)
American Policy Foundation, 3/95 (Washington DC)
Virginia Mining Association, 4/95 (Norton)
Minnesota Citizens League, 5/95 (Minneapolis)
Woodbury Forest Student Assembly, 5/95 (Orange VA)
Koch Industries, 5/95 (Minneapolis)
American Nuclear Society, 6/95 (Philadelphia)
University of Sydney, Global Change Seminar 7/95 (Sydney, Australia)
The Independent Institute 7/95 (Sydney)
CSIRO General Seminar 7/95 (Melbourne)
Tasman Institute 7/95 (Melbourne)
Western Fuels Association Annual Meeting 7/95 (Baton Rouge)
American Legislative Exchange Council, Annual Meeting 8/95 (San Diego]
National Forum on Global Warming 9/95 (Columbus OH)
Tennessee Association of Manufacturers 10/95, [Nashville]
Institute of Economic Affairs 10/95 [London]
Texas Coal Conference 11/95 [Austin]
Averett College 11/95 [Danville VA]
Colorado School of Mines 11/95 [Golden CO]
Denver Busniessmen's Association 11/95
U.S. House of Representatives, Subcommittee on the Environment 11/95
University of Virginia Environmental Sciences Seminar 11/95
University of Virginia Engineering Honor Society 11/95
Virginia Soil and Water Conservation Association 12/95 [Roanoke]
World Bank 12/95 [Airlie VA]
Dark Ages Weekend 12/95 [Miami FL]
Marshall Institute Science Roundtable 1/96 [Washington]
Western Mining Association 2/96 [Denver]
Wyoming Legislators, ALEC 2/96 [Cheyenne]
U.S. House of Representatives, Committee on Science 3/96
Virginia Institute of Marine Sciences, Institute Seminar 3/96
Environmental Conservation Organization Annual Meeting 3/96 [Kansas City]
North Carolina Coal Institute 3/96 (Lake Lanier GA]
U.S. Naval Academy 4/96
Association of American Geographers, Plenary Address 4/96 [Charlotte]
Edmund Burke Society, U .S. Environmental Protection Agency 4/96 [Washington]

Lynchburg College, Senior Seminar 4/96
Eastern Snow Conference, Keynote Address 5/96
New Zealand Business Roundtable 5/96 [Wellington]
New Zealand Academy of Sciences 5/96 [Wellington]
New Zealand General Ministerial Seminar 5/96 [Wellington]
New Zealand National Institute of Water and Atmospheric Research 5/96 [Auckland]
Auckland University, Department of Geography Seminar [Auckland]
Australian Coal Conference 5/96 (Gold Coast, Queensland]
Australian Department of Foreign Affairs 5/96 (Canberra]
Australian Department of Industry and Primary Energy 5/96 [Canberra]
Public Lecture, Australian Museum of Science 5/96 [Canberra]
Australian Environment Ministry 5/96 [Canberra]
Commonwealth Industrial and Scientific Organization 5/96 [Aspendale, Victoria, Australia]
The Tasman Institute 5/96 [Melbourne]
Institute of Economic Affairs, 6/96 [London]
Cato Institute Policy Forum 6/96 (Washington)
Governor's School for Science and Mathematics 8/96 [Lynchburg]
Minnesota Environment and Labor Coalition 8/96 [Mille Lacs, MN]
Keynote Speaker, Virginia Air Board Annual Meeting 10/96 [Virginia Beach]
Society of Environmental Journalists Annual Meeting 10/96 [St. Louis]
Southern Legislative Conference 11/96 [Lewisburg WV]
Danville Tuesday Club 11/96
U.S. Naval Academy 11/96 [Annapolis]
University of Virginia Retired Faculty Association (1/97)
Department of Environmental Sciences Undergraduate Seminar (1/97)
Tuckahoe Women's Club 1/97 (Richmond)
American Meteorological Society 2/97 (Long Beach)
Virginia Gypsy Moth Association 2/97 (Luray)
U.S. Naval Academy 3/97 (Annapolis)
Colgate Darden School, University of Virginia, Ruffin Lectures 4/97
Employers Reinsurance Conference on Extreme Events, 4/97 (Miami)
Eastern Fuel Buyers Association, 5/97 (Williamsburg)
phex Society, Lynchburg, 5/97
Extreme Events Workshop, National Climatic Data Center, 6/97 (Asheville)
Foreign Relations Committee, U .S. Senate, 6/97
People for the West, 6/97 (Spokane)
Energy Daily Environment Conference, 6/97 (Washington DC)
Competitive Enterprise Institute Kyoto Conference, 6/97 (Washington DC)
Cato Institute, Benefactors Summit, 7/97 (Fort Garland CO)
overnor's Science School, Lynchburg College, 7/97
Monash University, 8/97 (Canberra)
Western Australia Chamber of Commerce and Industry, 8/97 (Perth)
Cato Institute, 9/97 (Dallas)
Washington Explorer's Club, 9/97
Virginia Division of Forestry, 9/97 (Douthat)
Burlington Northern Santa Fe Headquarters, 10/97 (Fort Worth TX)
Koch Industries Headquarters, 10/97 (Wichita KS)
Koch Industries, 10/97 (Houston TX)
U.S. Naval Academy, 11/97
Basin Electric, Annual Meeting, 11/97
Virginia Coal Council, 11/97
Virginia Senate Committee on Energy, 11/97
Duke University School of the Environment School Seminar, 11/97
National Energy Education Program, 1/98 [Washington DC]
George Mason University, Seniors Program, 2/98

