

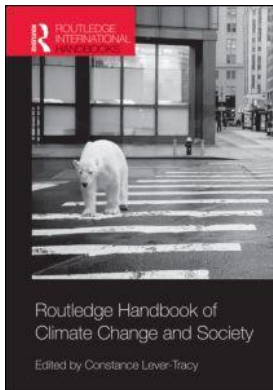
This article was downloaded by: 10.3.98.104

On: 25 Sep 2021

Access details: *subscription number*

Publisher: *Routledge*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: 5 Howick Place, London SW1P 1WG, UK



Routledge Handbook of Climate Change and Society

Constance Lever-Tracy

Climate change denial

Publication details

<https://www.routledgehandbooks.com/doi/10.4324/9780203876213.ch14>

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Published online on: 02 Jul 2010

How to cite :- Riley E. Dunlap, Aaron M. McCright. 02 Jul 2010, *Climate change denial from:* Routledge Handbook of Climate Change and Society Routledge

Accessed on: 25 Sep 2021

<https://www.routledgehandbooks.com/doi/10.4324/9780203876213.ch14>

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ROUTLEDGE
INTERNATIONAL
HANDBOOKS



Routledge Handbook of Climate Change and Society

Edited by Constance Lever-Tracy

First published 2010
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

Simultaneously published in the USA and Canada
by Routledge
270 Madison Avenue, New York, NY 10016
Routledge is an imprint of the Taylor & Francis Group, an informa business

This edition published in the Taylor & Francis e-Library, 2010.

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publishers.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data

Routledge handbook of climate change and society / edited by Constance Lever-Tracy.

p. cm.

1. Climatic changes. 2. Global warming. 3. Climatic changes--Social aspects. 4. Human beings--Effect of
climate on. I. Lever-Tracy, Constance. II. Title: Handbook of climate change and society.

QC903.R68 2010

304.2'5--dc22

2009043134

ISBN 0-203-87621-0 Master e-book ISBN

ISBN 978-0-415-54476-4 (hbk)

ISBN 978-0-415-54478-8 (pbk)

14 Climate change denial: sources, actors and strategies

Riley E. Dunlap and Aaron M. McCright

Introduction

Climate change denial has taken various forms over the past two decades – including the denial of global warming, the denial of its anthropogenic sources and the denial of its seriousness – as climate science and socio-political contexts have evolved. While it originated in the US, climate change denial has spread gradually to a range of nations, creating something of an international movement. Initially funded primarily by the fossil fuels industry (Gelbspan 1997), over time conservative foundations and think-tanks have become major supporters and promoters of climate change denial. Conservative think-tanks in particular have facilitated and promoted the efforts of a small number of ‘contrarian’ scientists in an effort to provide the forces of denial with the guise of scientific credibility, magnifying the visibility and impact of the contrarians’ views (McCright and Dunlap 2000, 2003). The activities of the contrarians have supplied vital ammunition for attacking mainstream climate science, symbolised by the Intergovernmental Panel on Climate Change (IPCC), and thus the scientific underpinnings of calls for policy-making to deal with climate change (Begley 2007).

This chapter begins with a brief examination of the historical roots of climate change denial starting with the technologically optimistic worldview, prevalent in Western societies, that is being challenged by environmentalism (Douglas 2007). After reviewing the emergence of environmentalism and its dependence on science, we trace the evolution of anti-environmentalism from the Reagan Administration to the transformation of the conservative movement into an anti-environmental counter-movement following the decline of communism and the emergence of global environmentalism. We discuss the development of ‘environmental scepticism’, built on the denial of scientific evidence of environmental problems, as a primary tactic of the conservative movement’s effort to undermine environmental policy-making, and then explain why climate change has become the *bête noire* of conservatism (Jacques *et al.* 2008).

Turning to climate change per se, we first focus on the major actors involved in climate change denial, highlighting the roles of the fossil fuels industry and its supporters in the business community, conservative think-tanks, contrarian scientists, conservative politicians (particularly leaders in the US Republican Party) and conservative media. After giving a brief overview of the key players in the ‘denial machine’ (Begley 2007), we examine their basic strategy of manufacturing uncertainty regarding climate change and how it is employed. While our emphasis is on the US, where climate change denial began and remains most strongly rooted, when appropriate we will note the diffusion of denial internationally – often with the direct aid of

US actors. We conclude with a brief assessment of the impacts of those promoting climate change denial.

Historical/cultural roots of climate change denial

Numerous analysts have suggested that modern societies tend to have an anthropocentric view of the natural world, stemming from the Judaeo-Christian perspective that nature was created for human use, a perspective magnified by Enlightenment thinking that emphasised human progress and improvement via the use of science and technology to transform the environment into useful resources. The industrial revolution implemented this instrumental view of nature, generating great wealth and prosperity (along with widespread poverty) and paving the way for political developments that elevated individual rights and private property as primary values (Barry 2007: 34–49). By the mid-twentieth century, wealthy Western nations – epitomised by the US – largely shared a ‘dominant social paradigm’ that valued individual rights, laissez-faire government, free enterprise and private property, and also held great faith in the ability of these politico-economic conditions to combine with science and technology in producing abundant resources, economic growth and inevitable progress (Dunlap and Van Liere 1984; Milbrath 1984).

The near-hegemonic status of the dominant social paradigm has been challenged by a variety of forces since the 1960s, especially the growing recognition of environmental degradation as a by-product of technological progress and economic growth (Douglas 2007). The emerging environmental movement called attention to the negative consequences of unrestrained economic growth, especially the unintended side-effects of technological developments such as pesticides and the rapidly growing use of chemicals throughout industrial production processes. Increasingly visible problems, such as air and water pollution, land degradation and endangered wildlife, led to calls for regulating production to limit environmental degradation and laws mandating environmental protection more generally. Such calls were not welcomed by industry and its allies, and efforts to oppose environmentalists quickly developed – particularly in the Western US where battles over access to natural resources raged (Switzer 1997). None the less, environmentalists achieved considerable progress in passing environmental laws and setting up agencies such as the US Environmental Protection Agency in the 1960s and 1970s.

The rise of the conservative movement and the Reagan presidency

The inauguration of Ronald Reagan as US President in 1981 initiated a major challenge to environmentalism, as his administration rode the crest of a new conservative tide dedicated to limiting government intrusion on free enterprise by reducing regulations, especially environmental regulations. Environmental organisations were appalled by the overtly anti-environmental orientation of the Reagan Administration. Several launched a relatively vigorous campaign to generate public opposition to Reagan’s efforts to weaken environmental laws, and in the process supported the Democratic Congress in mounting its, admittedly not very successful, resistance to his administration’s initiatives (Kraft and Vig 1984). While Reagan’s efforts to ‘make America great again’ may be viewed as an attempt to re-establish the hegemonic nature of the dominant social paradigm, the public backlash against his administration’s

overt anti-environmentalism demonstrated that Americans had come to value governmental efforts to protect environmental quality (Dunlap 1987).

Reagan's path to the Presidency had been paved by a reinvigorated conservative movement, stimulated by the success of progressive movements during the 1960s and 1970s. Wealthy conservative families and corporate interests converged in response to progressive gains, perceived as threats to their interests and values, to generate a conservative reaction led by newly created 'think-tanks' such as the Heritage Foundation. These conservative think-tanks provided both ideas and personnel for the Reagan Administration, and their analysts generated a torrent of ideas and policies (e.g. 'trickle-down economics') that were implemented or at least helped shape policy-making in the 1980s and continue to be influential – contributing significantly to the rightward shift in American politics (see McCright and Dunlap 2000; Austin 2002; Jacques *et al.* 2008 and references therein).

