



WHO WILL CRY FOR THE ICE?

*An examination of conceptual understanding
of climate change through metaphor*

CARTER BROOKS

Energy and Resource Group
University of California, Berkeley

Acknowledgements

I would like to thank my readers George Lakoff and Robert Hass. My fellow students at the Energy and Resources Group have been instrumental in encouraging my pursuit of this topic as well. Jamie Fine, for encouraging me to learn about box models, which eventually culminated in my entering the Energy and Resources Group program. Lastly, I would like to thank my daughter, Alison, for providing the inspiration to imagine the world 70 years from now.

Abstract

Examination of the conceptual metaphors we use in every day speech can provide insight into how we think about and understand the world. Conceptual understanding of climate change is shaped not only by scientific research, but also by everyday metaphors for such mundane topics as “warming” or “change.” Starting with an examination of how our most basic conceptual metaphors influence how we see climate change, this research then examines how competing worldviews dictates how global warming is understood and addressed, and finally how emerging terms create assumptions that influence how global warming is understood. This paper suggests that our conceptual understanding is limited by our physical experience of the world, and that how we understand climate change is influenced by our life priorities and worldview, which is in turn shaped by our day to day activities. The conclusion ponders the question, “what is missing.” The answer implies that our conceptual understanding is likely flawed and incomplete, and suggests more complex understanding may be found using indirect methods such as art.

Table of Contents

| | |
|--|------------|
| <i>Acknowledgements</i> | <i>i</i> |
| <i>Abstract</i> | <i>iii</i> |
| <i>Table of Contents</i> | <i>iv</i> |
| <i>Preface</i> | <i>1</i> |
| <i>Introduction</i> | <i>3</i> |
| <i>Conceptual Metaphors and Basic Understanding</i> | <i>5</i> |
| “Global Warming” | <i>6</i> |
| Globally Averaged Surface Temperature | <i>7</i> |
| Climate change and the weather frame | <i>9</i> |
| Nature as a human agent..... | <i>11</i> |
| Climate change as an object in motion | <i>11</i> |
| Greenhouse gases..... | <i>17</i> |
| The Scientific Frame..... | <i>19</i> |
| <i>The social metaphor</i> | <i>22</i> |
| Implications of the social metaphor and framing | <i>25</i> |
| Carbon emissions as pollution | <i>28</i> |
| Cap and Trade, Carbon Markets and the Economy metaphor..... | <i>31</i> |
| Who owns the sky?..... | <i>33</i> |
| Carbon offsets and carbon neutral | <i>34</i> |
| The atmosphere as a container | <i>34</i> |
| <i>Climate change as a threat</i> | <i>36</i> |
| Climate change as an invading force | <i>36</i> |
| Climate changes as a threat to the economy..... | <i>36</i> |
| Skeptics shouldn’t be called skeptic..... | <i>38</i> |
| Common sense wackos and “myths” | <i>40</i> |
| Chicken Little and Scaremongers | <i>40</i> |
| Global-warming ostriches and climate deniers | <i>41</i> |
| Climate Change as an experiment | <i>42</i> |
| <i>What is missing?</i> | <i>44</i> |
| Who will cry for the ice? | <i>46</i> |
| The glacial limit and the robin’s egg for climate change | <i>48</i> |
| Ice as a rapidly changing geologic feature..... | <i>48</i> |
| What is the point and what does it all mean? | <i>49</i> |
| <i>References Cited</i> | <i>53</i> |

Preface

For the artistically minded, the best way to solve a problem is indirectly. How many great discoveries have been accidents? How often do we set out on one course and arrive at an unexpected destination? So, perhaps the best way to address the climate crisis is to address something else. This is why I often say that I'm not interested in solving our climate change crisis. The crisis that needs solving is the crisis of the human imagination.

John Jeavons, an activist biodynamic farmer used to give a talk about agriculture in which, after thoroughly convincing the audience of the importance of learning to grow crops, he would say, "But once you have learned to grow crops, I want you to stop growing crops. I don't want you to grow crops ever again. Instead I want you to grow soil." That is, grow soil that will grow good crops. He would then state the obvious—that to grow good soil not only makes it easier to grow good crops, but also requires knowing how to grow crops. Then he'd stop and do it again. "I want you to stop growing soil. I want you never to grow soil again. What I want you to grow are people. People who know the importance of growing soil."¹ The lesson is no different with climate change. We don't need to stop emitting greenhouse gasses. We need to grow people, cultures even, that know not to.