Virginia Tech, Annual Corn and Soybean Conference, 2/98 (Williamsburg]
International Insect Disease Vector Conference, 2/98 [Williamsburg]
Corning Corporation, 3/98 [Corning, NY]
American Feed Industry Assoication, 3/98 [Las Vegas]
North Carolina Hurricane Conference, 3/98 [Morehead City]
University of Delaware, Geography Department Seminar, 3/98
North Carolina Coal Instutute, 4/98 [Greenville SC]
Charlottesville Woman's Club, 4/98
The Philadelphia Society, 4/98 (Chicago]
Lynchburg College Senior Seminar, 4/98
National Regulatory Conference, 5/98 [Williamsburg]
Charlottesville Rotary, 5/98
Amherst Rotary, 5/98
Applied Insurance Research, Inc, 5/98 [Colorado Springs]
Annual Meeting, Society for Scientific Exploration, 5/98 [Charlottesville]
Committee on Small Business, U.S. House of Representatives, 7/98
Governor's School for Mathematics and Science, Lynchburg College, 7/98
American Association of State Climatologists, 8/98 [Duluth MN]
Committee on Economic and Environmental Development, 9/98 [Abingdon VA]
Energy Daily Annual Conference, 9/98 [Washington DC]
Association of Urban Foresters, 9/98 [Charlottesville]
Bucknell University, Deparatment of Geology, 10/98
Fundacion Republica, 10/98 [Buenos Aires]
Universidad de Della, 10/98 [Buenos Aires]
Air and Waste Management Association, 10/98 [Arlington VA]
Southern Coal Conference, 10/98 [Cincinnati]
Virginia Assn. General Contractors, 10/98 [Charlottesville]
Basin Electric, Annual Shareholders Meeting, 11/98 [Bismarck ND]
Annual Meeting, National Communication Association, 11/98
Virginia Farm Bureau, Annual Meeting, 11/98 [Roanoke]
Tennessee Feed and Grain Association, 12/98 [Memphis TN]
Lynchburg College, Senior Seminar, 12/98
Winter Weather Conference, National Weather Service 12/98 [Wakefield]
Hope College Senior Tour, 1/99 [Washington]
Charlottesville Retired Professional Association, 1/99
Virginia Crop Production Association, 1/99 [Williamsburg]
Congressional Forum on Global Change, Pennsylvania State University, 1/99
Competitive Enterprise Institute, 2/99 [Washington DC]
Virginia Agcirultural Extension Service, 2/99 [Harrisonburg]
U.S. Department of Defense, National Security Study Group, 2/99 [Arlington VA]
Hampden-Sydney College, Presidential Debate Series, 2/99
North American Millers Association, 3/99 [Sanibel FL]
Blue Ridge Community College, 3/99
Virginia Severe Weather Conference, 3/99 [Williamsburg]
Maine Conservation Association, 3/99 [Bangor]
Randolph-Macon College, Environment Day Seminar, 4/99
Louisiana State University, President's Distinguished Lecture Series, 4/99
National Center for Policy Analysis, 5/99 [Washington DC]
Leaf Tobacco Association, 6/99 [Greenbrier WV]
Bright Belt Leaf Association, 6/99 [Hilton Head SC]
Wyoming Mining Association, 6/99 [Casper]
Virginia Tech, Piedmont Research Station Field Day, 8/99 [Orange]
Dixy Lee Ray Memorial Symposium, 8/99 [Washington DC]
Society of Environmental Journalists, 9/99 [Los Angeles]
Arthur Laffer Associates, 9/99 [Washington DC]
Southern Minnesota Municipal Power Association, 9/99 [Rochester]