The conservative movement, and conservative think-tanks in particular, appeared to learn from experience, taking note of the negative reaction against Reagan's overt efforts to weaken environmental regulations. Conservatives recognised that those pushing for environmental regulations – often coalitions of environmentalists, environmental scientists and policy-makers – typically build their case on the basis of scientific evidence concerning purported environmental risks and hazards. This awareness encouraged the adoption of a new tactic by those opposing environmental regulations, adding efforts to undermine environmental science to the overall strategy of opposing environmentalism and environmental regulations (Douglas 2007; Jacques *et al.* 2008).

The environmental movement's reliance on 'impact science'

Several scholars have noted the environmental movement's heavy reliance on science. Although environmentalists have often blamed science for creating problems such as nuclear contamination, and have at times been leery of scientific expertise (Yearley 1991), it is clear that scientists have played a crucial role in the environmental movement – including helping form influential US organisations such as the Environmental Defence Fund and the Natural Resources Defence Council (Mertig *et al.* 2002). In endless campaigns for clean-ups and preventative programmes designed to improve environmental quality, environmentalists have used (and at times misused) scientific evidence. In fact, the emergence of widespread societal concern over environmental issues in the late 1960s and early 1970s was a central factor generating interest in and support for the new field of environmental science and the reinvigoration of related fields such as ecology and earth science. Along with technology assessment, these fields reflected a major new development in science: the emergence of 'impact science' (Schnaiberg 1980: ch. 8; McCright and Dunlap 2010).

Whereas traditionally science was valued for producing knowledge that would lead to technological advances which would eventually prove profitable and thus contribute to economic growth, a model termed 'production science' (Schnaiberg 1980), the newer uses of science to assess the largely unintended and frequently negative impacts of industrial production were greeted quite differently. Growing evidence of air and water pollution from industrial effluents, pesticide contamination and the hazards posed by nuclear waste, for example, was useful to environmentalists, concerned citizens and policy-makers, but was typically unwelcome news to industrialists and their supporters (Schnaiberg 1980).

More generally, the rise of impact science constituted a fundamental challenge to the dominant social paradigm, which had promised endless growth and prosperity stemming from scientifically driven technological advances implemented by the private sector. The notion of ‘limits to growth’, seemingly confirmed by energy shortages in the 1970s, further challenged traditional assumptions on which capitalist nations operated, as well as the assumed efficacy of production science for facilitating growth (Douglas 2007). Finally, mounting efforts to understand the unintended negative consequences of industrial processes contributed to a rise in the standing of the biological and health sciences – essential for assessing environmental/health impacts – relative to the highly prestigious fields of physics and chemistry (Lahsen 2008).

The conservative movement’s embrace of ‘environmental scepticism’

Reacting to the environmental movement’s reliance on science, and remembering the environmental backlash against the Reagan Administration, by the early 1990s the conservative movement was producing a vast amount of material aimed at challenging environmental science (which it termed ‘junk science’) in an effort to undermine the rationale for environmental regulations (Jacques *et al.* 2008). Leading conservative think-tanks sponsored much of this work and used their sophisticated public relations apparatus to publicise it. Over time, direct assaults on the scientific evidence that formed the basis for calls for environmental regulations were merged into a broader framework stemming from conservative values (e.g. free markets, laissez-faire government, property rights) that has been termed ‘environmental scepticism’ and defined by Jacques *et al.* (2008: 354) as follows:

First, environmental scepticism is defined by its denial of the seriousness of environmental problems and dismissal of scientific evidence documenting these problems...Second, environmental scepticism draws upon the first theme to question the importance of environmentally protective policies. Third, environmental scepticism endorses an anti-regulatory/anti-corporate liability position that flows from the first two claims. Lastly, environmental sceptics cast environmental protection as threatening Western progress.

The charge that environmentalists and their supporters are a threat to ‘Western progress’ stems from at least implicit recognition that environmentalism poses a direct threat to the dominant social paradigm (Dunlap and Van Liere 1984; Milbrath 1984; Douglas 2007).

The intellectual groundwork for environmental scepticism was laid early on by Julian Simon (1981), who viewed human ingenuity as ‘the ultimate resource’ and denied the possibility of limits to growth. Simon’s worldview, based on intense technological optimism and a view of the Earth as offering limitless resources, was in direct contrast to the emerging ecological worldview that assumed Nature’s limits and viewed science and technology as often creating more problems than they solve (Dunlap 1983). Despite the fact that his evidence was roundly criticised by most scientists with relevant expertise, Simon quickly became an ex-officio adviser to the Reagan Administration and had a major influence on changing US population policy (Holden 1984).

Simon was also embraced warmly by conservative think-tanks (the Competitive Enterprise Institute named an award for him), and has become an icon for environmental

sceptics. Simon's 'human exemptionalist' worldview – which assumes that science, technology and the free market will ensure that modern societies are not subject to the ecological limits faced by other species – provides a meta-theoretical base for narrower efforts to challenge the evidence for specific environmental problems, including anthropogenic climate change (Dunlap 1983). It is particularly apparent in the work of Bjørn Lomborg (2001), for example, who acknowledges being inspired by Simon and clearly shares the same 'anthropocentric *weltanschauung*' as Oreskes and Conway (2008: 75) put it.

Anthropogenic climate change becomes the conservative movement's 'bête noire'

As the Reagan Administration was drawing to a close, important international trends were developing that would further enhance the conservative movement's embrace of environmental scepticism. First, the fall of the Berlin Wall and eventual collapse of the Soviet Union removed a foundational element of the conservative agenda – fighting communism.¹ At the same time, environmentalism was becoming a rising global force, mobilising around the UN Conference on Environment and Development (the 'Earth Summit') held in Rio de Janeiro in 1992 with representatives from 172 nations. For conservatives, the consideration of various international environmental treaties at the Earth Summit raised the spectre of sweeping regulations that threatened the spread of global capitalism via market economies, privatisation of resources and free trade, as well as national sovereignty (Begley 2007; Jacques *et al.* 2008: 352, 362). Add in conservatives' tendency to find enemies to battle, and it appears that the US conservative movement decided to substitute a growing 'green threat' for the declining 'red threat', and figuratively (and often literally) launched a war against environmentalism, both nationally and globally (Buell 2003: ch. 1; Douglas 2007).

To battle the environmental movement and its goal of increased environmental protection, conservative foundations and conservative think-tanks (both aided by corporate funding) mounted an anti-environmental counter-movement (Austin 2002; Jacques *et al.* 2008). While conservative think-tanks often joined corporations in lobbying against environmental regulations, much of their effort was devoted to de-legitimising environmentalism in the eyes of the public and policy-makers (Buell 2003; Douglas 2007) and particularly to undermining the scientific basis for environmental regulations. Cognisant of the degree to which environmentalists and supportive policy-makers depend on science, conservatives and especially conservative think-tanks made the development and promotion of environmental scepticism a key weapon in their arsenal (Jacques *et al.* 2008).

The result is that since the early 1990s there has been a comprehensive effort to portray environmental science as 'junk science', frequently with the assistance of sympathetic 'experts' often drawn from academia, and with enormous help from conservative media figures such as right-wing radio commentator Rush Limbaugh and Fox News (Wolcott 2007). While conservative think-tanks produce an enormous number of press releases, reports and policy briefs critical of environmental science and policy-making (McCright and Dunlap 2003), in the 1990s they began to issue more and more books. In fact, an analysis of 141 books published through 2005 which espoused environmental scepticism (many focused on climate change *per se*) found that 130, or 92 per cent, were linked to a conservative think-tank in the US or other nation. All but 20 were published from 1990 onwards (Jacques *et al.* 2008: 360–61).

