



# ODYSSEY IN CLIMATE MODELING, GLOBAL WARMING, AND ADVISING FIVE PRESIDENTS

THIRD EDITION



DR. WARREN M. WASHINGTON  
EDITED BY MARY C. WASHINGTON

# Odyssey In Climate Modeling Global Warming And Advising Five Presidents

**Syukuro Manabe, Anthony J. Broccoli**



## **Odyssey In Climate Modeling Global Warming And Advising Five Presidents:**

**Odyssey in Climate Modeling, Global Warming, and Advising Five Presidents** Warren M. Washington, 2007-05 Warren M. Washington Senior Scientist at the National Center for Atmospheric Research in Boulder Colorado was among the first scientists to pioneer the development of climate models that are used for evaluation of humankind's impact on the global environment. His modeling work has helped understand climate change including global warming. Over the last 30 years he has had Presidential Appointments under the Carter, Reagan, Clinton, and G. W. Bush administrations and he has served on many science committees and the including National Science Board which he chaired from 2002 to 2006. He is a former President of the American Meteorological Society and a member of both the National Academy of Engineering and the American Philosophical Society. This autobiography provides information about how he became a scientist and his insights into science policy. Throughout the book footnotes and internet web sites are used where more information is provided.

## **Odyssey in Climate Modeling, Global Warming, and Advising Five Presidents** Warren M. Washington, 2008

**NASA's Strategic Direction and the Need for a National Consensus** National Research Council, Division on Engineering and Physical Sciences, Committee on NASA's Strategic Direction, 2013-01-02. The National Aeronautics and Space Administration (NASA) is widely admired for astonishing accomplishments since its formation in 1958. Looking ahead over a comparable period of time, what can the nation and the world expect of NASA? What will be the agency's goals and objectives and what will be the strategy for achieving them? More fundamentally, how will the goals, objectives, and strategy be established and by whom? How will they be modified to reflect changes in science, technology, national priorities, and available resources? In late 2011, the United States Congress directed the NASA Office of Inspector General to commission a comprehensive independent assessment of NASA's strategic direction and agency management. Subsequently, NASA requested that the National Research Council (NRC) conduct this independent assessment. In the spring of 2012, the NRC Committee on NASA's Strategic Direction was formed and began work on its task. The committee determined that only with a national consensus on the agency's future strategic direction along the lines described in the full NRC report can NASA continue to deliver the wonder, the knowledge, the national security, and economic benefits and the technology that have been typified by its earlier history. **NASA's Strategic Direction and the Need for a National Consensus** summarizes the findings and recommendations of the committee.

**The Development of Atmospheric General Circulation Models** Leo Donner, Wayne Schubert, Richard Somerville, 2011. Presents unique perspectives from leading researchers on the development and application of atmospheric general circulation models. It is a core reference for academic researchers and professionals involved in atmospheric physics, meteorology, and climate science and a resource for graduate-level courses in climate modeling and numerical weather prediction.

**Climate Change in Practice** Robert L. Wilby, 2017-04-13. This accessible book challenges and provokes readers by posing a series of topical questions concerning climate change and society. With topic