U.S. House of Representatives, Committee on Government Oversight, 10/99
American Road and Transportation Builders Association, 10/99 [Roanoke]
North American Millers Association, 10/99 [Amelia Island FL]
Geological Society of America, 10/99 [Denver]
Cooler Heads Coalition, 11/99 [Washington DC]
International Society for Biometeorology, 11/99 [Sydney; Presented by R. Davis]
University Seminar, Mary Baldwin College, 12/99
Winter Weather Conference, 12/99 [Wakefield]
Virgnia Foundation for Public Policy, 1/00 [Richmond]
Retired Officer's Association, 1/00 [Charlottesville]
Navy Environmental Health Center, 2/00 [Norfolk]
Westvaco Corporation, 2/00 [Covington VA]
Tennessee Road Builders Association, 2/00 [Palm Beach FL]
University of Texas, Lyndon Johnson Institute. 3/00 [Austin]
American Rose Society, 3/00 [Staunton VA]
Virginia Association of Economists, 3/00 [Roanoke]
Virginia Emergency Management Conference, 3/00 [Williamsburg]
Applied Insurance Research, 4/00 [Tucson]
University of Washington, Dept. of Atmospheric Science, 4/00 [Seattle]
American Meteorological Society, 5/00 [Asheville NC]
North Carolina Coal Institute. 7/00 [Myrtle Beach SC]
Western Fuels Association Annual Meeting, 7/00 [Vail CO]
Arkansas Electric Cooperative Association, 7/00 [Eureka Springs AR]
Virginia Department of Fish and Game, 8/00 [Radford]
Rice University, James K. Baker Institute, 9/00 [Houston TX]
ENO Trasnportation Forum, 9/00 [Washington DC]
Cato Institute City Seminar, 9/00 [Houston TX]
University of Virginia Envi. Sci. Undergraduate Seminar, 10/00
Pocahontas Coal Association, 10/00 [Bluefield WV]
Milliken University Distinguished Lecture, 11/00 [Decatur IL]
Virginia Soil and Water Conservation Association, 11/00 [Warrenton]
Virginia Tech Turfgrass Mangement Conference 11/00[Virginia Beach]
University of Rochester, Department of Physics Seminar, 1/01
Environmental Science Organization, University of Virginia 2/01
Cato Institute, Benefactors Summit, 2/01 [Cancun]
The Washington Club, Washington DC, 3/01
College of William and Mary, Senior Seminar, 3/01 [Williamsburg]
Patrick Henry Supper Club, 5/01 [Richmond]
American Society of Mechanical Engineers, 6/01 [New Orleans]
John Locke Society, 7/01 [Raleigh]
American Association of State Climatologists, 8/01 [Omaha]
American Meteorological Society, 8/01 [Halifax NS]
Lynchburg College, 10/01
North Carolina State University, Anniversary Symposium, 10/01 [Raleigh]
Maryland Association of Republican Women, 10/01 [Columbia MD]
Frontiers of Freedom Foundation, 11/01 [Washington DC]
Air and Waste Management Association Annual Meeting 11/01 [Richmond]
Pennsylvania State University Hazleton, 1/02
Pennsylvania State University, Schuylkill, 1/02
Virginia Tech, Forage and Grassland Council 2/02 [Raphine VA]
Wyoming Legislature [Cheyenne] 2/02
Colorado Mining Association [Denver] 2/02
Sweet Briar College 3/02
Georgia Legislature [Atlanta] 3/02
University of Toledo, College of Law 3/02
Pennsylvania Legislature [Harrisburg] 3/02

Virginia Military Institute Environment Conference 4/02
American Legislative Exchange Council Environment Summit [Las Vegas] 4/02
Annual Drought Conference, National Climatic Data Center [Asheville] 4/02
American Meteorological Society [Portland OR] 4/02
Virginia Tech Small Grains Conference [Warsaw VA] 5/02
National League of Cities [Miami FL] 5/02
ALEC Illinois Legislative Briefing [Chicago] 5/02
California Legislature [Sacramento] 7/02
Cato Congressional Forum [Washington] 7/02
U.S. House of Representatives, Sbcmte. on Oversight and Invest. 7/02
UVa Department of Envi. Sci. Undergraduate Seminar 9/02
DePaul University, Conference on 21st Century Challenges [Chicago] 9/02
Cato Institute Club 200 Summit [Carmel CA] 9/02
American Society of Civil Engineering [Charlottesville] 10/02
U.S. Environmental Protection Agency Public Outreach 10/02
National Press Club, Canada [Ottawa] 11/02
Climate Change Science Program, Planning Meeting [Washington] 12/02
Debates Canada [Ottawa] 12/02
American Legislative Exchange Council [Denver] 1/03
Southeastern Regional Climatologist Conference [Tallahassee] 1/03
Virginia Tech, Virginia Forage and Grassland Council [Dublin VA] 2/03
Maine Legislature [Augusta ME] 3/03
Montana Legislature [Helena MT] 3/03
Virginia Community College Science Teachers Association [Roanoke] 4/03
George Mason University, Department of Envi. Sci. and Policy 4/03
American Legislative Exchange Council Annual Energy Summit [Miami] 4/03
Atmospheric Science Seminar, University of Virginia 5/03
Millersville University (PA) 5/03
U.S. House of Representatives, Capitol Hill Briefing 7/03
American Legislative Exchange Council, Annual Meeting [Washington] 7/03
American Association of State Climatologists [Portland OR] 8/03
Virginia Christmas Tree Growers Association [Natural Bridge] 8/03
Michigan Attorney General Staff [Lansing] 9/03
University of Virginia College Republicans 9/03
American Legislative Exchange Council [Boston] 9/03
Virginia Tech, Commonwealth Governor’s School [Orange] 10/03
Virginia Tech, Department of Forestry Seminar 11/03
German Academy of Engineering [Koln] 11/03
Ball State University, Geography Week Keynote [11/03
Virginia Coastal Commission [Williamsburg] 12/03
Cato Institute [Washington DC] 12/03
American Legislative Exchange Council [San Francisco] 1/04
University of Virginia School of Engineering and Applied Science 1/04
Shenandoah Valley Regional Governor’s School 2/04
Connecticut Legislature [Hartford] 2/04
Virginia State Feed Association [Charlottesville] 2/04
Connecticut Legislature [Hartford] 3/04
Staff Briefing, U.S. House of Representatives 3/04
Randolph-Macon University [Ashland VA] 4/04
Competitive Enterprise Institute [Washington DC] 6/04
American Association of State Climatologists [Ithaca NY] 8/04
Eris Society [Aspen CO] 8/04
Virginia Manufacturers Association [Richmond] 12/04
Cato Institute Book Forum [Washington DC] 12/04
Virginia Corn Growers Association [New Kent VA] 1/05
Virginia Dairymen’s Association [Staunton] 1/05
Duquesne University School of Law [Pittsburgh] 1/05

