The Dilemma of Reticence: Helmut Landsberg, Stephen Schneider, and public communication of climate risk, 1971-1976

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> "Most of the crucial issues of human survival that will confront humanity over the next few decades will call for ethical and political value judgments – decisions on how to act in the face of uncertainties. … Human value judgments are too important to be left exclusively to the experts." – Stephen Schneider[1]

> "Science is not as objective as some people think. Often human value judgments (or even prejudices) make things move as much as curiosity or the search for answers as to 'why.'" – Helmut Landsberg[2]

During the tumultuous mid-1970s, when energy and food shortages, environmental pollution, and political instability induced suspicions that America was increasingly susceptible to increased climatic instability, American climatologists Helmut Landsberg and Stephen Schneider disagreed strongly on whether scientists should engage the public about the future risks and urgency of climate change. On the one hand, Schneider, a young climate modeler with the National Center for Atmospheric Research (NCAR), expressed explicitly an unwillingness to embrace reticence as an appropriate response to the risks of climate change. To illustrate the gravity of the situation, he frequently resorted to vivid and frightening metaphors to convince the public and policy makers that

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[1] Stephen Schneider and Lynne Mesirow. *The Genesis Strategy: Climate and Global Survival* (Plenum Publication Corp., 1976).

[2] Landsberg to Toni Gerber, 15 November 1977, Series 3, Box 10, Papers of Helmut Landsberg, University of Maryland-College Park, hereafter referred to as PHL.

his sense of urgency was warranted. Ranging from wolves lurking in the forest to a large ship heading toward an iceberg to Russian roulette, he fashioned climate change as an object of fear that – without proper preventative measures – could overwhelm the defenses of society. Relying heavily on computer-based climate models to justify his concerns, Schneider joined a growing chorus of concerned scientists who adopted the role of an environmental advocate. Passionate for change, he pushed for national and international policies that would expand the margins of safety and reduce the effects of detrimental climatic conditions on the global food supply. An idea embodied in his 1976 manifesto *The Genesis Strategy*, he cautioned against a wait-and-see attitude to global problems and chastised those who he believed were complacent "global survival gamblers" who risked the welfare of future human civilization. While he cautioned his audience that his science-based claims were distinct from his political and philosophical judgments – a practice he believed would protect his credibility as a professional scientist – the meaning of these distinctions collapsed from the perspective of his detractors who believed that he was acting more like a celebrity than a scientist.[3]

One of the most notable detractors of the period was Helmut Landsberg, a much older world-renowned climatologist employed with the University of Maryland Institute for Fluid Dynamics and Applied Mathematics in College Park, MD. Frustrated with what appeared to be an activist spirit motivating socially-aware scientists like Schneider, Landsberg believed that scientists who studied the climate should stay out of the spotlight given what he considered to be a myriad of scientific uncertainties about the causes of climatic change. Concerned about the credibility of climatology as a professional discipline given his own role in its maturation since the 1940s, Landsberg cast considerable doubt on the validity of relying on computer-based models to inform policy makers and the general public. Unless one could adequately quantify the scientific uncertainties that underlay scientific claims based on models, he believed that reticence was the only appropriate course of action until such uncertainties could be identified and resolved. Staying behind closed doors, cautiously hedging one's claims by quantifying and emphasizing scientific uncertainty, and diligently collecting and analyzing data to resolve such uncertainties were hallmark characteristics of what he envisioned to be a professional atmospheric scientist.

On the face of it, the issue of reticence seems relatively benign given what may appear to be an intuitive answer from a more contemporary vantage point. Of course, one may argue with little pause, Schneider was right in his advocacy for more publicly-engaged scientists to inform the public about the high stakes of climate change and the potential collapse of western civilization.[4] Yet, why would two climatologists – admittedly of very different backgrounds and experiences –

[3] During the 1960s and 1970s, the professional identity of ecology also underwent a profound shift with regard to proper levels of public engagement. See, Dorothy Nelkin, "Ecologists and the Public Interest," *The Heritage Hastings Report* 6, 1 (February 1976): pp. 38-44. Also, see a summary of the ESA report within Richard Miller and John Reed, "Summary Report of the Ecology Study Committee with Recommendations for the Future of Ecology and the Ecological Society of America," *Bulletin of the Ecological Society of America* 46, 2 (July 1965): pp. 61-82.

[4] Naomi Oreskes and Erik Conway. *The Collapse of Western Civilization: A View from the Future* (New York: Columbia University Press, 2014).

disagree during a time when American society was primed to advance policies to minimize the costs of climate change and avert potential disaster?[5] To problematize what at first appears to be an intuitive need for scientists to engage the public, this article examines reticence under the light of historical inquiry. By examining closely the beliefs of Landsberg and Schneider within the context of the environmentally-conscious 1970s, one immediately realizes that the decision to speak out publicly had important ramifications for how scientists envisioned themselves as responsible gatekeepers of knowledge and participants in an always changing society – an issue that continues to resonate in the highly contentious climate politics of the present day.

Reticence as Problematic in Contemporary Climate Politics

Two years after former US Vice President Al Gore addressed the world with his 2006 documentary *An Inconvenient Truth,* his friend and colleague in climate advocacy, James Hansen, a climate modeler and Director of the NASA Goddard Institute of Space Studies, spoke about the need for scientists to speak publicly about the calamitous risks of climate change. Passionate about the role of outspoken scientists in steering society away from future dangers, figures like Hansen and Gore believed that their actions must compensate for what appears to be a general bias within the atmospheric science community to remain conservative and reticent. "Well, scientists are naturally reticent, I think," spoke Hansen on January 8, 2008 during an interview with Terry Gross on National Public Radio's (NPR) show, *Fresh Air*.[6] Hansen's comment was not off-the-cuff, but rather a deliberate acknowledgement of what he considered to be the dangers of reticence within the scientific community – a topic on which he had recently written at length. Within a paper in *Environmental Research Letters* entitled "Scientific Reticence and Sea Level Rise," Hansen accepted that scientific reticence may have been a consequence of the natural skepticism implicit within the practice of science. He used this largely academic forum, however, to warn policymakers that "excessive caution" by individual scientists may secure humanity's fate in light of the risks of climate change (e.g. sea level rise; collapsing ice sheets). "We may rue reticence, if it serves to lock in future disasters," he cautioned.[7]

In the wake of Hansen's claims about reticence in 2007/08, science journalists Mark Buchanan and Philip Ball took it upon themselves to discuss whether reticence was an outdated norm in light of the risks of anthropogenic climate change. Buchanan, a physicist and monthly columnist for the journal *Nature Physics*, argued that reticence may be appropriate when addressing specific or technical aspects of climatic change but may be inappropriate when addressing general ideas that are already well-grounded in science. "One can be cautious about mechanisms and outcomes," he suggested, "but far more vocal on general points that seem beyond dispute." While he failed to specify what he meant by 'general points,' he challenged what he called "linear

[5] Beginning in 1974, the U.S. Government began to introduce seminal legislation designed to deal with the effects of climate change in American society. Passed in 1978 under Jimmy Carter, the National Climate Program Act solidified climate as a political issue.

[6] Interview with Mark Bowen and James Hansen, Fresh Air, 8 January 2008.

[7] See, James Hansen, "Scientific Reticence and Sea Level Rise," *Environmental Research Letters* 2, 2 (April-June 2007). For further reflections, see James Hansen. *Storms of my Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity* (New York: Bloomsbury, 2009).

thinking" that appears to dominate discussions of climate change, and called for a reframing of future climatic effects not as "irresponsible hysteria" but as "plausible speculation." For him, the facts of the case – while not known in every detail – allows room to call into the question the virtue of staying silent given the dangers of disturbing a highly nonlinear system like the global atmosphere.[8]

On the other hand, Philip Ball, a freelance science writer, argued in *Nature* that reticence among climate scientists appears to have grown "out of fashion." Ball begins with the question of whether the abandonment of reticence is good for science – a practice that he defines as the "the stock-and-trade of good science." While he reasoned that Hansen has the right to voice his beliefs as an individual citizen, Ball points out that he should not consider himself a public spokesperson of the scientific community if a majority of his peers appear more conservative in their claims than him (e.g. the Intergovernmental Panel on Climate Change, IPCC). That Hansen is so unique in his public behaviors and statements provides an opportunity to ask whether he does, in fact, have a monopoly on what is best. Indeed, Ball argues, if scientists were to abandon their allegiance to caution and reticence – the very things that distinguish science from politics or sensationalism in the popular press – then climate science "ceases to be true science."[9] Ultimately, Ball seems to assert an inherent need to balance a respect for the value of reticence as a way to protect the integrity of scientific practice while acknowledging the risks of abandoning reticence for the sake of what some perceive to be the greater good.