It comes as no surprise that climate change has become the primary focus of contemporary environmental scepticism, promoted heavily by conservative think-tanks, conservative media figures, conservative politicians and contrarian scientists constituting the denial machine (Douglas 2007). This is the case because the formation of the IPCC, created by the United Nations Environmental Program and the World Meteorological Organization, represents a worldwide effort to develop science explicitly for policy-making – specifically the United Nations Framework Convention on Climate Change (FCCC). The IPCC, and the science it both summarises and helps stimulate, is thus viewed by conservatives as facilitating the development of international regulations that will hamper the spread of free markets, harm national economies, threaten individual freedom and national sovereignty, and basically be a tool for world government (Lahsen 1999; Begley 2007; Oreskes and Conway 2008).

For these reasons, climate change became a *cause célèbre* among conservatives even before the 1992 Earth Summit, as exemplified by a 1989 column in *Forbes* magazine arguing that ‘just as Marxism is giving way to markets, the political “greens” seem determined to put the world economy back into the red, using the greenhouse effect to stop unfettered market-based economic expansion’ (quoted in Lahsen 1999: 129). The efforts of a modest number of contrarian scientists (such as those at the Marshall Institute) to question the scientific evidence for anthropogenic climate change received a significant boost from a growing conservative concern over the Earth Summit and the Framework Convention on Climate Change and IPCC (Begley 2007), and especially over the 1997 Kyoto Protocol (designed to reduce carbon emissions) (McCright and Dunlap 2003). The conservative think-tank-led counter-movement against climate science and policy began picking up steam, and the contrarian scientists found their views highly valued and warmly welcomed.

The war against climate science: key actors

Analysing the war against climate science and policy-making in detail warrants book-length treatment such as those provided by Gelbspan (1997, 2004) and Hamilton (2007), and thus our account must of necessity be limited. In what follows we highlight the key actors involved in the denial machine and then describe their primary strategy, noting changes in both as climate change denial has evolved.

Given that burning fossil fuels is a major contributor to greenhouse gas emissions, it is understandable that the coal and oil industries have played an essential role in climate change denial from the outset, and have often been joined by a wide swathe of corporate America concerned about government efforts to control carbon emissions. Individual corporations such as Peabody Coal and ExxonMobil, as well as industry associations such as the Western Fuels Association and the American Petroleum Institute, have provided direct funding for individual contrarian scientists such as Patrick Michaels (whose newsletter *World Climate Review* was funded by the Western Fuels Association) as well as several conservative think-tanks. ExxonMobil has been the most important funding source for climate change denial, as documented in numerous sources and outlined in detail by the Union of Concerned Scientists (2007) (see also Chapter 3, this volume).

Coal and oil corporations and their industry associations have been joined by numerous energy companies, other resource-based corporations (e.g. in the steel, forestry and mining sectors), a wide range of manufacturing companies (e.g. auto-

mobile and chemical corporations) as well as large national associations such as the US Chamber of Commerce and the National Association of Manufacturers, in promoting climate change denial. A key mechanism has been to set up 'associations' such as the Information Council on the Environment, the Global Climate Coalition and the Cooler Heads Coalition to lead the charge against climate science and policy-making, thus shielding corporate sponsors from public scrutiny (see e.g. Gelbspan 1997, 2004; Lahsen 2005; Mooney 2005a, 2005b; Begley 2007).

Corporate support for climate change denial and opposition to climate policy have evolved in complex ways over the past couple of decades in response to growing evidence of anthropogenic global warming reported in IPCC assessments as well as to policy initiatives at various levels and market considerations. In retrospect it appears that the December 1997 Kyoto Conference was something of a watershed for the business community (Layzer 2007), as several oil companies gradually acknowledged the reality of human-caused global warming and abandoned the Global Climate Coalition. Perhaps embarrassment over the exposure of proposed strategies for undermining climate science, such as those by the American Petroleum Institute (Begley 2007: 25), contributed to their decisions.

Some companies, such as British Petroleum, increasingly adopted green discourse and developed green policies, possibly just for good public relations but perhaps also because adopting more 'sustainable' policies and practices seemed to make good sense economically. Regardless of their motives, by 2000 most multinational fossil fuels corporations – with the highly notable exception of ExxonMobil – appeared to abandon efforts to undermine climate science (Kolk and Levy 2001).² Several oil companies, along with other major corporations, subsequently joined a few leading environmental organisations to form the United States Climate Action Partnership, and some joined the US Business Council for Sustainable Development.

The reaction to the defection of several oil companies from the denial machine and their acceptance of climate science led to disappointment and anger among some conservatives (Layzer 2007), highlighting the importance of conservative ideology in stimulating opposition to climate science and policy-making, and environmental protection more generally. This suggests the importance of the ideological underpinnings of climate change denial, as it has become so endemic to the conservative movement that some conservative think-tanks will pursue climate change denial even without corporate support (McCright and Dunlap 2010).

As noted earlier, conservative think-tanks have been key actors in promoting environmental scepticism in general and climate change denial in particular since the early 1990s, basically leading the charge in the conservative movement's efforts to counter the perceived threat of global environmentalism (Austin 2002; Lahsen 2005; Jacques *et al.* 2008). They have also been the most thoroughly examined actors in climate change denial by both social scientists and journalists, probably because it is easier to gain information on their activities than on those of corporations or individual contrarians. Considerable insight into the overall role that conservative think-tanks play in the denial machine may be gained from the in-depth work of investigative journalists such as Sharon Begley (2007), Ross Gelbspan (1997, 2004) and Chris Mooney (2005a, 2005b). Social scientists have tended to focus on narrower issues, ranging from case studies of individual conservative think-tanks to identifying the think-tanks most active in climate change denial.

In terms of case studies, both anthropologist Myanna Lahsen (2008, see also 1999, 2005) and science historian Naomi Oreskes and colleagues (Oreskes and Conway 2008;

Oreskes *et al.* 2008) have provided insightful analyses of the Marshall Institute, one of the first conservative think-tanks to focus on climate change. Established in 1984 by three eminent physicists (Robert Jastrow, William Nierenberg and Frederick Seitz), primarily to counter the scientific community's criticism of Reagan's Strategic Defence Initiative or 'Stars Wars', the Marshall Institute was one of the first conservative think-tanks to focus on climate change – issuing criticisms of climate science in the late 1980s. While its growing focus on climate and other environmental issues may have stemmed from the diminishing threat posed by the Soviet Union, Oreskes *et al.* (2008) provide a detailed analysis of how Nierenberg used his influence to weaken a US National Academy of Sciences report on climate science in the early 1980s – immediately prior to the formation of the Marshall Institute.

Because of the scientific prestige of the founders (albeit in physics rather than climate science), the Marshall Institute's critical stance against anthropogenic global warming carried considerable weight, particularly within Washington, DC and with the press. It continues to be a leader in climate change denial, forging links with several leading contrarians. Despite their differing emphases, both Lahsen (2008) and Oreskes and Conway (2008) demonstrate that the Marshall Institute founders were reacting, at least in part, to a perceived loss of influence for physicists in policy-making circles and to their own fundamental disrespect for impact science. Similar in-depth analyses of other leading conservative think-tanks in the denial machine are needed.