American Legislative Exchange Council [Seattle] 2/05
Western Reforestation Association [Coeur d' Alene ID] 2/05
Cato Institute Club 200 [Grand Cayman] 2/05
United Nations Association [Washington DC] 3/05
James Madison University [Harrisonburg VA] 3/05
National Generation and Transmission Managers [Pinehurst NC] 4/05
Fundacion Rafael de Pino [Madrid] 5/05
Oxford Union Debating Society [Oxford] 5/05
HBSC Bank Leadership Forum [London] 6/05
Virginia Forest Products Association [Hot Springs VA] 7/05
Virginia Maryland Delaware Electric Cooperative Association [Norfolk] 7/05
Tennessee Farm Bureau [Nashville] 8/05
HSBC Bank Leadership Forum [London] 9/05
Salisbury University, Distinguished Speaker Series [Salisbury MD] 10/05
Bridgewater College, Distinguished Speaker Series 10/05
Washington and Lee University, School of Law 10/05
Virginia Governor's School for Arts and Sciences [Staunton] 11/05
Western Business Roundtable [Carefree AZ] 11/05
Virginia Tech, Program in Natural Resources [Alexandria VA] 2/06
American University, Issues Forum [Washington] 2/06
Marshall Institute Briefing, House of Representatives 2/06
Piedmont Master Gardeners [Charlottesville] 3/06
University of North Carolina College Republicans [Chapel Hill] 3/06
North Carolina Climate Commission [Raleigh] 3/06
John Locke Foundation [Raleigh] 3/06
HSBC Bank Leadership Forum [London] 4/06
JLT Insurance Institute [Lugano, Switzerland] 5/06
Virginia Academy of Sciences Negus Lecture 5/06
Albemarle County Farm Bureau 8/06
Bavarian-American Exchange Program [Washington] 8/06
Virginia Manufacturers Association [Richmond] 9/06
Heritage Foundation [Washington 9/06]
Cato Institute, Club 200 Seminar [Greenbrier WV] 9/06
Heritage Foundation [Washington] 10/06
Oberlin College General Lecture Series [Oberlin OH] 10/06
Richmond Rotary 10/06
North Carolina Forestry Association [Southern Pines NC] 10/06
University of Georgia, Geography Department Seminar [Athens GA] 11/06
Western Business Roundtable [Beaver Creek CO] 11/06
Chesapeake Bay Foundation [Edgewater MD] 12/06
Virginia Crop Production Association [Richmond] 1/07
World Affairs Council [Richmond] 2/07
James Madison University Washington Semester [Washington] 2/07
Minnesota Property Rights Coalition [Minneapolis] 3/07
Heartland Institute Legislative Summit [Chicago] 3/07
Ferrum College Evening Lecture Series [Ferrum VA] 3/07
U.S Department of State Brazil Exchange [Washington] 4/07
Capitol Hill Briefing, Cato Institute 4/07
Leadership Program of the Rockies [Parker CO] 4/07
Committee for a Constructive Tomorrow [Madison WI] 4/07
Texas Alliance of Energy Producers [Wichita Falls] 4/07
Indiana Coal Association [Evansville] 5/07
North Carolina Electric Utility Association [Pinehurst] 5/07
Energy and Transportation Study Group [Detroit] 7/07
American Association of State Climatologists [Coeur d'Alene ID] 7/07
Heartland Institute Legislative Summit [Providence RI] 8/07
Georgia Legislature Environment Committee 8/07