More recently, historians of science have begun to examine the role of reticence within American climate science community. According to Naomi Oreskes, Keynyn Brysse, Jessica O'Reilly and Michael Oppenheimer, climate scientists have traditionally privileged what it deems to be cautious claims in order to avoid or reduce suspicions that they are acting as anything other than professional scientists – what they call "erring on the side of least drama" (ESLD). In doing so, scientists pose a unique kind of risk to the future state of humanity. As they describe,

> ESLD provides a context for interpreting scientists' assessments of risk-laden situations, a challenge faced by the public and policy-makers. In attempting to avoid drama, the scientific community may be biasing its own work – a bias that needs to be appreciated because it could prevent the full recognition, articulation, and acknowledgment of dramatic natural phenomena that may, in fact, be occurring. After all, some phenomena in nature are dramatic.[10]

While Oreskes, Ball, Buchanan, and Hansen all agree that reticence has a deep tradition in climate science, there seems to be disagreement among historians, scientists, and science journalists regarding whether the threat of climate change provides an opportunity for scientists to abandon

[8] Mark Buchanan, "Less Reticence on Nonlinear Climate Change," *Nature Physics* 3 (2007): p. 291.
[9] Philip Ball, "When Its Right to be Reticent," *Nature*, 29 March 2007, http://www.nature.com/news/2007/070329/full/news070326-11.html#B3, last accessed 11 September 2014.
[10] Naomi Oreskes, Keynyn Brysse, Jessica O'Reilly and Michael Oppenheimer, "Climate Change Prediction: Erring on the Side of Least Drama?" *Global Environmental Change*, 23 (2012): pp. 327-337, quote on p. 335.

reticence as a norm of behavior. Should scientists be more outspoken about the dangers of climate change (e.g. Hansen) or should they continue to adhere to a norm that seems well entrenched but possibly irrelevant at best and dangerous at worst? While this issue has percolated to the surface in recent years, it behooves society to evaluate whether such disagreements are embedded in longer patterns in the history of science. Certainly, as this article shows, present discussions about reticence are not unprecedented. By examining the history of disputes about reticence within the climate science community in the mid-1970s, and particularly the two distinctive visions offered by Landsberg and Schneider, one may be in a better position to understand and appreciate the costs that accompany either course of action during a time when climatology itself was stepping on the public stage for the first time.

Climatology as Emerging Discipline in America

During the first half of the twentieth century, the study of the climate appears to have been a relatively uninspiring scientific pursuit. "Through the first half of the twentieth century," argues historian Spencer Weart, "climate science was a sleepy backwater. People who called themselves 'climatologists' were mostly drudges who kept track of average seasonal temperatures, rainfall, and the like."[11] In some respects, the drudge-like conditions of those who were committed to studying the climate reflected a distinctive lack of professional development and understanding of the global climate system. Climatologist C.E.P. Brooks quipped in 1950, for instance, that there were "at least nine and sixty ways of constructing a theory of climatic change, and there is probably some truth in quite a number of them."[12] From changes in elements of the Earth's orbit around the sun, to changes in solar radiation, to changes in atmospheric composition, researchers could not effectively account using a single theory for climatic variability on short-term and long-term time scales. Equally frustrating for those who sought to study the climate professionally was the lack of a uniform definition of the term 'climate.' While the International Meteorological Organization defined 'climate' in 1935 as the average state of meteorological conditions as recorded over a standard period of thirty years (1901-1930), climatologist Helmut Landsberg remarked in 1950 that climate is "a rather elusive entity. There are at least twenty different definitions of the term climate."[13] This lack of consensus regarding the causes and mechanisms of climate change as well as the lack of concise and widely-accepted definition of climate contributed to an underlying sense that climatology was merely mundane grunt work.

As a testimonial to the relatively depressed state of affairs, climatologists were also fairly reserved when it came to public engagement. Unlike meteorologists who were often approached to comment publicly on the frequency and causes of weather phenomena that directly effected of human lives, such as studying tornadoes, hurricanes, or lightning storms, those who studied the climate – Weart's "drudges" who tended to exist in the backrooms of organizations like the U.S. Weather Bureau – had little opportunity to study things that could be seen as directly relevant to the

[11] Spencer Weart. *Discovery of Global Warming* (Cambridge: Harvard University Press, 2008): p. 10.
[12] C.E.P. Brooks, *Climate Through the Ages: A Study of the Climatic Factors and Their Variations* (New York: McGraw-Hill, 1949).
[13] Helmut Landsberg, "Climatic Analysis and Climatic Fluctuation," 4 August 1950, Series 3, Box 3, PHL.

short-term needs of society. Climate was considered a humble topic of scientific interest in that it resided beneath the rapid and occasionally threatening daily variations of weather frequently discussed and sensationalized in popular media. As articulated in 1961, for instance,

> Climatology is not a glamorous field. It does not produce what the newspaper jargon applied to science calls 'exciting discoveries' or 'spectacular breakthroughs.' Improved knowledge in this field will, however, assure better living for mankind … These 'bread and butter' goals may not fire the imagination nor kindle much enthusiasm but they will help us to the necessities of life.[14]

According to this account, climatology was indeed a mundane scientific pursuit but not because it was uninteresting to those who studied the climate. Rather, climate was mundane by design; studying the climate was like studying what historian Roger Turner calls "infrastructural sciences," which he defines as a set of organizationally intensive, but purposefully invisible, applied sciences.[15]

Despite such humble beginnings, the 1960s and 70s acted as a sea change for the professional development of climatology as a scientific discipline. Landsberg, for instance, surmised in the early 1980s – and not without a mild tone of regret – that climate had undergone a dramatic shift in importance due to what he considered to be a rise of concern over global food production and population growth. As he characterized with the benefit of hindsight,

> In recent years much has been written and said about climatic change – perhaps too much. There are two principal reasons for this, in a field which only two decades ago was regarded by many meteorologists as a backwater. One reason is that in a crowded world, already dangerously overpopulated in some regions, poor harvests caused by adverse weather can mean famine and even death. The other reason is the fear, not without justification, that people by their activities are altering the atmosphere to such an extent as to cause local and even global climatic changes.[16]

Coinciding with the professional development of climatology and the existence of fears and anxieties about population growth and anthropogenic climate change was a convergence of researchers from other disciplines into climate-related research areas. Specialists from many disciplines historically tangential to climate research began to converge on the topic of climate out of a blend of curiosity, ambition, and an appreciation for the challenge of overcoming the complexities involved in studying the global atmospheric system.[17] In the wake of the International Geophysical Year in 1957/58 and the Global Atmospheric Research Program (GARP) in the 1960s

[14] "Outline for Climatology, 1961-1970." U.S. Department of Commerce, 1961. This document is available in Series 3, Box 7, PHL.
[15] Roger Turner, "Weather Heights: The Emergence of Aeronautical Meteorology as an Infrastructural Science" (2010). *Publicly accessible Penn Dissertations*. Paper 147.
[16] Helmut Landsberg, "Use of Early Weather Records," *Weatherwise* 34, 5 (October 1981): pp. 197-203.
[17] Spencer Weart, "Rise of Interdisciplinary Research on Climate," P*roceedings of the National Academy of Sciences* 110, 1 (26 February 2013): pp. 3657-64.

and 1970s, scientists were provided a set of tools that had been previously unavailable to study the global atmosphere. The expansion of weather observation networks alongside advancements in technology – radiosondes; rockets; meteorological satellites – provided grounds for believing that the enormous complexities of climatic systems could be overcome using sophisticated mathematics and technological prowess. This was both an opportunity and a problem for climatologists: while rapid changes in technology provided scientists from many different disciplines an enormous wealth of data about the natural world, translating that data into useful knowledge for theory-building lagged behind significantly. Awash in the potential, Landsberg himself seemed optimistic about the potential of computers to advance the field in the late 1960s: "I have full faith in the computer and would not want to go back to the days before it."[18]

Between 1950 and 1970, climate had become for the first time a trendy topic of popular and scientific interest, and rapid technological progress provided a hope that the complexities of the global atmosphere could be reduced to its most elemental physics. For those who witnessed such a sea change, the shift in priorities seemed nothing short of dramatic. "Particularly gratifying," noted Landsberg in 1972, was "the fact that a large number of physical and dynamic meteorologists now consider climatological problems worthy targets of their endeavors, an aim they would have disdained as recently as a decade ago."[19]