The Marshall Institute was one of the 14 conservative think-tanks that we identified as most central in opposing climate science and policy. Our own analyses focused first on the 'counter-claims' issued by think-tanks in an effort to call into question the findings of the IPCC and mainstream climate science, and second on the activities they employed in opposing US ratification of the 1997 Kyoto Protocol (McCright and Dunlap 2000, 2003). We identified three primary sets of counter-claims (global warming is not happening; if it were to occur, it would be largely beneficial; and proposed policies designed to limit global warming would be very harmful), and then analysed how the conservative think-tanks used the counter-claims to undermine climate science and the need for policies such as the Kyoto Protocol. Of special importance was the promotion of the views of a small number of contrarian scientists who, with support from think-tanks, received an exceptionally high degree of media visibility and influence within Congress. The overall activities of the conservative think-tanks appear to have played a central role in generating congressional opposition to the Kyoto Protocol.

Further analyses of developments since 1997 are definitely needed, not only because of the changing socio-political conditions but also because of changes within the network of conservative think-tanks. In particular, the Heartland Institute has grown greatly in influence over the past 12 years and is now arguably the most visible US conservative think-tank promoting climate change denial. A crucial topic for research is analysing the funding sources for the climate change denial activities of the conservative think-tanks, especially given preliminary evidence that conservative foundations such as those associated with Richard Mellon Scaife have become major supporters of climate change denial – perhaps offsetting any decline in corporate funding (Grandia 2009a). Thus far only ExxonMobil's contributions have been examined thoroughly.³ Other topics deserving attention include patterns of coordination among the US conservative think-tanks and between them and other key actors in the denial machine, as well as the roles of conservative think-tanks based in the US and those in other nations in spreading climate change denial internationally (Rahmstorf 2005).

The conservative movement has made heavy use of the small number of contrarian scientists with relevant expertise in climate science, and many with no expertise, but most of what has been written about contrarians stems from their involvement with industry, conservative think-tanks and sympathetic politicians. Thus, in addition to the extensive information available on the Marshall Institute's 'trio', one can find information on other key contrarians such as Patrick Michaels, Richard Lindzen and Fred Singer throughout both journalistic and scholarly analyses, especially their links to industry and conservative think-tanks via formal affiliations, lectures and publications (Gelbspan 1997, 2004; Lahsen 1999, 2005; Mooney 2005a, 2005b; Begley 2007).⁴ Social scientists have provided empirical evidence concerning ties between contrarians and conservative think-tanks as well as sympathetic public officials such as Republican members of Congress (who frequently invite contrarians to testify at hearings), along with detailed analyses of the disproportionate degree of media visibility which contrarians have received – in part due to the influence of the conservative think-tanks (McCright and Dunlap 2000, 2003, 2010; Boykoff and Boykoff 2004; Lahsen 2005; Jacques *et al.* 2008).

More detailed analyses of contrarians is clearly called for, especially their scientific credentials and expertise vis-à-vis other climate scientists. As already noted, some key figures such as the founders of the Marshall Institute have very strong 'scientific' credentials, but lack expertise in climate science *per se*. In addition, while there are notable exceptions like Richard Lindzen, many of the key contrarians are not involved in actual research on climate change, and their activities are mainly limited to writing critiques (sometimes in peer-reviewed journals, but typically not) of climate models, IPCC procedures and so forth (see e.g. Begley 2007: 24).

There has not yet been a detailed comparison of the credentials and expertise of the core contrarians with those of leading mainstream climate scientists. However, by taking advantage of the denial machine's success in generating large lists of sympathetic 'scientists' (using the term loosely) endorsing climate change denial, Anderegg *et al.* (2009) use citation data to compare the expertise and credibility of self-professed contrarians with those of climate scientists endorsing the IPCC's position. Measuring expertise by number of relevant peer-reviewed publications dealing with climate science and credibility by citations to these publications, Anderegg and colleagues find a huge discrepancy between the two camps – with the contrarian scientists ranking far lower than mainstream climate scientists on both counts.

Conservative US politicians have been receptive to environmental scepticism from the outset, and particularly to scepticism about climate change. Not only have they made a habit of inviting contrarian scientists and even novelist Michael Crichton (whose *State of Fear* portrayed climate change as a contrived plot) to hearings to rebut mainstream climate scientists, but some have held hearings designed to intimidate or harass the latter. For example, the Republican take-over of the House of Representatives in 1994 led to 1995 hearings called by California Republican Dana Rohrabacher devised to portray evidence for dioxin, ozone depletion and global warming as 'junk science' (McCright and Dunlap 2003: 361). Similarly, in 2005 Texas Republican Joe Barton held a hearing to critique the 'hockey stick' model resulting from the reconstruction of climate trends published by Michael Mann and his colleagues, directly as a result of criticism levelled against Mann by two Canadians (an economist and a statistician) affiliated with conservative think-tanks. But most notable is Oklahoma Senator James Inhofe, famous for his claim that global warming is 'the greatest hoax ever perpetrated

on the American people' in a US Senate speech. When Republicans took control of the Senate in 2003, Inhofe became Chair of the Committee on Environment and Public Works, and turned it into an institutionalised forum for climate change denial via its website and his frequent invitations to contrarians to oppose mainstream scientists in committee hearings.

The inauguration of the George W. Bush Administration in 2001 brought a level of anti-environmentalism to the White House far exceeding that of the Reagan era, although the administration did a much better job of hiding its actions behind closed doors and with double-speak like 'healthy forests' and 'clean skies' to describe initiatives that would produce the opposite effects. The administration mastered the political manipulation of science, calling for 'sound science' as a way of implying that climate science was 'unsound' and constantly emphasising the 'uncertain' status of knowledge summarised by the IPCC. When these tactics were not sufficient, the Bush Administration engaged in the suppression of mainstream climate science, all to justify its eight years of inaction on climate change (McCright and Dunlap 2010).

The receptivity of the Bush Administration and Republicans more generally to the influence of the denial machine during the past several years has led to most Republican politicians embracing climate change denial, and in the process becoming key actors in its promotion and implementation. As David Goldston, who served as Chief of Staff for the House Committee on Science beginning in 2001 when it was under Republican control, put it, 'There was a belief on the part of many [committee] members that the science was fraudulent, even a Democratic fantasy. A lot of the information they got was from conservative think tanks and industry' (quoted in Begley 2007: 27). Another indicator of the Republican Party's embrace of climate change denial comes from the results of a 2007 'Congressional Insiders Poll' of 41 Democratic and 31 Republican members of Congress which found 95 per cent of the former but only 13 per cent of the latter agreeing that human beings are definitely contributing to global warming (Cohen and Bell 2007).⁵

The final crucial actors in climate change denial are the conservative media, which have become increasingly influential in the US since the Reagan years and also appear to have a good foothold in the UK, Canada and Australia (Douglas 2007). Right-wing radio commentator Rush Limbaugh has led the anti-environmental charge for over two decades, prompting environmental organisations to publish booklets noting his 'errors'. Famous for denigrating 'environmental wackos' and Al Gore in particular, Limbaugh has followed the conservative trend by making climate change his favourite target (Wolcott 2007).⁶

Right-wing talk radio's impact in the US may well be exceeded by Rupert Murdoch's Fox News, as its current trio of Glenn Beck, Bill O'Reilly and Sean Hannity not only repeat the litany of charges against the reality of global warming and the IPCC, but offer invaluable visibility to contrarian scientists and spokespersons for conservative think-tanks battling climate science and policy. The conservative media assault is repeated across the nation on local radio shows and newspapers, especially the Murdoch-owned *Wall Street Journal* and *New York Post* and the Reverend Moon's *Washington Times*. Last but not least is the bevy of websites set up (some with corporate sponsorship and some with support from conservative foundations and think-tanks) to espouse climate change denial. While their emphases vary, they offer endless critiques of climate science and the IPCC; promote and then recycle every claim made against human-caused global warming, the IPCC and individual climate scientists; and thrive on generating debate with bloggers representing 'mainstream' views.