We currently have a crisis of the imagination. When our politics cannot imagine a way to harness clean energy without being in conflict with economic well being, then we have a crisis of imagination. When we have a populace fed awareness through a television, a populace wandering about muttering the talking points of the dominant party, we have a crisis of the imagination. When climate change is reduced to an issue of fossil fuel emissions thickening a carbon blanket, we have a crisis of the imagination.

But the question of the imagination goes beyond the collective human mind. There is more to imagination than just thinking. The landscape is an imagination. The thousands of insect species, bacteria, and other life forms playing out the game of life and death on *any* tree on *any* day is expression of imagination. The shape of mountains carved by rivers of ice is an expression of imagination.

Meanwhile, how many species a day are currently being driven to extinction? This is a crisis of imagination. Around the globe, the floor of the oceans to depth of 600ft. has been bulldozed by dragging trawler nets.² This is a crisis of the imagination. The crops that feed

¹ John Jeavons, "Cultivating Our Garden," *In Context*. #42. Fall 1995. Context Institute 1995. p.32. <http://www.context.org/ICLIB/IC42/Jeavons.htm>

² Robert Ballard, Public Lecture at Marin Civic Center Auditorium. Marin Speaker Lecture Series 2004/2005.

humanity have been reduced to a few hundred from tens of thousands. This is a crisis of the imagination. The ethnosphere of language and culture is in a state of genocide.³ This is a crisis of the imagination. The white peaks that wear down the mountains are vanishing. This is a crisis of the imagination.

In the middle of this crisis of the imagination, I wonder what it means that the great ice rivers and ice sheets of the Earth are melting away. Before I am a grandfather, the ice of Kilimanjaro will be gone. When my daughter is a grandmother, Santa's ice cap will be a watery nothing in the summer months. In my lifetime, the CO₂ concentrations in the atmosphere have reached levels the earth has not seen in 55 million years.⁴

And today it requires imagination to notice the missing question: what does it mean?

The crisis *is* of imagination. It is the war. "The only war that matters," as the great poet Diane DiPrima repeats and repeats.⁵:

There is no way out of the spiritual battle
the war is the war against the imagination
you can't sign up as a conscientious objector

the war is the war for the human imagination
and no one can fight it but you/ & no one can fight it for you

³ Diana Parsell, "Wade Davis on Vanishing Cultures," *National Geographic News*. June 28, 2002.
http://news.nationalgeographic.com/news/2002/06/0627_020628_wadedavis.html

⁴ Daniel Schrag, Presentation at Thought Leaders Forum, 2003. Credit Suisse/First Boston LLC 2003.
http://www.csfb.com/thoughtleaderforum/2003/schrag_sidecolumn.shtml

⁵ Diane DiPrima, "Rant," *Pieces of a Song*. City Lights Books. 1990.

Introduction

As a child in New Brunswick, my grandmother rode a dogsled over the snows to get to school. In her lifetime she saw her world change from horse and buggy to space shuttle. In my own lifetime, filled with no less dramatic advances in human technology—Vinyl to CD, dial phone to cell—I’ve also witnessed major climatic changes to the snow and ice over which my grandmother rode. I’ve seen the Larsen B ice shelf collapse, and will likely live to see Mt. Kilimanjaro’s glacier disappear. But my daughter, if she lives to my grandmother’s age, will witness the Arctic Ice Cap melt away.⁶ She will, in fact, be of a generation that will bridge the disappearance of the majority of alpine glaciers on the planet.

The human-driven aspects of climate change raise many ethical and moral questions: “What are the implications for humanity?” “What is the individual’s responsibility to the larger world community?” “What is our collective responsibility to future generations?” “What values are now essential?” “What ethical, religious, and other normative values will survive?” Asking the difficult questions is an urgent task today. What does it all mean?

To address these questions, a certain degree of humility is in order. Before asking what it means, we must explore what we understand. What is our conceptual understanding of climate change? Of the world? And where should we look for evidence of it?

The Inuit, one of the indigenous cultures of the Arctic Circle, have an interesting problem lately. They’ve been encountering robins—a bird they’ve never seen before. Previously confined to the temperate zones further south, these animals are so unfamiliar that the Inuit literally do not have words in their language for them. As a clever headline writer of *The Independent* put it, they are at a “loss for words.”⁷ They are even hearing thunder for the first time.⁸ The Inuit also have no words to describe the changes to their landscape brought on by the rising temperatures of global warming. They, famously, have tens of words to describe different variations of snow and ice, a fact often cited as an example of the importance of language in shaping our perception—attention to detail—as well as understanding. But now words fail them. Which should give us pause.