Aerosol-induced Cooling as Primary Source of Concern

One of the most curious phenomenon facing climate scientists in the 1960s was what appeared to be a prolonged dip in global temperatures. In existence since the 1940s, the apparent cooling trend led many to suspect that human industrial activities could – if not already – influence the global atmospheric system. J. Murray Mitchell, a climatologist with the U.S. Weather Bureau's Office of Climatology, suspected that human activities were releasing huge amounts of aerosols into the atmosphere and therefore altering the albedo of the earth. "At an ever-accelerating pace," he noted publicly in 1968, "man is bringing a variety of changes to his environment which, if they have not yet had much impact on large-scale weather, they are almost certain to have in the future." He went onto intimate that humankind may have not only altered local atmospheric environments with pollutants, but may have also "in a less obvious way" overloaded the world's atmosphere to a point that may induce a long-term cooling in climate.[20]

Like Murray, others expressed concern about the potential for a human-induced climatic change. As noted by Charles Hosler, a meteorologist and Dean of the Earth and Mineral Sciences at Pennsylvania State University, "We're putting astronomical quantities of materials into the atmosphere, and there's no question it is affecting the weather. I'm afraid the changes are already greater than most people suspect, and there may be a threshold beyond which small changes in the

[18] Landsberg to Franz Baur, 13 June 1969, Series 2.1, Box 1, PHL.
[19] Review of 1970 SCEP Conference Report by Helmut Landsberg, Series 3, Box 6, PHL.
[20] "Experts Fears Global Cooling Veil of Pollution," *Chicago Tribune*, 28 October 1968, p. A10. Also, J. Murray Mitchell (Jr.), "Recent Secular Changes of Global Temperature," *Annals of the New York Academy of Sciences* 95 (October 1961): pp. 235-250; J.M. Mitchell, "On the Worldwide Pattern of Secular Temperature Change," *Changes of Climate* (1963): pp. 161-81.

weather could bring about a major shift in the world's climate."[21] For more outspoken scientists, the signal was becoming clearer with every passing year that human civilization itself may be at risk in the not too distant future. As Reid Bryson, a climatologist with the University of Wisconsin-Madison and Director of the Center for Climate Research, stated in 1969,

> Looking at the climate of the past, it is clear that small changes in the past 10,000 years had very large ecological effects and they can happen bloody fast. The end of the ice age took less than a century – kapow! It's fast, and that worries me because we don't know but what in a few years we could have a significant change that could disrupt our entire climate. And that includes where we grow corn and wheat.[22]

Amidst prevalent concerns that this drop in global temperatures represented a potential hazard for domestic agricultural and energy production, the American government and scientific establishment sought develop plans to develop a national climate program.[23] However, many published reports disseminated to policy makers stated that the science of climate prediction – a kind of Holy Grail of atmospheric scientists and policy makers alike given the potential to defend against the vagaries of climate – was deficient. Without the ability to predict accurately the future of climatic change, policy makers would have a very difficult time translating science into ameliorative policies to manage the perceived risks. One report summarized that "advanced knowledge of long-term future changes of climate, of undoubted value to modern society, is not yet available . . . At present, we do not even know enough about the problem of climate predictability to know whether long-term predictions are a realistic possibility."[24] Two years later, the Congressional Research Service (CRS) – the research arm of the U.S. Congress – a published a report entitled, "A Primer on Climatic Variation and Change." Specifically requested to summarize the state of climate science for legislative purposes, the report mirrored broader historical frustrations that hindered the development of climatology for most of the 20th century: "So far, there is no single comprehensive theory, or even a combination of a small number of theories, that completely explains – much less predicts – climate fluctuation or change."[25]

This political and scientific uncertainty combined with significant technological progress in the late 1960s and early 70s provided a rather unsettling foundation upon which climate researchers could engage society about serious environmental and economic problems. Scientists understood

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[21] Richard James, "Changing Climate: Scientists Charge that Increased Air Pollution is Altering the Weather," *Wall Street Journal*, 31 December 1969, p. 1.
[22] ibid.
[23] U.S. National Research Council. *Understanding Climatic Change: A Program for Action* (Washington, D.C.: National Academy of Sciences, 1975); *A United States Climate Program Plan* (Washington: Federal Coordinating Council for Science, Engineering and Technology (July 1977).
[24] "Report of The Ad Hoc Panel on the Present Interglacial" (Washington, D.C.: Federal Council for Science and Technology, 1974): p. iii.
[25] "A Primer on Climatic Variation and Change," Prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology, U.S. House of Representatives, 94th Congress, Congressional Research Service (Washington, D.C.: U.S. Government Printing Office, 1976).

that potential existed to understand the complexities of the global climate system, but there appeared little to go on other than funding additional research and expanding an awareness of a climate threat. No guidebook existed to determine whether someone should speak about the risks of climate in public forums, nor was there enough information to quantify the uncertainties that existed about the timing, severity, and scope of climate change. Uncertainty was ubiquitous, and the only thing seemingly agreed upon was that complacency was no longer an option. As reported generally in 1977 within *Mosaic*, a news reporting publication under the auspices of the U.S. National Science Foundation,

> Among some climatologists today there is a feeling – not yet a consensus – that there is current evidence of world-wide climate change. And, while there are major differences among climatologists about the causes, nature, and direction of climate change, there is general agreement that climatic variability is a phenomenon whose existence has been underestimated or ignored until now, and that more knowledge about climate is needed urgently.[26]

Ultimately, between 1950 and 1977, the discipline of climatology in the United States underwent a radical shift in relevance to coping with societal challenges. A range of factors – technological developments, political urgency, concerns by scientists that humans were inducing changes in the climate, and what appeared to be a prolonged dip in global temperatures – created a window of opportunity for elite scientists to re-evaluate the role of climate in societal affairs.[27] Envisioning computers as the key to unwrapping the mystery of climate change, small groups of researchers within the United States – for example, the University of California at Los Angeles, the Geophysical Fluid Dynamics Laboratory in Princeton, New Jersey, and the National Center for Atmospheric Research (NCAR) in Boulder, Colorado – began to simulate the global climate system using models to calculate complex thermo- and hydro-dynamics equations. Although the models were crude in that they could not adequately address the complex small-scale processes that determine local weather, they nonetheless replicated many of the most important features of the global atmospheric system that could in time allow both scientists and policy makers a glimpse into the future state of climate.

Schneider's Entry into Climate Modeling and Public Engagement, 1966-1971

Beginning in the mid-1960s, a young physicist by the name of Stephen Schneider began his undergraduate and graduate studies at Columbia University. While initially interested in designing race cars due to the excitement of pushing the frontiers of engineering and science, he learned quickly that his interests resided elsewhere. He was drawn to courses offered by experimental physicist Leon Lederman and C.K. "John" Chu, each of whom introduced the idea that science was

[26] Warren Kornberg, "Climate, Weather, and Aridity," *Mosaic* 8, 1 (January/February, 1977): p. 15. *Mosaic* has been published by the National Science Foundation since 1970.

[27] For an elaboration on the role of elite atmospheric scientists in exploiting political opportunities for the benefit of atmospheric science, see David Hart and David Victor, "Scientific Elites and the Making of US Policy for Climate Change Research, 1957-1974," *Social Studies of Science* 23, 4 (November 1993): pp. 643-680.

not about making discoveries useful only to scientists but also recognizing that science had something to say about the direction of society generally. As Schneider recalled, Chu was "interested in politics; he was interested in how science made a difference in the world, not just the science for its own sake. . . And I thought that was pretty neat and I was kind of hoping that I would go on, and work with him."[28] Amidst the youthful rebelliousness of the 1960s, Schneider was politically moderate but believed that his knowledge of science could promote significant societal reform in what he considered a positive direction. "I didn't just want to discover something just for its own sake," he recalled. "Yes, I was curiosity driven, but I wanted what I did to make a difference in the world. That was always a deep and abiding passion in me."[29]

Slipping away from his graduate studies in physics when circumstances permitted, he conducted climate research in his spare time at the NASA Goddard Institute for Space Studies (GISS). There, he quickly learned that computers provided an illustrious opportunity for science to benefit society directly. Two personal encounters reinforced his optimism. The first took place in 1970, when famed weather and climate modeler Joseph Smagorinsky gave a talk at Columbia University. Smagorinsky, who had already acquired eminence within the atmospheric science community for his work on numerical weather prediction during the early 1950s, believed that modeling the global climate system could one day yield accurate and reliable predictions.[30] As director of the Geophysical Fluid and Dynamics Laboratory in Princetion, NJ since the late 1960s, Smagorinsky saw promise in using a nine-dimensional circulation model with ever increasing resolution to predict two weeks in advance the future state of the global atmosphere.[31] While Smagorinsky was cautious about using computer-based models for predictive purposes to advise policy makers, his talk nonetheless led Schneider to believe that computers can not only be useful for heuristic purposes but also predictive ones. "How exciting," he recalled, "it was that you could actually simulate something as crazy as the earth, and then pollute the model, and figure out what might happen – and have some influence on policy in a positive way which was something I'd always wanted to do."[32]