The above represent the key actors in climate change denial, but what binds them together – including concretely through funding and networking – requires in-depth analysis. Here we will only offer some speculative observations. Clearly material, economic interest is a major factor stimulating climate change denial by the fossil fuels industry, and the sectors of the business community supporting them, in order to undermine policies to reduce carbon emissions. The financial support these corporations and business associations provide to conservative think-tanks, individual contrarians and supportive politicians such as Inhofe (often termed ‘the Senator from oil’) is a vital driver of denialism. There is substantial evidence, for example, that a number of leading contrarian scientists have been supported directly by the fossil fuels industry as well as by conservative think-tanks (Gelbspan 1997, 2004; Begley 2007; Mooney 2005a, 2005b).

More than economic interests motivate climate change denial, and conservative political ideology also seems to be a fundamental motivating force shared by all of the key actors (Douglas 2007). As articulated most clearly by Althusser (1971), ideology can function with considerable autonomy from economic interests, and that seems to be the case here. We noted earlier that conservative think-tanks increased their opposition to climate science and the IPCC, even as major portions of industry were reducing theirs. The links between these think-tanks, conservative media, conservative politicians and contrarian scientists appear to be firmly grounded in a shared commitment to free markets and opposition to governmental regulations of all types (Douglas 2007; Oreskes and Conway 2008).

The shared conservatism of these think-tanks, politicians and media is obvious, and accumulating evidence makes it clear that contrarian scientists are staunch political conservatives as well – as exemplified by a majority having strong ties to conservative think-tanks (McCright and Dunlap 2003; Mooney 2005a; Jacques *et al.* 2008). While some may also be motivated by a perceived decline in prestige for production science (Lahsen 2008; see Lindzen (2008) for a current illustration), Oreskes and Conway (2008) along with Begley (2007) and Lahsen (1999, 2005) document the staunch commitment to free enterprise and extreme opposition to government regulations shared by leading contrarians. Indeed, Oreskes and Conway (2008: 78) argue that faith in what entrepreneur and philanthropist George Soros calls ‘market fundamentalism’ captures the ideological orientation of the contrarians – and helps explain the long careers shared by leading contrarians such as Frederick Seitz, Fred Singer and Richard Lindzen in opposing evidence for a range of problems requiring government regulations from tobacco smoke to ozone depletion to anthropogenic climate change.

The hegemonic status of conservatism as the unifying force in climate change denial is not limited to the US, as denialism seems to prosper in nations that have or have had conservative governments and in which conservative think-tanks are firmly planted (Douglas 2007; Hamilton 2007). This pattern is apparent from the strength of climate change denial (and environmental scepticism more generally) in the UK, Canada, Australia and Denmark. In the former three countries there are strong links between contrarian scientists and conservative think-tanks, and in Denmark the conservative government created an Environmental Assessment Institute for Bjørn Lomborg to ply his trade, although it folded after a few years. The UK’s Institute of Economic Affairs, Canada’s Fraser Institute⁷ and Australia’s Institute of Public Affairs, for example, provide support for contrarian scientists in those nations. There is also evidence that US-based conservative think-tanks have played a role in stimulating interest in climate

denial among their international counterparts (Rahmstorf 2005), but more research is needed on this connection.

Major strategies and tactics: manufacturing and disseminating uncertainty

Just as political conservatism seems to be the hegemonic glue that binds together the primary actors involved in climate change denial, the broad strategy of ‘manufacturing uncertainty’ is the unifying approach employed by the denial machine. The use of ‘experts’ to raise questions about scientific evidence, and thus help create uncertainty over the need for governmental regulations, was first perfected by the tobacco industry. It has since been employed by a wide range of industries to protect their products from regulations and lawsuits. As David Michaels (2008: x) puts it when introducing his detailed analysis of efforts to manufacture uncertainty:

Big Tobacco...showed the way. The practices it perfected are alive and well and ubiquitous today. We see this growing trend that disingenuously demands *proof* over precaution in the realm of public health. In field after field, conclusions that might support regulation are always disputed. Animal data are deemed not relevant, human data not representative, and exposure data not reliable. Whatever the story – global warming, sugar and obesity, second-hand smoke – scientists in what I call the ‘product defence industry’ prepare for the release of unfavourable studies even before the studies are published. Public relations experts feed these for-hire scientists contrarian sound bites that play well with reporters, who are mired in the trap of believing there must be two sides to every story.

If this sounds like a blueprint for climate change denial, it is because the denial machine not only learned from those who previously used the practice of manufacturing uncertainty successfully but some of its key actors learned the value of the strategy directly from their personal involvement in the ‘tobacco wars’.

The crucial role played by Frederick Seitz in helping the tobacco industry produce uncertainty concerning the health impacts of smoking, by administering a ‘Medical Research Program’, funded by the parent company of R.J. Reynolds Tobacco, has been well documented by Oreskes and Conway (2008: 66–68). They also outlined Fred Singer’s long career in manufacturing uncertainty over a variety of issues including the dangers of second-hand smoke (66–73). Fighting second-hand smoke regulations seems to have played a key role in generating use of the ‘junk science’ label as a means of denigrating scientific work on health threats and of course its opposite – ‘sound science’ – to camouflage the efforts of product-defence scientists (Mooney 2005b: ch. 6). As Michaels (2008: 58) notes, the first use of the sound-science trope seems to have been by The Advancement of Sound Science Coalition (TASSC). This front group was set up by a public relations firm for the Philip Morris tobacco company and run by Steve Milloy, who has gone on to establish a website (www.junkscience.com) dedicated to the promotion of *unsound* science to undercut the need for governmental regulations (Herrick and Jamieson 2001).⁸ The obvious appeal of manufacturing uncertainty is simple: ‘Industry has learned that debating the *science* is much easier and more effective than debating the *policy*’ (Michaels 2008: xi), a lesson reinforced during the Reagan years (also see Freudenburg *et al.* 2008).

Manufacturing uncertainty regarding climate change

Given the successful uses of manufactured uncertainty in combating or at least delaying effective government regulations to deal with a wide range of health and environmental hazards, combined with the personal experience of key actors in the climate denial machine, it is no surprise that it would be applied to climate change. The tactic of labelling mainstream climate science as junk science and lauding critiques of it as exemplars of sound science are readily apparent in the denial machine's constant attacks on the IPCC and leading climate scientists, along with its enthusiastic promotion of the views of contrarians (e.g. Gelbspan 1997, 2004; Mooney 2005a, 2005b). Efforts to manufacture uncertainty regarding climate science and thus create doubt about the reality of global warming have been exposed via leaked memos concerning strategy sessions by key actors such as the American Petroleum Institute (Begley 2007: 25) and a particularly infamous one written by the influential Republican pollster and strategist Frank Luntz.