summaries practical exercises case studies and various online resources it is ideal for students of geography natural science engineering and economics and practitioners in the climate service industry      The Routledge History of American Science Timothy W. Kneeland, 2022-12-01 The Routledge History of American Science provides an essential companion to the most significant themes within the subject area The field of the history of science continues to grow and expand into new areas and to adopt new theories to explain the role of science and its connections to politics economics religion social structures intellectual history and art This book takes North America as its focus and explores the history of science in the region both nationally and internationally with 27 chapters from a range of disciplines Part I takes a chronological look at the history of science in America from its origins in the Atlantic World through to the American Revolution the Civil War the World Wars and ending in the postmodern era Part II discusses American science in practice from scientists as practitioners laboratories and field experiences to science and religion Part III examines the relationship between science and power The chapters touch on the intersection of science and imperialism environmental science in U S politics as well as capitalism and science Finally Part IV explores how science is embedded in the culture of the United States with topics such as the growing importance of climate science the role of scientific racism the construction of gender and how science and disability studies converge The final chapter reviews the way in which society has embraced or rejected science with reflections on the recent pandemic and what it may mean for the future of American science This book fills a much needed gap in the history and historiography of American science studies and will be an invaluable guide for any student or researcher in the history of science in America      **The Republican Reversal** James Morton Turner, Andrew C. Isenberg, 2018-11-12 Not long ago Republicans took pride in their tradition of environmental leadership The GOP helped create the EPA extend the Clean Air Act and protect endangered species Today Republicans denounce climate change as a hoax and seek to dismantle environmental regulations What happened James Morton Turner and Andrew C Isenberg provide answers      *Beyond Global Warming* Syukuro Manabe, Anthony J. Broccoli, 2020 A definitive account of how we have come to understand the fundamental processes behind global warming Syukuro Manabe is perhaps the leading pioneer of modern climate modeling Beyond Global Warming is his compelling firsthand account of how the scientific community came to understand the human causes of climate change and how numerical models using the world's most powerful computers have been instrumental to these vital discoveries Joined by atmospheric scientist Anthony Broccoli Manabe shows how climate models have been used as virtual laboratories for examining the complex planetary interactions of atmosphere ocean and land Manabe and Broccoli use these studies as the basis for a broader discussion of human induced global warming and what the future may hold for a warming planet They tell the stories of early trailblazers such as Svante Arrhenius the legendary Swedish scientist who created the first climate model of Earth more than a century ago and they provide rare insights into Manabe's own groundbreaking work over the past five decades Expertly walking readers through key breakthroughs they explain why

increasing atmospheric carbon dioxide has caused temperatures to rise in the troposphere yet fall in the stratosphere why the warming of the planet's surface differs by hemisphere why drought is becoming more frequent in arid regions despite the global increase in precipitation and much more Authoritative and illuminating Beyond Global Warming is an invaluable insider's look at some of today's most cutting edge Earth science and a rare window into a brilliant scientific mind

**Global Change** Georg Götze, 2012-01-04 The book consists of interviews with leading climate scientists Experts on different aspects of the topic explain their own field and give their opinion on general questions concerning climate change The interviews cover both fundamental research climate modeling global warming sea level change melting of the ice caps natural hazards and impact assessment adaption mitigation economic impacts and costs of climate change The goal is to provide the reader with first hand information on the current state of climate research *The Climate Caper* Garth W. Paltridge, 2010-06-16 So you think the theory of disastrous climate change has been proven You believe scientists are united in their efforts to affect a reduction in carbon emissions You trust that scientists are far too professional to overstate their case Maybe we should all think again In *The Climate Caper* written with a light touch and a readable manner Garth Paltridge shows that the case for action against climate change is not nearly so clear cut after all He leads us through the inherent problems of the climate modeling process as well as the uncertainties associated with economic forecasts of climatic doom Paltridge uncovers the conscious and subconscious forces that hide skepticism within the scientific community from the public eye and submit governments to a scientific and technological elite an elite that achieves its ends by manipulating the public through fear of climate change creating the world's greatest example of a religion for the politically correct **The Presidents and the Planet** Jay Hakes, 2024-08-05 *The Presidents and the Planet* recounts the story of the world's greatest environmental dilemma through the eyes of early climate change pioneers It begins in the 1950s when American scientists first warned about the risks of pollution altering the natural climate in dramatic ways the national media began covering the matter and experts first offered testimony to congressional committees on the topic The story ends in the early 1990s by which time global efforts to confront the challenge were advancing while political turmoil had begun to undermine U S leadership's ability to address current and future environmental threats While some early proponents endorsing climate action are well known many of the major players have gone largely unrecognized The oceanographer Roger Revelle exerted influence on eight White Houses during his life and even one after his death when his former student Al Gore assumed the office of vice president William Nordhaus had already written seminal studies on climate change when President Jimmy Carter appointed him to the Council of Economic Advisors Four decades later the Yale professor won the Nobel Prize in economics for his work on the subject John Chafee a Republican from Rhode Island chaired the Senate's first committee on the problem and provided concrete solutions to face the dangers of a warming planet during the Reagan administration The drama reached a full pitch during the George H W Bush years as vocal advocates for climate action and staunch foes of