Schneider's second encounter involved a brief encounter at an annual meeting of the American Geophysical Union with W.W. Kellogg, the Director of Laboratory of Atmospheric Sciences at the National Center for Atmospheric Research in Boulder, Colorado. While few within

[28] S.H. Schneider and R.M. Chervin, 2002-01-10: American Meteorological Society (AMS) Oral History Project, Archives, National Center for Atmospheric Research (NCAR), p. 10.
[29] ibid., p. 14.
[30] For insight into the development of modeling, see Interview of Joseph Smagorinsky by Spencer Weart on March 1, 1989, Niels Bohr Library and Archives, American Institute of Physics, College Park, MD, USA, http://www.aip.org/history/ohilist/5056.html. Also, for a historical analysis of the development of numerical weather prediction (NWP), see *Harper, Kristine. Weather by the Numbers: The Genesis of Modern Meteorology* (Cambridge: MIT Press, 2008).
[31] J. Smagorinsky, "The Role of Numerical Modeling," *Bulletin of the American Meteorological Socie*ty 48 (1967): pp. 89-93; Syukuro Manabe, Joseph Smagorinsky, J. Leith Holloway, Jr., and Hugh Stone, "Simulated Climatology of a General Circulation Model with a Hydrologic Cycle," *Monthly Weather Review* 98, 3 (March 1970): pp. 175-212.
[32] Schneider Interview (2002), p. 29.

the Columbia physics community knew about or recognized Schneider's interests in climate-related issues at the time, the AGU meeting provided him an opportunity to learn more about what he considered to be a captivating world of computer-based simulation. Having just witnessed Smagorinsky's talk, Schneider approached Kellogg to discuss his research interests regarding the role of human activity on global atmospheric temperatures. Apparently impressed with Schneider's curiosity, Kellogg invited him to participate in an upcoming meeting in Europe specifically convened to examine such issues. Held in Stockholm in the summer of 1971 and titled "Study of Man's Impact on Climate," Schneider met many of the most eminent minds in the world such as German climatologist Herman Flohn, climate modeler Syukuro Manabe, Phillip Thomson, among a host of others. Attending a world-class meeting on a global stage was an exhilarating experience: "I would have cancelled anything I had, including a wedding to go to that! So of course I did it," he recalled.[33]

Coincidentally, this meeting also exposed Schneider to the porous boundaries between the internal world of scientific deliberation and the world outside of academia. Engagement in public affairs was unsettled terrain, and during the last few days of his time in Europe in July 1971 Schneider was informed that research he conducted in consultation with GISS researcher S.I. Rasool would be published in the journal, *Science*.[34] Using some of the most advanced computers available during that time, Schneider argued provocatively that a prolonged continuation of emissions – perhaps on the order of five to ten years – would trigger an ice age. Schneider's colleagues within the atmospheric science community might have shied away from such provocative claims, but the American media was drawn to what seemed like a scientifically-robust prediction worthy of serious alarm. For Schneider, the experience of what it actually meant to produce science that contributed to popular discussions about climate was slightly surreal. "It was a baptism of fire," he recalled. "So I started to feel like I was getting too much attention, plus a problem I have not had since, but I was nervous about this. I had no experience doing this stuff. This was quite a trial by pen and microphone."[35]

Something clicked inside Schneider. Given the enormous implications of climate on human affairs, he understood that the public needed to have an accurate understanding of the issues and not be persuaded by those he felt confused or distorted what he considered to be a serious threat. The initial inspiration was an article written for the *New York Times* by Eugene Guccione in 1971, a chemical engineer and senior editor of *Engineering and Mining Journal*. While not opposed dogmatically to environmentalists' concerns, Guccione wrote his piece in an effort to cast doubt on those who appeared to exaggerate environmental threats for political gain. To bolster his case against the environmental movement, he directed the reader to environmentalists' tendency to promulgate messages about future climate-induced doom – a practice that he believed amounted to contradictory and confusing claims about future ice ages and global warming. The problem,

[33] ibid., p. 35.
[34] S.I. Rasool and S.H. Schneider, "Atmospheric Carbon Dioxide and Aerosols: Effects of Large Increases on Global Climate," *Science* 173, 3992 (July 9, 1971): pp. 138-141.
[35] Schneider Interview, p. 41-42.

according to Guccione, was that climate change was becoming a way for environmentalists to scare an already anxious public.[36]

As someone who had just published an article that sought to disentangle the science behind such contradictory claims, Schneider sought to inject what he considered a more reasoned perspective on the matter. Noting what appeared to be Guccione's tendency to conflate environmental exaggerations with real climate risks, Schneider appeared to position climate as an important consideration that should be examined on its own terms. Characterizing Guccuione's claims as "often inaccurate and certainly misleading" and his tone as "supercilious," Schneider cast Guccione's dismissive attitude toward future climatic change as irresponsible without first committing time to appreciating the complexities involved (i.e. one should not disregard the threat of climate change merely because the media is laden heavily with confusing or contradictory messages about future climate-induced problems).[37]

By bringing attention to the importance of climate change in his 1971 article, as well as defending the legitimacy of the climate threat against skeptics of the environmental movement in popular news outlets, Schneider's comments reinforced a growing chorus of individuals – Bryson, Mitchell, Hosler – who believed that climate was becoming a potential threat to human civilization. From the beginning of his studies at Columbia in the late 1960s as an undergraduate and later as a graduate student, Schneider defined himself as someone committed to exploiting opportunities to inject himself into the public discourses about climate variability.

Schneider's Transition to Public Figure, 1973-1976

Having left Columbia University for a position at that National Center for Atmospheric Research (NCAR) in the summer of 1973, and having already acquired a reputation among some sectors of the climate science community as an outspoken but talented climate modeler, Schneider became increasingly committed politically to advancing a sense of urgency among the general public, scientists, and policy makers. To him, the uncertainty of state-of-the-art climate models did not lead to a belief that he should be reticent, but rather demonstrated an *increased* need to go public and convince others to respond to the threat of increased climatic variability. Increased variability was problematic not only because it made prediction difficult, but also because producers of food would have a harder time planning for the future. His belief was rooted in what he considered to be real-world pragmatism; while models were insufficient to define the future state of climate given its enormous complexity, he believed that basing decisions on estimates – however general and vague – was more prudent than dealing with the potential ramifications of not being prepared at all.

At first, Schneider began to write articles intended largely for an academic or intellectual audience. Publishing in journals like *Ambio*, the *Bulletin of the American Academy of the Arts and Sciences*, *Science*, and the *Journal of the Atmospheric Sciences* during two-year span between 1974

[36] Eugene Guccione, "No, Breathe Easier," *New York Times*, 28 August 1971, p. 25.
[37] Stephen Schneider, "Are We Winning the War Against Pollution?" *New York Times*, 16 September 1971, p. 42.

and 1976, Schneider investigated the potential ramifications of a deteriorating global food supply, and expressed his fears that a relatively stable warm climate that had existed during most of the 20th century had given way to what he claimed to be a state of higher climatic variability. Balance was central to his conception of environmental problems; without a sustainable balance between technological growth, population growth, and climate conditions, humankind was at risk of extreme malnutrition, starvation, and potential collapse. "The 1970s," he wrote provocatively, "hold the potential for a crisis in human suffering on a scale which may be unprecedented in recorded history."[38]

Integrating climate into broader discourses about "leverage points" – an early version of so-called "tipping points" – was also rooted in his skepticism toward geoengineering measures or what he called measures for the purpose of "climate stabilization."[39] Within a 1974 article co-authored with NCAR colleague W.W. Kellogg, for instance, Schneider was clear:

> We believe that it would be dangerous to pursue any large-scale operational climate control schemes until we can predict their long-term effects on the weather patterns and the climate with some acceptable assurance. … To tamper with the system that determines the livelihood and life-styles of people around the world over would be the height of irresponsibility if we could not adequately foresee the outcome.[40]

To protect against even minor climate variations, Schneider advocated for an international policy to "cushion the shock" of inadequate food production. Revitalizing the biblical story of Joseph and the Egyptian Pharaoh, a story that speaks to the virtue of storing food during productive years for the benefit of having enough to eat during lean years, Schneider imagined what he called a genesis strategy wherein entire nations would stock pile food.[41]

Politically savvy, Schneider sought opportunities to convey his ideas to those whom he believed sympathized with the environmental left. One such occasion arose in February 1975 at the house of Howard Higman, a sociologist at the University of Colorado and founder of the Conference on World Affairs. Just as he had a few years earlier when he approached William Kellogg, Schneider was not shy when conveying his concerns with Timothy Wirth, a progressive Democratic senator from Colorado. Critical of what he saw as the risky federal policies of U.S.

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[38] Stephen Schneider, "The Population Explosion: Can It Shake the Climate?" *Ambio* 3, 4 (1974): pp. 150-155, quote on p. 152.