In a lengthy report prepared for Republican candidates in the 2002 election, Luntz's section on the environment begins by noting Republicans' vulnerability on environmental protection and then offers detailed advice for dealing with the party's poor image on environmental issues.⁹ The section on global warming begins by noting that '*The scientific debate remains open. Voters believe there is no consensus about global warming within the scientific community...Therefore, you need to continue to make the lack of scientific certainty a primary issue in the debate, and defer to scientists and other experts in the field.*'

Later Luntz adds, '*The most important principle in any discussion of global warming is your commitment to sound science.*' Finally, focusing specifically on the issue of international policy, Luntz offers this talking point:

We must not rush to judgment before all the facts are in. We need to ask more questions. We deserve more answers. And until we learn more, we should not commit America to any international document that handcuffs us either now or into the future.

(All emphases in original, and quotes available in Michaels 2008: 198)

Luntz's advice, enthusiastically embraced by Republican figures such as Senator Inhofe (Mooney 2005b: ch. 7), pretty well captures the Republican Party's 'platform' on climate change over the past decade.

Whereas manufacturing uncertainty in the past was typically confined to corporations and their efforts to protect specific products against regulations and litigation, it has been employed against climate change science and policy by the full range of actors in the denial machine. It started with the fossil fuels industry but spread to the conservative movement, politicians and media – all of whom have relied heavily upon the dedicated efforts of contrarian scientists (Gelbspan 1997, 2004; Mooney 2005b). Furthermore, perhaps because attempts to deal with global warming have been greeted not simply as economic threats but as threats to free enterprise, individual rights and 'Western progress', climate change denial has been carried out with a vociferousness that goes beyond challenging the findings of the IPCC and mainstream climate scientists (Douglas 2007). Indeed, *ad hominem* attacks on individual scientists, allegations of conspiracy against those involved in the IPCC (Lahsen 1999), and charges of corruption within mainstream science have become common, both in the

writings of contrarian scientists (e.g. Lindzen 2008) and non-scientists representing conservative think-tanks (e.g. Horner 2008).

Disseminating uncertainty

Clearly a small number of contrarian scientists with varying levels of expertise have played an essential role in manufacturing uncertainty over climate science from the outset of climate change denial. They sometimes offer evidence of natural causes of global warming (such as solar activity and various atmospheric and oceanic cycles), but more often write critiques of the work of mainstream climate scientists and the IPCC. In addition, from the beginning, contrarians such as the Marshall Institute founders, Fred Singer, Patrick Michaels and Richard Lindzen have frequently published their ideas via newspaper editorials, articles in conservative magazines and reports for conservative think-tanks, while readily expressing them in speeches and interviews as well.

Regardless of where they published or spoke, the contrarians – with the aid of corporate and think-tank sponsorship – quickly established themselves as ‘experts’ in the eyes of the media. Especially in the 1990s, contrarians received enormous visibility as journalists eager to provide ‘balanced’ coverage made a practice of soliciting the views of contrarians to give ‘the other side’ whenever reporting on the IPCC or climate change more generally (McCright and Dunlap 2003; Boykoff and Boykoff 2004). By matching leading climatologists such as James Hansen with contrarians, and creating a ‘duelling scientists scenario’, mainstream media have played an essential role in facilitating the denial machine’s efforts to generate ‘uncertainty’ regarding climate science in the eyes of readers and viewers. The evolution and consequences of disproportionate media attention to contrarian viewpoints have been the subject of considerable research (see Chapter 11, this volume).

As their ideas have fallen further out of the mainstream and their work has become less and less credible, contrarians’ tendency to use non-scientific outlets over peer-reviewed scientific journals has become more pronounced. They have defended this by claiming bias against their work by journal reviewers and editors, charging corruption of the peer-review process, arguing that questioning the dominant ‘paradigm’ makes publication more difficult, and alleging that there is a conspiracy aimed at suppressing their challenges to mainstream climate science (e.g. Michaels and Balling 2000; Lindzen 2008). Lindzen (2008) adds that scientific associations and even the US National Academy of Sciences have been corrupted by environmentalism and partisan politics. Such allegations, which go well beyond those typically used by ‘product-defence scientists’ employed by industry to manufacture uncertainty, reflect a paranoia common within right-wing circles that Lahsen (1999) sees as being shared by some contrarians. More importantly, the allegations resonate well with the rest of the denial machine, which enthusiastically repeats and amplifies them (e.g. Horner 2008).

Virtually any claim uttered by a contrarian scientist these days – whether it be a ‘finding’ that challenges anthropogenic climate change or the discovery of a weakness in a mainstream scientist’s work or an allegation of suppression – immediately zooms around the internet via the climate change denial blogosphere; is publicised by conservative think-tanks such as the Heartland Institute, the CATO Institute and the Competitive Enterprise Institute; receives coverage by conservative columnists and Fox News; and is soon repeated by Republican politicians.

The result is that the efforts of contrarian scientists are now supplemented by a wide cast of other actors in the denial machine, and uncertainty over climate change has a large number of manufacturers from academics with no natural science training (e.g. economists) to conservative pundits to think-tank and industry representatives to a rising number of laypeople who self-publish books denouncing climate change, sometimes for children (e.g. Schmidt 2008).

Besides the expansion of scientific debates beyond scholarly meetings and journals (where they are typically conducted) to society at large, there are two other consequences with special bearing on the future of science. First, unlike normal scientific debates which tend over time to be settled in peer-reviewed publications as some claims are falsified and others verified, in the ‘public sphere’ claims never disappear, no matter how solidly refuted. Arguments put forth by contrarian scientists – and nowadays a huge supporting cast – remain in circulation, endlessly repeated, and added to an accumulating body of allegations and falsehoods rather than a cumulative body of knowledge (e.g. Peterson *et al.* 2008). The result is that the leading counter-claims used by denialists that we found in the 1990s (McCright and Dunlap 2000) as well as the complementary set discerned by Rahmstorf (2005) remain widely used, but have been regularly supplemented by new ones. These include the unfairness and futility of the US taking action to reduce carbon emissions if China and India do not agree to do so, reducing carbon emissions will destroy the economy, and rich nations can readily adapt to climate change. All have become ammunition added to the climate change denial arsenal.

Second, the denigration of peer-review, scholarly journals and scientific institutions by contrarian scientists is readily used by interests eager to challenge science, especially impact science. Thus, the author of a recent piece on ‘Making it up in global warming theory’ in the conservative online magazine *American Thinker* argues that ‘*Science* magazine is run by a True Believer in global warming...So you have to assume that in reaching [*sic*] *Science* magazine you’re always reading the *New York Times*, and you always have to read for spin and bias. It’s a breakdown of normal science, and it is potentially a disaster’ (Lewis 2009: 1). So much for the authority of the world’s most respected scientific journal! De-legitimising leading science journals makes it easier for conservatives to ignore cutting-edge scientific knowledge on topics that they might regard as threatening to their interests and worldview.

Although contrarian scientists have developed an ever-larger supporting cast over the past two decades, in recent years mainstream media have gradually recognised the contrarians’ outlier status within the scientific community and their ties to corporations and think-tanks. As a result of publicity such as Begley’s (2007) cover story for *Newsweek*, the contrarians appear to be receiving declining attention outside of conservative media sources such as Fox News. However, conservative think-tanks have stepped up their efforts to manufacture uncertainty by going all out to create the image of widespread scientific disagreement over climate change. The Heartland Institute in particular has begun hosting an annual conference designed specifically to counter the IPCC, and it sponsors publications designed as alternatives to IPCC assessments – issued by the cleverly named ‘Nongovernmental International Panel on Climate Change’ or NIPCC (Singer and Idso 2009). The attendees at Heartland conferences read like a ‘who’s who’ of climate change denial, and this annual event offers contrarian scientists a friendly (if small) audience for their dissenting voices.