government regulation wrestled over the direction of U S energy and environmental policy To better trace the evolving climate debate in America author Jay Hakes inspected the archives and writings of prominent scientists and the pivotal reports of the National Academy of Sciences and traveled to presidential libraries to discover how commanders in chief and their science economic and political advisors addressed the issue The Presidents and the Planet affords fresh perspectives that will alter the public s understanding of when officials first grasped the dire consequences of climate change

**A Vast Machine** Paul N. Edwards, 2010-03-12 The science behind global warming and its history how scientists learned to understand the atmosphere to measure it to trace its past and to model its future Global warming skeptics often fall back on the argument that the scientific case for global warming is all model predictions nothing but simulation they warn us that we need to wait for real data sound science In A Vast Machine Paul Edwards has news for these skeptics without models there are no data Today no collection of signals or observations even from satellites which can see the whole planet with a single instrument becomes global in time and space without passing through a series of data models Everything we know about the world s climate we know through models Edwards offers an engaging and innovative history of how scientists learned to understand the atmosphere to measure it trace its past and model its future

[The Discovery of Global Warming](#) Spencer R. Weart, 2003 In 2001 a panel representing virtually all the world s governments and climate scientists announced that they had reached a consensus the world was warming at a rate without precedent during at least the last ten millennia and that warming was caused by the buildup of greenhouse gases from human activity The consensus itself was at least a century in the making The story of how scientists reached their conclusion by way of unexpected twists and turns and in the face of formidable intellectual financial and political obstacles is told for the first time in The Discovery of Global Warming Spencer R Weart lucidly explains the emerging science introduces us to the major players and shows us how the Earth s irreducibly complicated climate system was mirrored by the global scientific community that studied it Unlike familiar tales of Science Triumphant this book portrays scientists working on bits and pieces of a topic so complex that they could never achieve full certainty yet so important to human survival that provisional answers were essential Weart unsparingly depicts the conflicts and mistakes and how they sometimes led to fruitful results His book reminds us that scientists do not work in isolation but interact in crucial ways with the political system and with the general public The book not only reveals the history of global warming but also analyzes the nature of modern scientific work as it confronts the most difficult questions about the Earth s future

Table of Contents Preface 1 How Could Climate Change 2 Discovering a Possibility 3 A Delicate System 4 A Visible Threat 5 Public Warnings 6 The Erratic Beast 7 Breaking into Politics 8 The Discovery Confirmed Reflections Milestones Notes Further Reading Index Reviews of this book A soberly written synthesis of science and politics Gilbert Taylor Booklist Reviews of this book Charting the evolution and confirmation of the theory of global warming Spencer R Weart director of the Center for the History of Physics of the American Institute of Physics dissects the interwoven threads of research and