[39] For an indication of why scientists are concerned about tipping points, see Fred Pearce, *With Speed and Violence: Why Scientists Fear Tipping Points in Climate Change* (Boston: Beacon Press, 2007); Malcolm Gladwell, *The Tipping Point: How Little Things Can Make a Big Difference* (New York: Little, Brown, and Company, 2000).

[40] W.W. Kellogg and Stephen Schneider, "Climate Stabilization: For Better or Worse?" *Science* 186, 4170 (December 27, 1974): pp. 1163-72. For a broader historical perspective of thought regarding geo-engineering, see James Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010).

[41] Stephen Schneider, "Food: The Next Crisis," *The National Observer* (5 June 1974): p. 18. This article appears to have been the first time that Schneider mentioned publicly the idea of a "genesis strategy" to deal with the potential long-term effects of climate on the global food supply.

Secretary of Agriculture Earl Butz, whose policies appeared to assume erroneously a continuation of favorable climatic conditions for agricultural production, Schneider suggested the need for developed countries to endure major sacrifices through such means as population control, slower growth, and more attention to the difficult challenges of self-sufficiency.[42] Similar in tone to the claims of outspoken environmentalists such as Paul Ehrlich who believed that human population growth had exceeded the ability of human civilization to feed itself, Schneider was clearly intent on fashioning an identity very much aligned with broader environmentalist sentiments coursing through American culture since the late 1960s.[43]

As Schneider discussed his ideas with Wirth in early 1975, he began working on a manuscript – more accurately a manifesto – that built upon the ideas that he had developed since the early 1970s. Entitled *The Genesis Strategy*, he perceived an opportunity to engage popular audiences about the climate-food issue that he believed had failed to sink deeply into popular consciousness. For those who were supportive of Schneider's interests, the timing seemed appropriate. He laid his concerns clearly on the table for everyone to see. "I have decided to eschew the traditional role of scientist to advance knowledge quietly and instead to write a book that mixes politics and science and often goes beyond the confines of my academic training," he wrote confidently.[44] These were powerful words if only because no book had yet been published that conjoined the science of climate with such political fervor. "With a new 'ethic of prudence,'" he imagined, "perhaps we can begin our transition to a sustainable, workable world order and can hope to minimize the chances for either interim human catastrophes or long-range climatic damage."[45] For those who knew Schneider, the book would be nothing less than a strident attempt to push an agenda. Indeed, Walter Orr Roberts, a well-respected statesman of atmospheric science, remarked that "the book is going to be hard-hitting, somewhat controversial, and an excellent exposition of the subtleties of the problem, intended for general readers."[46]

As described explicitly in the introduction to *The Genesis Strategy*, Schneider's eschewal of what he called a more traditional ethic of reticence meant that he sought not only to publish a popular book about his concerns. "My chief concern for the future," he surmised, "is political rather than scientific; it is that some wolves will attack long before we are certain enough of their existence to feel compelled to effect difficult political actions." As he continued,

> Such actions, however expensive or unpleasant, may be vital to hedge against dangerous plausibilities long before scientific certainty about their magnitude and timing is established. … I am deeply convinced of the real dangers that societies face

[42] Stephen Schneider to Timothy Wirth, 21 February 1975, Box 122, Folder 9, Timothy Wirth Collection, University of Colorado Archives.
[43] Paul Sabin, *The Bet: Paul Ehrlich, Julian Simon, and Our Gamble Over Earth's Future* (New Haven, CT: Yale University Press, 2013).
[44] Schneider (1976): p. xiv.
[45] ibid., p. xix.
[46] Walter Orr Roberts to Robert Stein, 6 November 1975, Box 43, Walter Orr Roberts Collection, University of Colorado Archive.

> in the year ahead and the need to clarify the importance of the scientific component of these dangers.

For him, the threat required one simple task of the audience – determine whether to take precautionary actions to ameliorate human suffering or cavalierly play Russian roulette with the future of the world.[47]

After its publication in 1976, most official reviewers who published in the popular and academic press praised Schneider's book for its substance, originality, and accessibility. Roberts, an avid supporter of Schneider and Director of the Aspen Institute for Humanistic Studies, was the first to publish a book review wherein he praised Schneider for writing a "superb and readable book" that focuses on the world predicaments. He went on to note that the book was "marvelously lucid," "full of scientific detail," and "excellently documented," while labeling Schneider as one among a "small number of brilliant young scientists … with impeccable credentials" who has made "original and important contributions to the mathematical modelling of weather and climate." Given Roberts's long-standing interest in issues of food and climate, he believed that Schneider's policy suggestions – while a bit naïve – were novel, refreshing and had the "marks of that admirable impatience of small solutions that characterizes youth."[48] Deborah Shapley, a staff member at *Science Magazine*, characterized the book as an accurate and responsible portrayal of serious problems, and John Oliver, a Professor of Geography at Indiana State University, expressed his gratitude for Schneider's public efforts and a hope that decision makers would pay heed to his ideas.[49]

Given Schneider's rise as one of the most visible climatologists in the United States, Rep. George Brown, Jr. (D-CA) asked him to testify soon after the publication of *The Genesis Strategy* in front of the House Subcommittee on the Environment and the Atmosphere. Given an increased reliance of Americans on a stable climate, Schneider argued that increased climatic variability was taxing existing technological and agricultural systems to a breaking point. Aware of the deficiencies of current climate models to account for the complicated feedback mechanisms of the global climatic system, he testified that it was crucial to change the "political consciousness" of the United States and overcome the short-term perspective and whimsical interests of policy makers. "The worst mismatch in the future I see is the political system, whether it socialist or capitalist or totalitarian or democratic … is to short-term issues," he cautioned. While he could not specifically address whether the climate would change for the worse in the near future, he did believe that climate change issues provided a "sort of last-ditch symbol" for governments to realize the importance of thinking on generational time-scales.[50]

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[47] Schneider (1976), p. xv.
[48] Walter Orr Roberts, "Book Review: The Genesis Strategy," *Interdisciplinary Science Reviews* 1, 3 (1976): 268-269.
[49] Deborah Shapley, "The Genesis Strategy: A Chilling Prospect," *New York Times*, 18 July 1976, p. 165; John Oliver, "Global Climate: Review of The Genesis Strategy," *Bioscience* 27, 2 (February 1977): p. 128
[50] Stephen Schneider, Statement to the House, Subcommittee on the Environment and the Atmosphere. *The National Climate Program Act*, Hearing, May 18, 1976 (Serial 75-149 O): pp. 83-84.

Ultimately, between his public baptism by fire of 1971 and his inauguration as a public figure in 1976, Schneider had molded himself as one of the most influential voices about the potential dangers of an imbalanced relationship between human society and the natural environment. Adopting a rhetoric closely aligned with the environmentalist left, Schneider consciously sought to straddle the boundary between political activism and scientific protocol. In doing so, however, he understood on an intellectual level that divulging his ideas publicly required that he adopt a public consciousness of environmental politics. It was not enough to merely convey one's ideas emptily into the public realm in the hope to initiate change; Schneider also had to continually mold himself to changing cultural circumstances so as to maintain both his professional credibility and cultural authority as a spokesperson for the risks of climate change. Straddling the boundaries between his identity as a professional scientist and as public figure required something more deliberate.

Inhabiting a Cultural Middle Ground

The political and increasingly public steps that Schneider took between 1975 and 1976 were not without risks to his professional credibility as a scientist. By using a tone of urgency with respect to future instabilities and advocating for fundamental change within existing government structures, Schneider's rhetoric appeared increasingly similar to the pessimistic claims of more vocal elements within the environmental movement. Schneider was aware of the risks involved in expressing his philosophical and political judgments publicly in light of existing uncertainties, and he also knew that his judgments were being framed in light of what he called "a raging debate worthy of notice." As he further characterized,

> As in other modern debates about aspects of the 'world predicament,' such as population, environment, and resources, articulate 'prophets of doom' were presenting strong evidence to support their theories of imminent catastrophe. Meanwhile, with equal passion, choruses of 'Pollyannas' were countering that history is replete with dire predictions of doomsday, none of which had yet come to pass.

This debate between those whom he termed Pollyannas and prophets of doom framed nascent discussions of climate change as an environmental problem and provided Schneider with the political metrics by which to judge his own political rhetoric. Schneider's rhetoric existed in a cultural funnel of ideas frequently filtered through the sensational claims of the media, and it was in this world that he sought to engage despite the risks of doing so. "Inevitably," he surmised,

> Newspaper editors and other purveyors of public information began to take sides. Some hailed the courage of the sentinels of doom, while others accused them of overemphasizing disaster, thereby sapping our spirit. Often the issues were oversimplified by arguments that we can continue to overcome our problems by keeping our spirits high, working hard, and using more technology.[51]

[51] Schneider (1976): pp. x-xi.