Florida Women's Republicans [Orlando] 8/07
Georgia Tech, Dept Earth and Atmospheric Sciences 9/07
American Academy of Environmental Engineers [Hampton VA] 9/07
US Deparatment of Agriculture Graduate School 9/07
East Texas Baptist University-wide seminar [Marshall] 10/07
California State University-Fullerton University Seminar 10/07
National Association of Homebuilders [San Juan PR] 10/07
Hanover College Capstone Series [Hanover IN] 11/07
State Policy Network [Washington] 12/07
International Regulatory Conference [Berlin] 12/07
Leadership Program of the Rockies [Colorado Springs] 2/08
Capitol Hill Briefing, U.S. House of Representatives 2/08
Heartland Conference on Climate Change [New York] 3/08
Canadian Oil Drilling Contractors [Calgary AL] 3/08
International Arctic Mining Symposium [Fairbanks] 3/08
University of Alaska, Geophysical Institute 3/08
IBMEC Sao Paulo [Brasil] 3/08
Friends of Science [Calgary AL] 5/08
Colorado College Washington Seminar 5/08
Hampden Sydney Alumni College 6/08
Hudson Institute 9/08
American Association of Petroleum Geologists 10/08 [Pittsburgh]
Fundacion Rafael del Pino [Madrid] 10/08
Ethical Council, Sweeden [Washington DC] 11/08
Capitol Hill Briefing, U.S. House of Representatives 1/09
University of Michigan, Sponsored Speaker [Ann Arbor] 2/09
U.S. House of Representatives, Subcommittee on Oversight and Investigations 2/09
Dartmouth College, Sponsored Speaker 2/09
Maryland House of Delegates, Republican Caucus 2/09
U.S. Chamber of Commerce, Dinner Commentator [Washington] 2/09
Eaton Vance Corporation, Global Warming Briefing [Washington] 2/09
Sarasota Institute of Lifelong Learning 3/09
Cato Institute, Benefactors Summit, [Playa del Carmen, Mex] 3/09
Heartland Conference on Climate Change [New York] 3/09
Book Forum, "Climate of Extremes", Cato Institute 3/09
Independence Institute [Golden CO] 3/09
Oregon House of Representatives, Republican Caucus [Salem OR] 3/09
Cascade Policy Institute [Portland OR] 3/09

*Top Ten Speaking Platforms in the U.S. (According to Fortune 250 CEOs)

THE VIRGINIA CLIMATE ADVISORY

The Advisory is a quarterly publication of the State Climatology Office, targeted for Education, Governmental Agencies, and the educated layman. Current circulation is approximately 4,000.In 1993, the Advisory was selected by the American Library Association as one of the 60 "best government information sources" in the world.

1980. 4 (1) Degree-days and energy usage in Virginia. 27pp.
l980. 4 (2) Modelling soybean/climate relationships. 24pp.
l980. 4 (3) History of tropical cyclones in Virginia. 33pp.
l981. 4 (4) History of drought in Virginia. 27pp.

1981. 5 (1) Satellite climatology. 26pp.
1981. 5 (2) Acid rainfall in Virginia. 26pp.
1981. 5 (3) Winter severity over Virginia. 26pp.
1982. 5 (4) Coastal cyclogenesis. 26pp.

1982. 6 (1) History of tornadoes in Virginia. 26pp.
l982. 6 (2) Lightning and damaging thunderstorms in Virginia. 26pp.
l982. 6 (3) Thunderstorm patterns over Virginia. 26pp.

l983. 6 (4) Virginia wind patterns. 26pp.

l983. 7 (1) Virginia fog frequency and distribution. 26pp.
l983. 7 (2) Origin and distribution of summertime haze over Virginia. 26pp.
l983. 7 (3) Mountain temperature regimes. 26pp.
l984. 7 (4) The Carbon Dioxide controversy. 26pp.

1984. 8 (1) Precipitation and Elevation. 30pp.
1984. 8 (2) Improvements for Virginia Thunderstorm Forecasts. 30pp.
1984. 8 (3) Vineyard Microclimate. 30pp.
l985. 8 (4) Objective Improvement of Local Temperature Forecasts. 30pp.

1985. 9 (1) Radar Climatology of Piedmont Thunderstorms. 30pp.
1985. 9 (2) Cumulus Clusters. 30pp.
1985. 9 (3) Hurricane Gloria. 30pp.
1986. 9 (4) Winter History since 1890. 30pp.

1986. 10 (1) Climate and High-Level Nuclear Waste Disposal. 30pp.
1986. 10 (2) Carbon Dioxide/Climate Revisited. 30pp.
1986. 10 (3) Virginia Acid Rain Research. 30pp.
1987. 10 (4) Hurricanes, Drought, and Va Agriculture. 30pp.

1987. 11 (4) The Ozone Hole and Nuclear Winter. 30pp.
1987. 11 (2) Virginia Evaporation Regimes. 30pp.
1987. 11 (3) Virginia Snow Phobia. 30pp.
1988. 11 (4) Updated Climatic History. 30pp.

1988. 12 (1) Historical Floods. 30pp.
1988. 12 (2) Acid Precipitation Trajectories. 30pp.
1988 12 (3) Eastern Shore Hurricane History. 30pp.
1989 12 (4) Eastern Shore Northeaster History. 30pp.

1989 13 (1) Testimony on Greenhouse Effect. 30pp.

1989 13 (2) Hurricane Camille. 30pp.
1989 13 (3) Hurricane Hugo. 30pp.