reveals the political and societal subtexts that colored scientists' views and the public reception their work received. Andrew C. Revkin, *New York Times Book Review*. Reviews of this book: It took a century for scientists to agree that gases produced by human activity were causing the world to warm up. Now in an engaging book that reads like a detective story, physicist Spencer Weart reports the history of global warming theory, including the internal conflicts plaguing the research community and the role government has had in promoting climate studies. Publishers Weekly. Reviews of this book: It is almost two centuries since the French mathematician Jean Baptiste Fourier discovered that the Earth was far warmer than it had any right to be, given its distance from the Sun. Spencer Weart's book about how Fourier's initially inconsequential discovery finally triggered urgent debate about the future habitability of the Earth is lucid, painstaking, and commendably brief, packing everything into 200 pages. Fred Pearce, *The Independent*. Reviews of this book: *The Discovery of Global Warming* is a well-written, well-researched and well-balanced account of the issues involved. This is not a sermon for the faithful or verses from Revelation for the evangelicals, but a serious summary for those who like reasoned argument. Read it and be converted. John Emsley, *Times Literary Supplement*. Reviews of this book: This is a terrific book. Perhaps the finest compliment I could give this book is to report that I intend to use it instead of my own book for my climate class. *The Discovery of Global Warming* is more up-to-date, better balanced, historically beautifully written, and not least important, short and to the point. I think the Intergovernmental Panel on Climate Change needs to enlist a few good historians like Weart for its next assessment. Stephen H. Schneider, *Nature*. Reviews of this book: This short, well-written book by a science historian at the American Institute of Physics adds a serious voice to the overheated debate about global warming and would serve as a great starting point for anyone who wants to better understand the issue. Maureen Christie, *American Scientist*. Reviews of this book: I was very pleasantly surprised to find that Spencer Weart's account provides much valuable and interesting material about how the discipline developed, not just from the perspective of climate science but also within the context of the field's relation to other scientific disciplines, the media, political trends, and even 20th-century history, particularly the Cold War. In addition, Weart has done a valuable service by recording for posterity background information on some of the key discoveries and historical figures who contributed to our present understanding of the global warming problem. Thomas J. Crowley, *Science*. Reviews of this book: Weart has done us all a service by bringing the discovery of global warming into a short, compendious, and persuasive book for a general readership. He is especially strong on the early days and the scientific background. Crispin Tickell, *Times Higher Education Supplement*. A Capricious Beast: Ever since the days when he had trudged around fossil lake basins in Nevada for his doctoral thesis, Wally Broecker had been interested in sudden climate shifts. The reported sudden jumps of CO<sub>2</sub> in Greenland ice cores stimulated him to put this interest into conjunction with his oceanographic interests. The result was a surprising and important calculation. The key was what Broecker later described as a great conveyor belt of seawater carrying heat northward. The energy carried to the neighborhood of Iceland was staggering. Broecker realized nearly a third as much as the

Sun sheds upon the entire North Atlantic If something were to shut down the conveyor climate would change across much of the Northern Hemisphere There was reason to believe a shutdown could happen swiftly In many regions the consequences for climate would be spectacular Broecker was foremost in taking this disagreeable news to the public In 1987 he wrote that we had been treating the greenhouse effect as a cocktail hour curiosity but now we must view it as a threat to human beings and wildlife The climate system was a capricious beast he said and we were poking it with a sharp stick I found the book enjoyable thoughtful and an excellent introduction to the history of what may be one of the most important subjects of the next one hundred years Clark Miller University of Wisconsin The Discovery of Global Warming raises important scientific issues and topics and includes essential detail Readers should be able to follow the discussion and emerge at the end with a good understanding of how scientists have developed a consensus on global warming what it is and what issues now face human society Thomas R Dunlap Texas A M University

**The Rise of Climate Science** Gerald R. North, 2020-10-21 In a career spanning four decades Gerald R North contributed groundbreaking research that continues to shape the modern field of climate science However the route he has taken was full of surprising twists and turns that included hate mail eavesdropping by the KGB and sometimes acrimonious debate with climate change deniers North's significant contributions to the field include his innovative toy model analysis of climate change based on ingeniously simplified models and his lead proposal for and successful approval of the Tropical Rainfall Measuring Mission TRMM satellite Launched in 1997 the TRMM's purpose was to collect data on the global climate system The TRMM operated successfully for 17 years before it was deactivated in 2015 In *The Rise of Climate Science* North recounts in detail his life in the vanguard of modern climate science He offers an insider look at the academic research and government initiatives around global warming and what that means for the planet He includes stories of conversations with top Soviet climate scientists at the height of the Cold War in the late 1970s complete with clandestine electronic surveillance He also describes the experience of testifying before Congress and engaging in public exchanges with those who doubted the reality of the phenomenon his research field described Climatology today has advanced into a mature phase This book is an important contribution to understanding its development in the twentieth century and adds a distinctly human face and sensibility to the ongoing societal conversation around climate change and its implications for our future