For Schneider, the task was to negotiate a middle ground that could appeal to his concern for climate without sacrificing his credibility in lieu of the raging debates about environmental degradation. He was immersed in a cultural debate where the social rules were being developed in real-time, and he needed to portray himself in a particular way so as to elude the simplistic dichotomies often sensationalized in the media – a difficult problem to overcome given his own passion for environmental and climate matters.

The process by which he maneuvered through the mine-field of these cultural tropes is manifest in his writings and public testimony. During his 1976 testimony for Rep. Brown's climate hearing, Schneider sought to compensate his sense of urgency with an explicit warning that his claims about future calamity were not in themselves emotion-laden doomsaying. "Let me emphasize at the outset," he clarified, "that I am not forecasting the end of the world."[52] This cautious remark within such a political setting suggests that he was seeking to establish a boundary – at least a rhetorical one – between himself and more extreme elements of the environmental movement. In addition, within the preface of the *Genesis Strategy*, he recounts a TV reporter's question whether scientists cried wolf too often regarding future environmental disasters. Struck by the question, he offered the best response he could muster at the time:

> The journalist was waiting for a definite answer, and all I could offer was a statement of probability – the odds for human catastrophes related to the world among seemingly irreconcilable 'experts' about the seriousness, even the timing, of a host of prospective crises was a reflection of the uncertain state of scientific knowledge.[53]

Schneider's response was not an attempt to bypass the question, nor was it a direct response to the frequency of "cry-wolf" claims by scientists. Rather, he took it as an opportunity to give what he saw as an honest assessment of the difficulties of dealing with the inherent risks of living in a highly complex society. Nonetheless, he felt that the existence of uncertainties about environmental risks and the uncertain state of climate science was insufficient to limit one's political ambitions to prevent future catastrophe. As he elaborated more fully in his preface,

> Uncertainty does not simply mean that there are no problems; nor does it deserve a 'wait and see' attitude. … Nor does political action require knowledge of the exact location of each tree behind which a wolf may be hiding. Rather, knowledge of the probability that wolves do lurk in the forest should be sufficient information for deciding whether to take preventive action. … My chief concern for the future is political rather than scientific; it is that some wolves will attack long before we are certain enough of their existence to feel compelled to effect difficult political actions.[54]

[52] Schneider Testimony (1976), p. 39.
[53] Stephen Schneider and Lynne Mesirow. *The Genesis Strategy: Climate and Global Survival* (Plenum Publication Corp., 1976), xi.
[54] ibid.

Despite his attempts to situate himself as a moderate within the "raging debates" of environmental degradation and resource deletion, he nonetheless pursued a very public persona that directly reinforced his message that reticence was unacceptable. Appearing on the Johnny Carson Show on July 19, 1977 a year after the original release of *The Genesis Strategy*, Schneider responded to a series of questions regarding the ability of scientists to predict the weather more than a few days in advance, a prospect that – given his experiences with Kellogg and Smagorinsky early in his career – appeared entirely possible. Other conversation topics ensued, including issues of drought, whether the climate was cooling or warming, and even whether a recent weather fluctuation caused a serious black out in New York City. Given what appeared to be signs that society was increasingly sensitive to even small-scale environmental challenges, Schneider argued for building further resilience into society. "The laws of nature frequently are not in line with some of our laws," he stated in an attempt to distinguish between natural laws – which are stable and enduring – and man-made laws – which tend to be short-sighted, sporadic, and clumsy. Everything in human decision making, he believed, is a trade-off between risks and benefits and therefore decisions require the incorporation of value judgments to maximize margins of safety in spite of existing uncertainties.[55]

Certainly, by the summer of 1976, Schneider had abandoned entirely any notion that he was a reticent scientist. His statements filled the air waves, and his modeling efforts acquired a new found importance for those interested in the future of climate and its effects. While he could not definitely say one way or the other how hazardous climate would be in the near future, he took every opportunity to go public about his concerns about the future. For better or worse, climate had become an environmental topic discussed widely in the public and political arena. The matter was discussed in the pages of newspaper and magazine headlines, policy makers were increasingly concerned about its potential effects, and many scientists not only adopted a language of urgency but made claims that unwittingly contributed to a range of confusing and contradictory messages about the future of climate.[56]

In spite of his determination to negotiate a more moderate rhetoric on climate change within the context of existing debates over resource scarcity and environmental degradation – an effort characterized as adhering to disciplinary norms by emphasizing existing uncertainty; eschewing reticence by engaging with political advocacy while distancing himself from so-called prophets of doom – Schneider's emergence onto the political scene was perceived as inconsistent with established norms. Even sympathizers themselves who valued Schneider's political ambition to make climate national concern suspected that his actions would likely face substantial criticism and

[55] *The Tonight Show Starring Johnny Carson*, 1977, University Corporation for Atmospheric Research, http://www.ucar.edu/multimedia/videos/2010/schneider_tonightshow77.mov, last accessed 10 September 2014.

[56] David Salisbury, "Earth's Climate Changing?" *The Sun*, 1 September 1974, p. Trend1; Harold Schmeck (Jnr.), "Climate Changes Called Ominous: Scientists Warn Predictions Must be Made Precise to Avoid Catastrophe," *New York Times*, 19 January 1975, p. 31; Walter Sullivan, "Scientists Ask why World Climate Is Changing," *New York Times*, 21 May 1975, p. 92.

even abuse from within more established ranks within climatology. As Kenneth Hare, a Canadian climatologist and director of the Institute for Environmental Studies at the University of Toronto, noted in his own positive review of Schneider's *Genesis Strategy*,

> This is a risky game for a younger man to play, and he takes his professional life in his hands when he does so. For there is a widely held view that scientists ought to stay out of politics. Getting into such questions is thought somehow to imperil one's judgment, or one's objectivity. Above all, too active and too public an involvement in politics – even nonpartisan world strategic debate – is seen as the waste of a young man's talents. We are a conservative profession.[57]

Landsberg's Response to *The Genesis Strategy*

Helmut Erich Landsberg was born in Frankfurt am Mein, Germany in 1906. At the age of 24, he received his Ph.D. in seismography from the Frankfurt Institute of Meteorology and Geophysics under the guidance of one of the preeminent seismologists of the 20th century, Beno Gutenberg.[58] Grounded in early 20th century geophysical sciences, Landsberg felt comfortable in a variety of disciplines ranging from meteorology to seismology. After his graduate training, he held two professional positions, both of which were under meteorologist Franz Linke. His first task was to establish a weather station in the Rhineland, followed with a position as Chief of the Taunus Observatory near Frankfurt in 1931. In 1934, after three years in Frankfurt and upon a recommendation provided by Gutenberg, he emigrated to the United States to help build a meteorology program at the Pennsylvania State College. While he was a geophysicist by training, he committed himself to fashioning the field of climatology into a professionalized discipline by publishing in 1941 one of the first American textbooks in the field entitled *Physical Climatology* – a textbook that underwent multiple printings well into the 1960s.

Having established himself as one of the most recognized climatologists of the period by the 1940s, Landsberg was given an opportunity to work with Carl-Gustaf Rossby at the Institute of Meteorology at the University of Chicago early in World War II. Soon thereafter, Landsberg was asked to work as an Operations Analyst for the U.S. Army Air Forces, a position that allowed him to understand the importance of atmospheric research to real-time decision making in war time. Ranging from producing maps of climatic conditions for geographical regions for the purpose of bombing runs to conducting meteorological research to understand the influence of winds on strategic bombing accuracy, Landsberg became an invaluable asset to his superiors. Of particular importance to his superiors was to understand changing weather conditions for the purpose of conducting low-level incendiary bombing runs at night.[59] Recognizing his talents, Colonel W.B. Leach, Chief of the Operations Analysis, wrote to Landsberg toward the end of the war that his "work as an Operations Analyst, specifically studies and analyses of weather problems as they

[57] F. Kenneth Hare, "Book Review: The Genesis Strategy," *Bulletin of the American Meteorological Society* 58, 8 (August 1976): p. 1016

[58] "Beno Gutenberg," *Complete Dictionary of Scientific Biography*, Vol. 5; "Beno Gutenberg," *Science in the Early Twentieth Century: An Encyclopedia*, ABC-CLIO.