1990 14 (2) Scales of Temperature Variation. 30pp.
1990 14 (3) Climate of Saudi Arabia. 30pp.
1990 14 (4) Sleet and Freezing Rain in Virginia. 30pp.

1991 15 (1) Virginia Growing Season Trends. 30pp.
1991 15 (2) Heat Stress. 30pp.
1991 15 (3) Autumn Color Change. 30pp.
1992 15 (4) 15 Years of the Advisory . 30pp.

1992 16 (1) Northeasters. 30pp.
1992 16 (2) Ligthtning. 30pp.
1992 16 (3) Hurricane Andrew. 30pp.
1993 16 (4) Annual Temperature Regimes. 30pp.

1993 17 (1) Blizzard of 1993. 30pp.
1993 17 (2) Tree Mortality. 30pp.
1993 17 (3) Cyclones and Climate Change. 30pp.
1993 17 (4) Regional Visibility. 30pp.

1994 18 (1) Rainfall Recurrence Intervals. 30pp.
1994 18 (2) United Nations Climate Treaties. 30pp.
1994 18 (3) Anticyclonic History. 30pp.

1995 19 (1) Improving Ice Storm Forecasts. 30pp.
1995 19 (2) Hot Weather Mortality. 30pp.
1995 19 (3) Internet Weather. 30pp.
1996 19 (4) Forecast Model on Internet. 30pp.

1996 20 (1) Winter of 1996. 30pp.
1996 20 (2) Annual Rainfall Climatology. 30pp.
1996 20 (3) Annual Snowfall Climatology. 30pp.
1997 20 (4) Extreme Temperatures in Virginia. 30pp.

1997 21 (1) Extratropical Cyclones. 30pp.
1997 21 (2) Regional Rainfall Extremes. 30pp.
1997 21 (3) Lack of El Nino influence in Virginia. 30pp.
1998 21 (4)

1998 22 (1)
1998 22 (2)
1998 22 (3)
1999 22 (4) Snowfall and Winter History. 30pp.

1999 23 (1) Indications of Climate Change. 30pp.
1999 23 (2) 1999 Drought in Perspective
1999 Virginia Climate Advisory Online, beginning December, 1999.

2000 Online:
Weather vs. Infrastructural Droughts
Virginia Climate: 1999 in Perspective
Book Review: The Global Stupidstorm
The Current Wisdom (Recent research in climate science)
Cherry Blossoms in DC
Growing Climate Concern

Just the Facts Please (Spring weather history)
A Closer Look at Visibility
A Careful Look at the New National Assessment
Not-so-hot
Wet, Cool Weather Doesn't Bug Asian Tiger Mosquito
Record Cold Comparison
October Sets All-Time Record Low for Precipitation
Cold Turkey (Cold Thanksgiving History)
Luke-Cold Leftover Turkey (2000 in Perspective)
Dreaming of a White Christmas?
Inaugural Weather

2001 Online
Too Cool for Words (Historical Perspective on Winter Cold)
Energy Usage vs. Cold Winters
Drought Task Force Makes Rain
Doppler Radar and Local Moisture Monitoring
National Academy Report on Global Warming
The Current Wisdom
Urbanization vs. True Warming in Virginia Records
Long Range Forecast Models
Precipitation and Water Shortages in Perspective

2002 Online
(Virginia Drought Emergency in 2002 shifted Advisories to Drought Updates)
1932: The Year Without a Winter
Drought Report from the State Climatology Office: 3/12, 4/10, 5/1
Summer of 1930: Harbinger of 2002?
Drought Report from the State Climatology Office
6/3, 7/2, 8/16, 8/19, 9/23, 10/22, 11/21.

2003 Online
Snowfall Records
New Plant Hardiness Zones
Twenty Days and Twenty Nights—excessive rain days
In a Rainy Daze?
Isabel and Virginia’s Vegetation Problem
Record Annual Virginia Rainfall

VIDEO CLIMATE ADVISORY

In January, 2003, the State Climatology Office switched largely to video Advisories, broadcast statewide on Public Television, Local Access, and Commerical broadcast (the last as PSA’s). Spots vary between 1.5 and 2.5 minutes. Advisories are produced by the Virginia Farm Bureau.

2003:
Sleet and Freezing Rain in the Mid Atlantic (Jan)
El Nino/La Nina (Feb)
Transitional Season Weather (Mar)
Tornadoes in Virginia (Apr)
Moisture and Temperature (May)
Hurricane Season Forecasts (Jun)
Dew Point Temperatures (Jul)
Wet Start to 2003 (Aug)
History of Excessive Virginia Precipitation (Sep)
Jet Stream and Precipitation (Oct)

Isabel Damage (Nov)
White Christmas Probability (Dec)

2004:
The Farmer's Almanac (Jan)
Precipitation Records in 2003 (Feb)
Virginia Temperature Histories (Mar)
Virginia Crop Yields (Apr)
Virginia Precipitation Histories (May)
Trends in Extreme Temperatures (Jun)
Hurricane Season Outlook (Jul)
Home Weather Instrumentation (Aug)
Summer Temperature Departures (Sep)
Summer Precipitation (Oct)
Perceived Winter Cold (Nov)
Record-Breaking Hurricane Season (Dec)

2005:
Heating Degree Days (Jan)
Snowfall and North Atlantic Oscillation (Feb)
Late Season Snows (Mar)
Late Spring Frost (Apr)
Spring Moisture Status (May)

THE SOUTHEASTERN CLIMATE REVIEW

The Southeastern Climate Review is a technical and public service publication of the Southeast Regional Climate Center. Circulation is approximately 4,500.