What the Inuit face is a foreshadowing of what humanity faces more generally. Does modern society have any experiences that will provide us with a conceptual understanding of the

⁶ Jonathan Leake, “Arctic Ice Cap to Vanish in 80 Years, study says,” *The Times*. December 22, 2002.
<http://www.climateark.org/articles/reader.asp?linkid=18818>

⁷ “Climate change and unfamiliar species leave Inuit lost for words,” Geoffrey Lean, *The Independent*, November 28, 2004.

⁸ Bill McKibben, “Imagine That,” *Grist Magazine*. 21 April 2005.
<http://www.grist.org/comments/soapbox/2005/04/21/mckibben-imagine/>

events and changes we are likely to see as a result of climate change? More to the point, do we even have a proper conceptual understanding of what global warming is?

Conceptual Metaphors and Basic Understanding

Among scientists and activists concerned with climate change, the question of language is usually centered around finding the right words and metaphors to communicate what we know to a broader public. But the knife cuts both ways, for examining the language and metaphors also reveals how we think about things. Looking at the language we use to talk about climate change can give us a window into how we do or do not understand it. Furthermore, examining how we understand the world can shed light on the difficulties we often have communicating about or taking action on global warming.

Work in cognitive science reveals that we understand the world largely through metaphor, whether we are conscious of it or not. That is, our conceptual understanding is almost entirely metaphorical. Furthermore, the conceptual metaphors we use are largely drawn from our physical embodied experience of the world.⁹ Conceptual metaphors are so essential to how we think that they often go unnoticed. A basic example of a conceptual metaphor is the concept MORE IS UP. “Carbon dioxide levels are *rising*.” “The stock market is *down* this year.” The metaphor comes from our earliest childhood experiences. Think of stacking blocks. The most basic conceptual metaphors can be termed primary metaphors. Some of these include: STATES ARE LOCATIONS, PURPOSES ARE DESTINATIONS, KNOWING IS SEEING, UNDERSTANDING IS GRASPING, IMPORTANT IS BIG, CHANGE IS MOTION.¹⁰

Interestingly, some of the richest and complex concepts are almost entirely understood through metaphor. Take, for example, “time.” We conceptualize time primarily through three spatial and movement metaphors:

TIME ORIENTATION
MOVING TIME
MOVING OBSERVER

In the spatial orientation metaphor, the future is *in front*, while the past is *behind* us. A long time ago is the *distant* past, while the next day is in the *near* future. Movement of time is alternatively either a stationary observer with a moving time or a moving observer with time as a stationary object or place. Examples of moving time include: Time is *flowing* by. Time *flies*. The end of the sentence is *approaching*. An example of the moving observer metaphor is: We are *getting*

⁹ I just used one at the beginning of this section—“window into”—when I suggested that “knowing” is “looking,” and more specifically a window is to a way to peek into abstract ideas represented as a “building.”

¹⁰ George Lakoff and Mark Johnson, *Philosophy in the Flesh*. New York: Basic Books. 1999. p.50-54. A full list of examples is not included here, but think of the following common phrases: “I slipped *into* depression.” “It’s a *big* deal.” “I don’t *see* what he gets out of their relationship.” “The idea is *not clear* to me.” “I’m *almost at the point* that I can retire.”

to the crucial moment. Most cultures have these three metaphors for time. Modern western culture also has the TIME IS A RESOURCE metaphor. Time is something that we have *a lot of*, or *need more of*. The interesting point is that time is not understood or even defined by time itself. Our conceptual understanding is rooted in metaphors.¹¹

Another concept almost entirely defined through metaphor is “love.” Like time, love is understood through metaphors: LOVE IS A JOURNEY, LOVE IS MADNESS, LOVE IS A COLLABORATIVE WORK OF ART, etc.¹² The mysteries of love and time, therefore, cannot be approached directly, but only understood indirectly—like understanding the nature of the sun by watching the moon.

How can conceptual metaphors be used to better understand climate change? An exploration of conceptual metaphor with respect to climate change not only promises to reveal how we think about climate change, but also illustrative of the difficulties of communicating what we understand scientifically.