[59] Patrick Hughes, "Winning the War," *Weatherwise* 48, 3 (June 1995): pp.38-41.

affected operations, missions, and planning of the air forces utilizing B-29s against the Japanese Empire, contributed materially to the success of our efforts."[60]

After serving in World War II, Landsberg became the acting director – and later the director – of the US Air Forces Joint Research and Development Board's Committee on Geophysical Sciences. Responsible for evaluating and coordinating service programs pertaining to the geophysical sciences in the United States, Landsberg was given an opportunity to oversee geophysical research on a national scale. This was crucial experience that led him, in 1951, to become the Director of the Geophysics Research Directorate of the U.S. Air Force Research Center in Cambridge, Massachusetts, followed by an appointment as Director of the U.S. Weather Bureau's Office of Climatology from 1954 to 1965. Subsequently, he was asked to direct the newly built Environmental Data Service within the Environmental Science Service Administration (ESSA) between 1965 and 1966, after which he finally concluded his long career as professor at the University of Maryland Institute of Fluid Dynamics and Applied Mathematics.[61]

Taken together, Landsberg had a broad perspective of its development and assisted in its maturation during the 1950s and 60s, a point that was not lost on those who considered him unique. Modeler Joseph Smagorinsky, the same climatologist who inspired Schneider to pursue climate modeling in the early 1970s, believed that Landsberg "played an important spiritual role as a leader and as a scientist," while Swedish meteorologist C.C. Wallen noted that there "has been at least one person who has played a fundamental role in the development of climatology in this century, namely Helmut Landsberg."[62] Landsberg's reputation was not so much for his scientific accomplishments – which were many – but rather his ability to represent the kinds of values and behaviors that many of his colleagues believed were fundamental to being a professional scientist. As Timothy Oke remarked, "the undoubted eminence of Landsberg stemmed not from his scientific research but from a special combination of intellectual and personal qualities."[63]

One the most persistent qualities of Landsberg was a robust sense of the importance of skepticism and caution. He believed that climate had become in many ways a convenient scapegoat for ill-conceived policies and sought ways to inform the public without exacerbating public confusion. As he noted in 1978 in regard to a variety of what many believed to be climate-induced socio-economic problems,

> These socio-economic impacts, as never before, brought climate into the focus of public attention. As a by-product of this interest a whole mythology of climate has

[60] W.B. Leach to Landsberg, 5 September 1945, Series 7, Box 1, PHL.
[61] The Environmental Data Service (EDS) was responsible for archiving and disseminating geophysical observations to the general public, federal, state, and local agencies, the scientific and engineering communities, and private corporations. For a very brief overview of the EDS, see Patrick Hughes, *A Century of Weather Service: a History of the Birth and Growth of the National Weather Service* (New York: Gordon & Breach, 1970): pp. 157-58
[62] Joseph Smagorinsky, "Climatology's Scientific Maturity," within *Climate in Human Perspective: A Tribute to Helmut E. Landsberg* (Kluwer, 1991); Carl Christian Wallen, Interview 1995 by Gordon Cartwright, p. 29.
[63] Climate in Human Perspective (1991): p. 69.

> been spilled on the public: An ice age is overdue and will engulf us in the next few years; climate has become 'more variable' (than what) … The real problem is that population increases have placed greater demands on food supplies and the disarray of fuel supplies have made a cold winter a threat to large population groups.[64]

Of course, this was entirely aligned with the rhetorical paradigm argued by individuals like Schneider and Paul Ehrlich – population was a serious problem insofar as it allowed economically marginal areas to feel the effects of even minor climatic variations more than a more temperate climate. In this respect, Landsberg carried with him the same ideas that motivated others to engage the public with one distinctive difference – he did not deem it appropriate to engage the public about climate-related matters or about anything that may be perceived as departing from his station as a professional and reticent expert.

Indeed, the challenge of properly adjudicating the various causes of global energy and food shortages was something that Landsberg took seriously, but he appeared frustrated at occasionally embittered by what he saw as a lack of credible science to assist in public understanding. He felt that specialists and non-specialists alike were making claims publicly and privately about the nature and potential severity of climate, but ultimately contributing to a general sense of anxiousness about the future instead of enlightening. "In recent years," Landsberg observed in 1972,

> Much has been said and written about man's interference with climate. Alarming tales have been spread, many of them by persons whose standing as climatologists may well be questioned. And just as the competence of a cardiologist in neurosurgery may be doubted so may the judgment of atmospheric physicists or dynamicists in climatology. But the claims of omniscience in this field by some in other professions, even farther removed, such as biologists or even politicians are indeed astonishing and very misleading.[65]

While he did not specifically address Schneider, Landsberg's sentiments reveal a growing frustration with and perhaps resentment toward those whom he characterized as more outspoken, untrained scientists. Public communication was important to him. He felt that only those with what he saw as a calm and moderate perspective of environmental threats mixed with the appropriate expertise could anchor appropriately what he saw as sensationalist rhetoric and contradictory messages being disseminated to the general public about climate change. After decades of witnessing the gradual professionalization of climatology from a backwater to one increasingly relevant to societal problems he believe it imperative that climate research maintain an air of credibility above the fray of public politics.

Given Landsberg's predilections, he saw Schneider's 1976 manifesto as particularly problematic for a variety of reasons. First, he challenged one of Schneider's fundamental assertions that justified his public engagement, namely that climate variability was increasing in the 1970s.

[64] Helmut Landsberg, "Recent Climatic Fluctuations and the Outlook for the Near Future," Talk presented at the 1978 Meeting of the AAAS Symposium on Climate Futures, Series 3, Box 8, PHL.
[65] Helmut Landsberg, "Human Influence on Climate," *Sartryck ur Lakartidningen* 69 (1972): pp. 2772-78.

Climate was not the problem, he reasoned, as much as the movement of people into areas that had traditionally been more susceptible to the vagaries of weather. "I have analyzed dozens of long records of all kinds of elements. There is no sign of a 'recent' increase in variability. It is a myth to me where people read this into the climatic record. What has happened is that our economic has (by poor planning) become continually more vulnerable to the normal climatic fluctuations," he cautioned.[66] This criticism exposed one of most glaring inadequacies of public discussions about the role of climate in what many perceived to be the existence of societal frailties – one could not isolate scientifically the relative influence of poor planning, climate variability, lack of technological progress, or population growth on societal problems. Indeed, the climate seemed to have a relatively inferior role when compared to these other causes, a point that even Schneider himself understood as early as 1974: "In my view, the real crisis is not so much a climate crisis but a lack of world leadership capable of devising and agreeing on a world food security plan."[67] The question from Landsberg's perspective, then, was why climate received so much public attention in the first place? As he once wrote,

> Cause and effect relationships of climate are known in only a rudimentary way; hence predictions for either short or long intervals are afflicted with great uncertainties. Shouldn't this be persuasive enough to send at least the scientists back from the television cameras to their laboratories and studies in order to perfect their knowledge?[68]

Additionally, Landsberg vehemently challenged the usefulness of present climate models to both science and to the development of policy. While he appreciated their potential usefulness over the long-term, he believed that Schneider's use of model-based estimates to guide policy development overlooked the fact that such uncertainties were not quantified and they did not adequately represent the real atmosphere. While Schneider once again agreed with Landsberg that models were riddled with uncertainties, the lack of a *quantifiable* estimate of those uncertainties made any public claim about the future more problematic than if nothing had been said at all. "I disagree with the opinion that uncertain predictions derived from clearly inadequate mathematical-numerical models should be used for public (political) decisions," Landsberg noted. "Nothing could erode the credibility of scientists faster than that. This does not mean one has to have absolute certainty, but one needs to give the decision makers a precise estimate of the uncertainty."[69] To reinforce his case for reticence, Landsberg referred to a quote by Joseph Smagorinsky, the modeler who first introduced to Schneider in1970 the idea that the climate was a tractable scientific problem. As Smagorinsky noted,

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[66] Landsberg to James Norwine, 10 February 1977, Series 2.2, Box 8, PHL.
[67] Stephen Schneider, "A New World Climate Norm?: Implications for Future World Needs," *Bulletin of the American Academy of Arts and Sciences* 28, 3 (December 1974): pp. 20-35, quote on p. 32 .
[68] Helmut Landsberg, "Whence Global Climate: Hot or Cold?" *Bulletin of the American Meteorological Society* 57, 4 (April 1976): pp. 441-43.
[69] Helmut Landsberg, "Review of The Genesis Strategy," *EOS: Transactions of the American Geophysical Union* 57 (September 1976): pp. 634-35.