*Lukewarming* Patrick J. Michaels, Paul C. Knappenberger, 2015-10-29 If you could wave a magic wand and make one or two policy or institutional changes to brighten the U S economy's long term growth prospects what would you change and why That was the question asked to the 51 contributors to this volume These essays originally appeared in conjunction with a conference on the future of U S economic growth held at the Cato Institute in December 20014 Brink Lindsey Vice President for Research at the Cato Institute and editor of this volume is pleased to share this insightful and provocative collection with a new audience The motivation for asking that question should be clear enough to anyone who has been following the dreary economic news of the past few



years Since the Great Recession of 2008 2009 the U S economy has experienced the most stubbornly disappointing expansion since World War II Reviving Economic Growth offers a wide ranging exploration of policy options from an eclectic group of contributors Think of this collection as a brainstorming session not a blueprint for political action By bringing together thinkers one doesn't often see in the same publication the editor's hope is to encourage fresh thinking about the daunting challenges facing the U S economy and with luck to uncover surprising areas of agreement that can pave the way to constructive change

**Science as a Contact Sport** Stephen H. Schneider, 2009-11-03 Schneider persuasively outlines a plan to avert the building threat and develop a positive practical policy that will bring climate change back under our control help the economy with a new generation of green energy jobs and productivity and reduce the dependence on unreliable exporters of oil and thus ensure a future for ourselves and our planet that's as rich with promise as our past

Man-made Global Warming Hans H. J. Labohm, Simon Rozendaal, Dick Thoenes, 2004 These three Dutchmen respectively an international relations expert a scientific journalist and a chemical engineer past chairman of the Royal Netherlands Chemical Society form part of that growing body of reasonable and qualified people who feel unease at the claims of scientific consensus on climate change and wonder at the policies flowing from those claims If the science is flawed plainly the policies are too Worldwide billions of public money will be mis spent unnecessary costs placed on existing industry new industrial development hampered Together these three authors are well placed to point up the weaknesses in the scientific argument that global warming is a man made phenomenon and are able to analyse that murky place where the needs for recognition research grants and votes all come together Could it really be the case that the global warming crisis is really as much about careers and power as anything else

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Climatology Versus Pseudoscience Dana Nuccitelli, This book explains the science of climate change in plain language and shows that the 2 to 4 percent of climate scientists who are skeptical that humans are the main cause of global warming are a fringe minority and have a well established history of being wrong Although some politicians pundits and members of the public do not believe it global warming predictions by mainstream climate scientists have been remarkably accurate while those made by climate deniers have not And if mainstream global warming predictions continue to prove correct the window of opportunity to prevent a climate catastrophe is quickly closing This book is the first to illustrate the accuracy and inaccuracy of global warming predictions made by mainstream climate scientists and by climate contrarians from the 1970s to the present day Written in simple non technical language that provides an accessible explanation of key climate science concepts the book will appeal to general audiences without previous knowledge about climate science Author Dana Nuccitelli an environmental scientist and risk assessor discusses some key climate discoveries dating back to the 19th century and debunks myths such as the idea that climate scientists and climate models have grossly over predicted global warming He addresses recent findings of a 97 percent consensus in the peer reviewed scientific literature that humans are

causing global warming a nearly unanimous agreement that formed in the early 1990s and has grown through the present day Nuccitelli also discusses what the future climate might look like if current trends continue unabated and what we as a global society need to do to prevent a climate catastrophe

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