Another means by which conservative think-tanks and politicians build on the contrarians’ efforts to manufacture uncertainty is to stimulate the development of lists

of purported scientists who question mainstream climate science and/or the IPCC. Two efforts are particularly notable. One is the ‘Oregon Petition’ organised in the late 1990s by the little-known Oregon Institute of Science and Medicine with early support from Frederick Seitz to garner support against the Kyoto Protocol (Lahsen 2005), and revived in recent years for use against the IPCC.¹⁰ Second is an evolving list of supposed ‘leading international scientists’ compiled by Marc Morano – based on his interpretations (and sometimes misinterpretations) of their views on global warming – for Senator Inhofe, who uses the list to claim an international groundswell of opposition to the IPCC within the scientific community.¹¹ Both lists have been found to be highly questionable, with no more than 0.5 per cent of the 31,000-plus signers of the Oregon Petition having backgrounds in climatology or atmospheric science (Grandia 2009b), and only 15 per cent of the scientists appearing on Inhofe’s list having refereed publications relevant to climate change (Bindschadler *et al.* 2009).

Despite analyses of their dubious nature, both the Oregon Petition and Inhofe’s list are frequently referenced by the climate denial machine as evidence of major and even growing dissensus among scientists over climate change – at the very time the IPCC assessments indicate increasing consensus. Both lists are thus useful in manufacturing *growing* uncertainty over global warming among laypeople and policy-makers around the world. They will be used repeatedly and added to the ever-growing body of ‘evidence’ employed by climate change deniers, given that no matter how fallacious a claim may prove to be, the denial machine will keep it in circulation as long as it is useful.

In sum, we see that manufacturing uncertainty over climate change is the fundamental strategy of the denial machine, and that the efforts and perceived authority of actual (and sometimes just purported) contrarian scientists play an indispensable role in that strategy. Viewing current evidence and theory with a sceptical eye is an essential part of healthy science, but ideologically driven attacks on mainstream climate science pervert the scientific process and stimulate overly defensive reactions that are also harmful to advancing knowledge. The long-term consequences of (mis)using science to sow confusion in democratic policy-making call for research and reflection (Lahsen 2005).

Conclusion

We began by locating contemporary uses of environmental and climate scepticism in historical context and then turned to key actors involved in climate change denial. We gave quick overviews of the roles of industry, conservative think-tanks, contrarian scientists, conservative politicians and conservative media in challenging mainstream climate science as a means of opposing policies designed to reduce carbon emissions. We argued that uniting these actors, even as their individual roles have evolved over time, is a strong commitment to the basic tenets of conservatism, particularly faith in the free market and opposition to government regulations. We then turned to the strategy and tactics employed by the denial machine, noting that manufacturing uncertainty is the strategic approach that ties together specific tactics.

As we reflect on the evolution of climate science and policy-making over the past few decades, we believe the denial machine has achieved considerable success – especially in the US, but internationally as well. Public concern over global warming and support for climate policy-making in the US is low relative to other nations (see Chapter 10, this volume), contributing to inaction by the US government. Further, the lack of American

leadership on climate change and outright opposition to international policy-making during the George W. Bush Administration (McCright and Dunlap 2010) have been significant obstacles to international progress. Finally, major figures from the US (such as Exxon Mobil, conservative think-tanks and leading contrarian scientists) have helped spread climate change denial to other nations (Rahmstorf 2005).

Yet, despite Senator Inhofe's claims to the contrary, the evidence supporting anthropogenic climate change and pointing to the problems it poses continues to grow stronger as reflected in IPCC assessments. This evidence is increasingly accepted not only by most governments but by a significant share of corporate interests, especially the insurance industry that is highly vulnerable to the impacts of global warming. This would seem to portend progress in international climate policy. However, much will depend on the US. The current efforts of the Obama Administration and a Democratic Congress to develop a national policy – and contribute to an effective international policy – for achieving reductions in carbon emissions is meeting intense resistance. Not surprisingly, the opposition is being led by the denial machine, and all of its major components are working feverishly to defeat any measure aimed at reducing carbon emissions.

Notes

- 1 Oreskes and Conway (2008) describe how the decline of the Cold War stimulated the Marshall Institute, a key actor in climate change denial, to shift its original emphasis from national defence (it was set up to promote Reagan's 'star wars' initiative) to environmental issues, especially climate change (see also Lahsen 2008; Oreskes *et al.* 2008).
- 2 Explaining differing responses to climate change among various oil companies has received considerable attention (see Pulver (2007) and references therein) but deserves more, and analyses of the responses of coal versus oil companies would be welcome.
- 3 See information on this website run by Greenpeace: <http://www.greenpeace.org/usa/campaigns/global-warming-and-energy/exxon-secrets> (accessed 14 July 2009).
- 4 Most of the leading contrarian scientists may be found at the website listed in note 3 above.
- 5 Polling results over the past decade indicate that scepticism regarding climate change has diffused widely among Republican voters as well as among elites (Dunlap and McCright 2008).
- 6 Illustrating the networking within the denial machine is the fact that Marc Morano, who as Senator Inhofe's 'communications director' on the Senate Committee on Environment and Public Works played the key role in turning the committee into a forum for climate change denial, formerly worked for Limbaugh.
- 7 The website Deep Climate provides detailed information on the role of conservative think-tanks in disseminating climate change denial in Canada. See <http://deepclimate.org/> (accessed 16 May 2009).
- 8 The Heartland Institute, a leading think-tank promoting climate change denial, has a 'Smokers' Lounge' on its website that provides 'the place to go for sound science, economics, and legal commentary on tobacco issues'. Available at <http://www.heartland.org/suites/tobacco> (accessed 23 June 2009).
- 9 The 16-page environment section was disseminated by the Environmental Working Group and is available at http://www.ewg.org/files/LuntzResearch_environment.pdf (accessed 14 May 2009).
- 10 Information on the petition may be found at <http://www.oism.org/s32p31.htm> (accessed 23 July 2009).
- 11 The latest version, undated, is available on the Minority Page of the Senate Committee and Public Works: http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=83947f5d-d84a-4a84-ad5d-6e2d71db52d9 (accessed 23 July 2009).