“Global Warming”

Let's hope Antarctica and Greenland melt. Let's hope the sea levels rise. All life glorifies warmth. Only death prefers the icy fingers of endless winter.

— Derek Kelly, PhD, Asia Times Online¹³

“Global Warming” is arguably the most common term used to describe the phenomena of climate change. Credit for coining the term is often given to Dr. James Hansen, a climate scientist and currently director the NASA Goddard Institute for Space Science.¹⁴ The term is reasonably accurate scientifically. The build up of carbon dioxide in the atmosphere is expected to raise the Earth’s temperature—i.e., the globally averaged surface temperature—by a matter of degrees. While such a shift is of serious concern, it would have been exaggeration to have termed global warming “global heating” instead. From the point of view of a scientist trying to be accurate, to portray the phenomena as warming is probably most accurate. (At least with our respect to our understanding of relative temperatures.)

The use of the word “warming” has conceptual consequences, however. For example, because of our cultural understanding of “warming”—our folk theory of “warming”—the term does not convey the sense of a problem. In fact, “warming” is generally perceived as a good thing. If it is the weather we are talking about, we tend prefer it warmer than colder. We use

¹¹ *Ibid.* p.152.

¹² George Lakoff and Mark Johnson, *Metaphors We Live By*, Chicago: University of Chicago Press. 1980, p.138-141

¹³ Derek Kelly, “The global warming scam,” *Asia Times Online*, 25 February 2005.

¹⁴ “The Week That Was – Jan 8, 2000,” <http://www.sepp.org>

“warm” if it is pleasant. If it is too warm, we don’t say “too warm,” we say “hot.” Furthermore, when it is cold outside, we try to keep warm.

But “warm” is not confined to just temperature. It is an emotional term as well. For example, We associate warmth with affection. She *warmed* up to me. We *warm* up to ideas. *Warm colors* make us feel good. Searching for an answer or a hidden object, we *are warm* when we are closer. When we feel good, we feel *warm and fuzzy*. WARM IS GOOD.

In fact, WARMTH IS AFFECTION is one of the “primary” metaphors as identified by George Lakoff and Mark Johnson in their book *Philosophy of the Flesh*.¹⁵ That is, it is nearly universal across cultures, and is usually derived from our earliest experiences. This understanding of “warming” originates in our physical experience of being infants sharing body heat with our mothers or fathers. The experience of being physically warmed while being close to another body is literally imprinted on our neurons. Physically. As our first experiences of affection and the physical experience of warmth is blended in our brain. If the notion of “global warming” is intended to be a cause for concern, therefore, such an understanding must overcome a deeply embedded and largely unconscious conceptual framework.¹⁶

Granted, there are examples where “warm” can be the first signs of a potential problem. When a parent feels a child’s forehead to see if they are warm, it is to detect a possible fever. But in general, when the temperature is a problem, other words are favored. “He’s *burning* up.” “It’s too *hot* to go outside.”

So why not “global heating?” While this may have been a better choice of term for raising public concern, at the time it came into use it would have been a scientific overstatement. From the scientific point of view, “global warming” is a more accurate metaphor than “global heating” would have been, because the changes in the earth’s temperature are small in an absolute sense. In addition, scientists are notoriously (and thankfully) cautious about placing value judgments on their findings, not to mention careful about overstating their case. Accuracy and caveats are cherished—“warming” was a be more accurate characterization.

Globally Averaged Surface Temperature

The term “global warming” is also metonymy. That is, it is a case when a part of something is used to identify or describe the whole. The specific to represents the general. (Or sometimes the general represents the specific.) Though few outside of linguistic circles may be

¹⁵ George Lakoff, *Flesh*. P.50.

¹⁶ George Lakoff, *Flesh*. P.50.

familiar with the term, metonymy is part of our everyday conversation. We use “the White House,” for example to refer to the executive branch of government. Some standard forms of metonymy and examples include:

THE PART FOR THE WHOLE
Get *your butt* over here!
PRODUCER FOR PRODUCT
He bought a *Ford*
OBJECT USED FOR USER
The *buses* are on strike.
CONTROLLER FOR THE CONTROLLED
Nixon bombed Hanoi.
INSTITUTION FOR PEOPLE RESPONSIBLE
You’ll never get the *university* to agree to that
THE PLACE FOR THE INSTITUTION
Wall Street is in a panic.
THE PLACE FOR THE EVENT
Watergate changed our politics.¹⁷

Climate change is more than just warming, of course. Rising average temperatures result in changes in the circulation of air and water, the timing of the seasons, the distribution of flora and fauna—and that is just the start of it. Increasing carbon dioxide concentrations in the atmosphere change the pH of rain and even the oceans. Though to the scientist, “global warming” might be understood as all these things and more, the metonymy gives the impression of a one-dimensional problem—i.e., “It’s the temperature stupid.”