> Crude or premature estimates can be very misleading in providing guidance for such far-reaching decisions and may be far more damaging than no estimate at all. ... It does warn us, however, that if current physically comprehensive models are inadequate to answer some of our questions, then certainly we should be wary of basing broad national or international decisions on hand-waving arguments or back-of-the-envelope calculations.[70]

Given Schneider's youth and inexperience, Landsberg also objected on political grounds Schneider's apparent hubris when discussing his political and scientific views in public. This was yet another area where Landsberg felt that Schneider had erred; while it was one thing to speak about climate-related matters in public from a scientific perspective, it was quite another to engage the public about policy matters. Appearing on television shows, in magazine articles, publishing popular works – these activities suggested that Schneider was sacrificing the credibility of the scientific profession for the purpose of raising his own political profile. "One misses in the technical part of the treatise the dispassionate and critical attitude which has been such a distinguishing attribute of scientists," Landsberg noted. This was a crucial point. Not only was Scheider's suggestions for a genesis strategy "a bit vague and unbelievably naive," Landsberg argued that it was indicative of a deep ignorance of the international and domestic institutions that already existed to meet the needs of American society. Landsberg mockingly suggested that if Schneider was so interested in policy matters he should either 1) run for public office or 2) spend more time with the science and "spend less time going to the large number of meetings and workshops that he seems to frequent and also that he change his reading habits from newsprint – all through the simple expedient of reading scientific journals and otherwise being a regular devotee of a first class scientific library."[71]

While Landsberg perhaps exaggerated the point for effect, his underlying frustration was rooted in something quite simple: Schneider was quite simply a member of a more youthful and ambitious generation of scientist unafraid to engage the public.[72] Reticence and caution may have appealed to an older generation of experts who believed in the virtue of scientific deliberation devoid of public input, but Schneider was a part of a rebellious generation who witnessed the role of experts in the Vietnam War. Landsberg, however, spent a career participating in the development of climatology as a professionalized discipline with strong ties to government and the military. He was skeptical of youth who believed that they had the answers and especially concerned that emotion and irrationality often drove popular discussions that appeared unanchored to established science. As he remarked years earlier, "It is very essential that we let the general public know what is

[70] Helmut Landsberg, "Comment on Review of 'The Genesis Strategy'," *EOS* 58, 3 (March 1977): p. 122. Also, see Joseph Smagorinsky, *Weather and Climate Modification* (John Wiley and Sons, 1974): pp. 673 - 85.
[71] Landsberg (September 1976): pp. 634-35.
[72] Rae Goodell, *The Visible Scientists* (Little, Brown and Co., 1977).

scientifically really proved and what is wild speculation," he argued. "It would be very unfortunate if major decisions were based on the latter type of emotion rather than factual background."[73]

If a generational gap did indeed exist, it is perhaps best exemplified not by Landsberg's scathing appraisal of Schneider's book but rather by more derisive comments by those of whom designed the first computers used for numerical weather prediction during the late 1940s and early 1950s. [74] Three months after receiving a copy of *Genesis Strategy*, for instance, Jule Charney, an MIT Professor of Mathematics, wrote to Samuel Day, Jr., the editor of *the Bulletin of the Atomic Scientists*. After reading Schneider's work per Day's request for a professional review, Charney was unequivocal. Agreeing with Landsberg's assessment that Schneider's book was a "lightweight affair," he launched into what Day referred to modestly as an "informal appraisal":

> The author (Stephen Schneider) is apparently both incapable and unwilling to distinguish between good science and bad speculation based on bad statistics. He is like the sun-spot-weather people who adduce no causal connections and are therefore forced to rely on statistics, bad statistics. To involve oneself in criticizing them is a career in itself and a thankless one.[75]

While it is beyond the scope of this article to discuss in depth what he meant by "sun-spot-weather people," Charney expressed particular concern that Schneider was indulging in long and short-range climatic theory which he referred to as "at best pure speculation" given significant limitations of current models. But more than the deficiencies of models, Charney interpreted Schneider's actions as a danger not only to scientists but also to the general public that frequently could not distinguish the political from scientific statements of scientists like Schneider – in spite of efforts to demarcate his political judgments from his scientific claims. None of the "speculative ideas of people like … Schneider on future climate change are worth the paper (usually newspaper) they are written on. They mislead the public and they do the field harm," Charney concluded in a separate letter.[76]

Landsberg and Charney's reservations toward Schneider's work were not necessarily because they believed that models were not useful to the scientific profession, but rather because individuals like Schneider appeared too willing to overlook what even he agreed were serious uncertainties for the sake of informing the general public and policy makers. Models were not suitable for public viewing in any shape or form, let alone used in the backdrop for popular pieces meant to sway public passions toward a particular cause. They were not casting doubt on models as much as what Schneider represented about this crucial period in the history of American science – a period when outspokenness was cherished as a valuable commodity for those who believed that scientists had an obligation to improve society. Individuals like Charney and Landsberg were concerned that such

[73] Landsberg to H. Panzram, 1971 November 24, Series 2.1, Box 2, PHL.
[74] Paul Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge: MIT Press, 2010).
[75] July Charney to Samuel Day, Jr., 7 December 1976, Box 3 – B, General Correspondence, 1949-80, Papers of Jule Charney, MIT Institute Archives, Cambridge, MA. (Hereafter referred to as PJC).
[76] Jule Charney to Warren Kornberg, 12 October 1976, Box 13 – NSF, 1955-81, PJC.

visible scientists were too eager to engage the public and may not have understood fully the risks that accompanied such actions.

Conclusion: Virtue of a Reticent Tradition?

As illustrated with the two quotes at the beginning of this article, Landsberg and Schneider knew that dealing with the potential risks of climate change required an appreciation or the role of subjective human value judgments when making decisions about the future of society. Reticence was such a value judgment. They understood that humans were imperfect agents who must strive to make long-term decisions about human welfare, but were limited by the lack of foresight and knowledge that may alleviate the burdens that come with tough decisions. There was no crystal ball, no prophet, and no teachers who could guide how scientists should have behaved and acted in an irrational and rapidly changing world. Neither Schneider nor Landsberg had a monopoly on whether reticence was more scientifically warranted or socially responsible. Nonetheless, within the vacuum of uncertainty about the science of climate change and the political ambiguities available at the time, both appealed to what they understood about the role of scientist in American society to assess how they fashioned themselves as experts.

On the one hand, Schneider's concern for the future effects of climate change on agricultural production during the 1970s was a response to what he perceived to be an unstable relationship between population growth, food and energy production, technological progress, and the global climate system. He was skeptical of what he saw as the status quo of political complacency, and valued a return to what he considered a science-based pragmatic approach to resolving human and environmental problems. He never asserted that he knew all of the answers, but he did rely on a set of assumptions about the interface between science and society. Since his days at Columbia University, he believed that scientists had a role in solving societal problems by becoming public figures. Computer-based models gave him an opportunity to fulfill that potential. His optimism was consistent with his professional ideals and he sought to use every avenue open to him to give voice to what he and many others were saying about a world that appeared on the verge of collapse.

On the other hand, Landsberg, as a highly-esteemed climatologist interested in protecting what he considered an older tradition of climatology, believed that Schneider's advocacy for political action signaled a threat to reticence as a firmly-rooted tradition in climatology. From his experiences during World War II to his position at the University of Maryland in the 1970s, he believed that outspoken individuals like Schneider represented a new kind of climate scientist. Schneider's eschewal of reticence struck Landsberg as not only rooted in a misreading of climatological records but irresponsible in light of his own faith in current governmental structures to adapt to changing circumstances. Relative to Schneider, Landsberg was quite simply a more stodgy kind of scientist; he was skeptical of what he considered to be a generation prone to emotion-laden exaggeration, dismissive of the confusing and contradictory messages promulgated to the general public about climate change, and frustrated especially with credentialed scientists like Schneider who appeared to circumvent established traditions for the purpose of unifying politics, the public, and science.

As this article highlights, the decision to go public during the 1970s was – and still is – a cultural and personal decision. The decision was cultural in the case of Schneider and Landsberg because they had to consider whether their actions violated existing norms within the scientific community. Given what both agreed were tremendous uncertainties about the future state of climate during the 1970s, each had to decide whether the norm of reticence was justified or not. The decision was personal because it required that they evaluate and assess future risks according to their best interpretation of the available evidence. Amidst wide-spread anxieties about future environmental degradation during the 1960s and 70s, no hard and fast rules existed to dictate scientists' behaviors when it came to public engagement. In light of serious scientific uncertainties about climatic change, Schneider and Landsberg marshaled evidence in support of what they considered to be reasonable arguments in favor of their respective visions – a practice that compelled them to negotiate their own personal values and beliefs with the norms and traditions of the atmospheric science community.

So, what does this disagreement between two climatologists during the 1970s say about more contemporary debates about global warming? Given what appears to be some concern that the atmospheric science community is too conservative and therefore risking the future of Western civilization, this article suggests that reticence is not a simple matter of choosing simply to speak in public and risking one's credibility. Reticence provides an opportunity to understand cultural and historical patterns of thought that have shaped individual decision making over the last four decades, patterns that cannot – and should not – be ignored or overlooked. They should be explained. This article suggests a need to assess the difficulties of abandoning reticence, and to examine in further depth the fact that seemingly simple disputes about whether to engage society involve conflicting belief-systems about the role of climatologists in guiding an increasingly complex world.