References

- Althusser, L. (1971) *On Ideology*, London: New Left Books.
- Anderegg, W.R.L., Prall, J.W., Harold, J. and Schneider, S.H. (2009) 'Expert credibility in climate change', unpublished manuscript, Department of Biology, Stanford University, Stanford, CA.
- Austin, A. (2002) 'Advancing accumulation and managing its discontents: the U.S. anti-environmental countermovement', *Sociological Spectrum*, 22: 71–105.
- Barry, J. (2007) *Environment and Social Theory*, 2nd edn, New York: Routledge.
- Begley, S. (2007) 'The truth about denial', *Newsweek*, 13 August: 20–9.
- Bindschadler, R., Jordan, S. and O'Brien, T. (2009) *The Credibility Project: An Assessment of the U.S. Senate Minority Report: More than 650 International Scientists Dissent Over Man-Made Global Warming Claims*, (brochure), Washington, DC: Centre for Inquiry Office of Public Policy. Available < www.centerforinquiry.net/opp > Accessed 25 July 2009.
- Boykoff, M.T. and Boykoff, J.M. (2004) 'Balance as bias', *Global Environmental Change*, 14: 125–36.
- Buell, F. (2003) *From Apocalypse to Way of Life: Environmental Crisis in the American Century*, New York: Routledge.
- Cohen, R.E. and Bell, P. (2007) 'Congressional insiders poll', *National Journal*, 3 February: 6–7.
- Douglas, R. (2007) 'Growthism and the green backlash', *Political Quarterly*, 78: 547–55.
- Dunlap, R.E. (1983) 'Ecologist versus exemptionalist: the Ehrlich–Simon debate', *Social Science Quarterly*, 64: 200–203.
- (1987) 'Polls, pollution, and politics revisited: public opinion on the environment in the Reagan era', *Environment*, 29: 6–11, 32–7.
- Dunlap, R.E. and McCright, A.M. (2008) 'A widening gap: Republican and Democratic views on climate change', *Environment*, 50: 26–35.
- Dunlap, R.E. and Van Liere, K.D. (1984) 'Commitment to the dominant social paradigm and concern for environmental quality', *Social Science Quarterly*, 65: 1013–28.
- Freudenburg, W.R., Gramling, R. and Davidson, D.J. (2008) 'Scientific certainty argumentation methods (SCAMs): science and the politics of doubt', *Sociological Inquiry*, 78: 2–38.
- Gelbspan, R. (1997) *The Heat Is On*, Reading, MA: Addison-Wesley Publishing.
- (2004) *Boiling Point*, New York: Basic Books.
- Grandia, K. (2009a) 'Research on the "sponsors" behind the Heartland's New York climate change conference', available <http://www.desmogblog.com/research-sponsors-behind-heartlands-new-york-climate-change-conference>. Accessed 25 February 2009.
- (2009b) 'The 30,000 global warming petition is easily-debunked propoganda', available <http://www.desmogblog.com/30000-global-warming-petition-easily-debunked-propoganda>. Accessed 23 July 2009.
- Hamilton, C. (2007) *Scorcher: The Dirty Politics of Climate Change*, Melbourne, Australia: Schwartz Publishing.
- Herrick, C. and Jamieson, D. (2001) 'Junk science and environmental policy: obscuring public debate with misleading discourse', *Philosophy and Public Policy Quarterly*, 21: 11–16.
- Holden, C. (1984) 'A prolife population delegation?', *Science*, 224: 1321–2.
- Horner, C.C. (2008) *Red Hot Lies: How Global Warming Alarmists Use Threats, Fraud, and Deception to Keep You Misinformed*, Washington, DC: Regnery.
- Jacques, P.J., Dunlap, R.E. and Freeman, M. (2008) 'The organization of denial', *Environmental Politics*, 17: 349–85.
- Kolk, A. and Levy, D. (2001) 'Winds of change: corporate strategy, climate change, and oil multinationals', *European Management Journal*, 19: 501–9.
- Kraft, M.E. and Vig, N.J. (1984) 'Environmental policy in the Reagan Presidency', *Political Science Quarterly*, 99: 415–39.

- Lahsen, M. (1999) 'The detection and attribution of conspiracies: the controversy over Chapter 8', in G.E. Marcus (ed.) *Paranoia Within Reason: A Casebook on Conspiracy as Explanation*, Chicago, IL: University of Chicago Press, pp. 111–36.
- (2005) 'Technocracy, democracy, and U.S. climate politics', *Science, Technology and Human Values*, 30: 137–69.
- (2008) 'Experiences of modernity in the greenhouse', *Global Environmental Change*, 18: 204–19.
- Layzer, J. (2007) 'Deep freeze', in M.E. Kraft and S. Kamieniecki (eds) *Business and Environmental Policy*, Cambridge, MA: MIT Press, pp. 93–125.
- Lewis, J. (2009) 'Making it up in global warming theory', *American Thinker*, available http://www.americanthinker.com/2009/09/making_it_up_in_global_warming.html. Accessed 8 September 2009.
- Lindzen, R.S. (2008) 'Climate science: is it currently designed to answer questions?' Paper presented at the conference on Creativity and Creative Inspiration in Mathematics, Science, and Engineering, San Marino, Italy, August.
- Lomborg, B. (2001) *The Sceptical Environmentalist*, Cambridge: Cambridge University Press.
- McCright, A.M. and Dunlap, R.E. (2000) 'Challenging global warming as a social problem', *Social Problems*, 47: 499–522.
- (2003) 'Defeating Kyoto: the conservative movement's impact on U.S. climate change policy', *Social Problems*, 50: 348–73.
- (2010) 'Anti-reflexivity: the American conservative movement's success in undermining climate science and policy', *Theory, Culture, and Society*, 27: in press.
- Mertig, A.G., Dunlap, R.E. and Morrison, D.E. (2002) 'The environmental movement in the United States', in R.E. Dunlap and W. Michelson (eds) *Handbook of Environmental Sociology*, Westport, CT: Greenwood Press, pp. 448–81.
- Michaels, D. (2008) *Doubt Is Their Product*, New York: Oxford University Press.
- Michaels, P.J. and Balling, R.C., Jr. (2000) *The Satanic Gases: Clearing the Air about Global Warming*, San Francisco, CA: CATO Institute.
- Milbrath, L.W. (1984) *Environmentalists: Vanguard for a New Society*, Albany, NY: SUNY Press.
- Mooney, C. (2005a) 'Some like it hot', *Mother Jones*, May/June: 36–49.
- (2005b) *The Republican War on Science*, New York: Basic Books.
- Oreskes, N. and Conway, E.M. (2008) 'Challenging knowledge: how climate science became a victim of the cold war', in R.N. Proctor and L. Schiebinger (eds) *Agnology: The Making and Unmaking of Ignorance*, Stanford, CA: Stanford University Press, pp. 55–89.
- Oreskes, N., Conway, E.M. and Shindell, M. (2008) 'From Chicken Little to Dr. Pangloss: William Nierenberg, global warming, and the social deconstruction of scientific knowledge', *Historical Studies in the Natural Sciences*, 38: 109–52.
- Peterson, T.C., Connolley, W.M. and Fleck, J. (2008) 'The myth of the 1970s global cooling scientific consensus', *Bulletin of the American Meteorological Society*, 89: 1325–37.
- Pulver, S. (2007) 'Making sense of corporate environmentalism', *Organization and Environment*, 20: 44–83.
- Rahmstorf, S. (2005) 'The climate sceptics', in Munich Re Group (ed.) *Weather Catastrophes and Climate Change*, Munich, Germany: Munchener Ruckversicherungs-Gesellschaft, pp. 76–83.
- Schmidt, A.S. (2008) *Deb and Seby's Real Deal on Global Warming*, Bloomington, IN: AuthorHouse.
- Schnaiberg, A. (1980) *The Environment*, New York: Oxford University Press.
- Simon, J. (1981) *The Ultimate Resource*, New Haven, CT: Yale University Press.
- Singer, S.F. and Idso, C.D. (2009) *Climate Change Reconsidered: The 2009 Report of the Nongovernmental International Panel on Climate Change (NIPCC)*, Chicago, IL: The Heartland Institute.
- Switzer, J.V. (1997) *Green Backlash*, Boulder, CO: Lynne Rienner Publishers.

- Union of Concerned Scientists (2007) *Smoke, Mirrors, and Hot Air*, Cambridge, MA: Union of Concerned Scientists.
- Wolcott, J. (2007) 'Rush to judgment', *Vanity Fair*, May: 100–6.
- Yearley, S. (1991) *The Green Case: A Sociology of Environmental Issues, Arguments, and Politics*, London: HarperCollins Academic.