1989 1 (1) Background on Climatic Change. 30pp.
1989 1 (2) Hurricane Camille. 30pp.
1989 1 (3) Hurricane Hugo. 30pp.
1989 1 (4) Severe Cold Outbreaks. 30pp.

1990 2 (1) Drought Preparedness. 30pp.
1990 2 (2) 1990 Atlantic Hurricane Recap. 30pp.
1990 2 (3) El Nino and Florida Wildfires. 30pp.
1991 2 (4) Southeastern Growing Seasons. 30pp.

1992 3 (1) Heavy Rainfall Events. 30pp.
1992 3 (2) Climate Change and Fishery Harvest. 30pp.

WORLD CLIMATE REVIEW

A quarterly national publication with a circulation of 15,000 reviewing current science and policy trends relating to Global Climatic Change. Publication began in Fall, 1992, and terminated in Spring, 1995. Each issue averaged 26 pages.

GOVERNMENT ADVISORY SERVICE

Governor's Inquiry--l980 drought
Governor's Inquiry--l981 drought
Virginia Farm Bureau--l983 drought
Virginia Department of Agriculture and Consumer
Services--Avian Influenza, l983-4
Virginia Air Pollution Control Board--Acid Precipitation, l984-1987
Governor's Task Force the Disposal of High-Level Nuclear Waste, l986.
Governor's Task Force on Drought, l986-present
Virginia Office of Economic Development, l986-present
Virginia Film Office, l986-present
Virginia Division of Forestry, l982-1987
Virginia Water Resources Research Center, 1986
U.S. Environmental Protection Agency Global Change Initiative, l987
U.S. Geological Survey, l988, 1991
United Nations, Intergovernmental Panel on Climate Change
(Reviewer, 1990; Contributor and Reviewer, 1992; Contributor, 1995
pdate)
Governor's Representative, Southern Appalachian Mountains Initiative
Virginia Cooperative Extension Service
Virginia Institute of Marine Science
Virginia State Police
Virginia Department of Mines, Minerals and Energy
Virginia State Viticulturalist
Virginia Department of Transportation
Virginia Division of Emergency Services
Virginia Department of Health
Virginia Medical Examiner's Office
Virginia Museum of Natural History
Governor's Cabinet
Virginia Department of Commerce and Resources
Virginia Disaster Assistance Program
Various Commonwealth's Attorney Offices
Virginia Department of Game and Inland Fisheries
James Madison University
Henrico County Police Department
Chesterfield County Police Department
Richmond Police
Cities of Charlottesville and Newport News
For Further listings, see Annual Reports on file at University of Virginia

FINANCIAL SUPPORT (OVER $10,000)

1980-Present. Research Faculty and Staff Support, State Climatology Office. $2,500,000 (est). Current biennial (Active) portion: $170,000 [Active]
1981-l985. United States Department of Agriculture, Forest Service. Prediction models for Southern Pine Beetle Outbreaks. $133,000.
l981-l982. United States Department of Agriculture, Economics Research Service. Statistical-Dynamic Models for Virginia Corn and Soybean Yields. $25,000.
l982-1984. United States Department of Commerce, National Oceanic and Atmospheric Administration, Sea Grant Program. High Resolution Weather Forecasts for Chesapeake Bay and Estuarine Virginia. $84,000.
l983-l985. National Aeronautic and Space Administration. Sea Breeze-Induced Mesoscale Systems and Severe Weather. $26,000.

1985-1986. United States Department of Agriculture, Forest Service. Historical fluctuations of Gypsy Moth Populations and Climate. $18,000.
1986-1987. National Oceanic and Atmospheric Administration. Objective Characterization of the Relationship between Seasonal Wind Regimes and the Recruitment of Croaker and Flounder. $41,000
1986-1988. Commonwealth of Virginia, State Air Pollution Control Board. Origin and Destination of Pollutant-bearing Airstreams Entering and Exiting the Commonwealth of Virginia. $140,000.
1989-1990. Jet Stream Alterations Induced by Anthropogenerated Sulfur Emissions. Cyprus Minerals Company. $40,000.
1989-1993 U.S. Department of Commerce/Southeastern Regional Climate Center. Research Publication for the Southeastern Climate Center. $135 ,000.
1991-1992. Anonymous. Research Support for Climatic Change. $50,000.
1992-1995. Edison Electric Institute. Literature Review of Climatic Change and Updates. $25,000
1992-1993. Western Fuels Association. Research on Global Climatic Change. $63,000
1994-96. Gesamtverband des Deutschen Stenkohlenbergbaus, Fed. Rep. of Germany, $98,000
1995-2000. Commonwealth of Virginia, Department of Environmental Quality. Research on science and policy on global warming. $195,000
1996-1999. U.S. Department of Commerce. Cold Air Volume and Persistence in the Mid-Atlantic Region. $90,000.
1996-1998. U.S. Department of Energy. Greenhouse Influences on Diurnal Warming and Cooling Rates. $100,000
1998-2000. Virginia State Air Pollution Control Board. Development of Operational Ozone Forecasts for the Commonwealth of Virginia. %35,986.
1998-2000. Cato Institute. Support for writing of The Satanic Gases. $78,000
2001-2003. Virginia Department of Environmental Quality. Atmospheric Transport and Concentrations of Mercury in Virginia Fish Samples. $75,400
2003-2005. High Resolution Drought Impact Monitoring. Virginia Department of Environmental Quality $99,471
2004-2005. Integrated Climatic Database for Shenandoah National Park. $40,826
2006-2007. Air Quality Climatology for Shenandoah National Park. NOAA SHENAIR Program, Subcontract from James Madison University $100,505

ATTACHMENT C

http://www.globalwarming.org/2009/09/24/no-data-no-science/

No data, no science

by Marlo Lewis, PhD.

September 24, 2009 @ 1:35 pm

In "The Dog Ate Global Warming," published yesterday in *National Review Online*, Cato Institute scholar and climatologist Patrick J. Michaels delivers a body blow to the "science is settled" dogma.

There are three core issues in climate change science: ***detection*** (Is it warming, and if so by how much); ***attribution*** (What's causing the warming we observe?); and, ***sensitivity*** (How much warming will a given increase in greenhouse gas concentrations produce?). As I argue in a previous post, all of these issues remain unsettled, and more so today than at any time in the past decade.

Although climate sensitivity is the most important issue (because if climate sensitivity is low, then there is no "planetary emergency," hence no need for "urgent action"), detection is in a sense primary, because without reliable temperature data it is impossible to resolve the other two issues.

The claim that the latter half of the 20th century was warmer than any comparable period during the past 1300 is largely based on surface temperature records subject to several well-known warming biases. Urbanization generates artificial "heat islands." Agriculture and irrigation in places like California's Central Valley also produce local warming effects. Retired meteorologist Anthony Watts has documented that nearly nine out of every 10 U.S. weather stations fail to meet the U.S. Weather Service's minimum requirement that temperature sensing equipment be placed at least 30 meters (about 100 feet) away from artificial heat sources such as air conditioner exhaust vents, waste water treatment plants, and parking lot pavements.

Michaels now exposes the shocking fact that the data allegedly underpinning the most influential surface temperature record are missing and apparently have been destroyed. The record is known as Jones-Wigley for its authors, Phil Jones of the University of East Anglia Climate Research Unit (CRU) and Tom Wigley of the National Center for Atmospheric Research (NCAR). The IPCC relied exclusively on this record until its 2001 report.

For years, Jones and Wigley declined to share the raw data from which they constructed their record. Recently, however, Jones told University of Colorado Professor Roger Pielke, Jr. that they could not share their data with him, because the data no longer exist:

Data storage availability in the 1980s meant that we were not able to keep multiple sources for some sites, only the station series after adjustment for homogeneity issues. We, therefore, do not hold the original raw data but only the value-added (quality-controlled and homogenized) data.

Michaels says the “data storage availability” excuse is “balderdash,” since “All the original data could easily fit on the 9-inch tape drives common in the mid-1980s.”

The bigger point, of course, is that if other scientists cannot examine the raw data, they cannot assess the accuracy and objectivity of the “value-adding” adjustments Jones and Wigley made to produce their global temperature record.

In addition to providing another reason to reject the “science is settled” dogma, disappearance of the Jones-Wigley data is of direct relevance to EPA’s pending endangerment finding. The Jones-Wigley temperature record is part of the evidence on which EPA bases its judgment that “air pollution” from greenhouse gas emissions “endangers public health and welfare.”

Use of the Jones-Wigley temperature record in a rulemaking clearly flouts federal data quality standards. Under OMB guidelines implementing the Federal Data Quality Act, data quality consists of four elements: objectivity, utility to users, integrity of information, and reproducibility in the case of “influential scientific or statistical information.”

Now, if the original Jones-Wigely data have been destroyed, then it is impossible to assure “integrity of information.” For all we know, Jones and Wigley goofed in their calculations or choice of methodologies, or even manipulated the data to produce a pre-determined result. By the same token, it is impossible to “reproduce” the Jones-Wigley temperature record, because there are no data to reproduce it from. Yet, as a factual basis of both the IPCC reports and the EPA endangerment finding, Jones-Wigley indisputably qualifies as “influential scientific or statistical information.”

Michaels’s terse conclusion speaks volumes: “No data, no science.” For decades, Jones-Wigley has been a mainstay of the alleged ”scientific consensus” supporting Kyoto-style energy rationing. Warmists have a lot of explaining to do.