The consequence of the global warming metonymy is to emphasize “the earth’s temperatures,” or more scientifically specific, “globally averaged surface temperature.” That increased carbon dioxide concentrations have the effect of raising the earth’s surface temperature is generally not controversial. In fact, we’ve known this since the 1800s.¹⁸ It is no surprise, therefore, that so much research has gone into trying to detect and document the earth’s temperature. And focusing on temperature masks the greater complexities of climate science, focusing on the globally averaged surface temperature masks the greater complexities of the earth’s surface temperature patterns themselves. In point of fact, temperatures do not go up or down uniformly across the planet. In some locations, global warming will result in temperatures going down. Nor will surface temperatures change uniformly. Relatively speaking, for example, the temperatures at the equator will not be all that different, but temperatures in the Arctic will go up 2 or 3 times the average. They already are.

¹⁷ George Lakoff and Mark Johnson, *Metaphors We Live By*, Chicago, University of Chicago 1980. pp.38-39.

¹⁸ [cite Foirirer]

As if that is not enough, consider that the whole notion of “the earth’s temperature” is itself metaphorical. In his very worthwhile book, *Making Truth*, Theodore Brown explains that scientists are no different than the rest of us and so must also rely on their physical experience of the world to understand and explain the results of their investigations. Concepts such as “protein folding” are useful for describing observed phenomena, but are seldom properly literal descriptions. In fact, all our scientific “models” are essentially metaphors. That is, with respect to climate, there is no *literal* temperature of the earth. Our current instrument readings are not evenly distributed around the globe, either geographically or temporally. Nor are the instruments that measure them all calibrated. To inferring past temperatures, we rely on pollen counts in lake beds, oxygen isotope ratios in ice cores, and various other proxies which we relate to temperature by theories—or models—about how these proxies represent or are otherwise connected to average temperature. Legitimate disagreements about the proper algorithm used to arrive at an average temperature are, well, legitimate disagreements. Most importantly, temperatures and the range of temperature variations are different all over the planet at any given time and place. Necessarily, then, the idea of “the earth’s temperature” is not literal, but rather a metaphor.¹⁹ It is just an idea we collectively agree upon.

The focus on *a* measure of temperature has proved problematic for more reasons than the simple fact that it is hard to discern. Reports of temperatures going down in certain locations, while not contrary to the scientific theory, feed doubts about the whole scientific understanding. One reason for this is the conceptual metaphor, THE EARTH IS A BODY. The forests are the *lungs* of the earth, the ocean currents the *circulation system*. Environmental insults threaten the *health* of the planet. So the idea that you would take the temperature of the earth in the same way one takes the temperature of a body should not be a surprise. Even though it takes only a moment’s reflection to realize that temperatures vary tremendously over the planet—and that, therefore, the notion of a uniform temperature of the planet is naïve—the conceptual metaphor is strong, and one has to exercise the imagination to overcome the conceptual connection to a body.

Climate change and the weather frame

The weaknesses of the term “global warming” are duly noted by those working to communicate our scientific understanding. The most significant problems with climate change are arguably all the indirect effects that result from increasing carbon dioxide and temperature. These include, name just a few, changing air and water currents, rainfall patterns, timing of the

¹⁹ Theodore Brown, *Making Truth: Metaphors in Science*. Urbana and Chicago: University of Illinois Press. 2003.

seasons, and range of species habitats. This is not to mention the increased probability of severe storms, rising sea levels, insect infestations, and the spread (and incubation) of disease. And, of course, we cannot forget the effects we are yet to discover, which include the social, economic and political disruptions to our human society.

It is for this reason—“global warming” is more about *change* than temperature—that “climate change” is often favored among those familiar with or working directly on the issue. “Climate change” is more satisfying to the scientist, because it encompasses more accurately the scope and nature of the phenomena. That is, it is the complex and unpredictable changes to a large system which are at issue. While “climate change” is a more accurate term in this sense, it suffers many of the same conceptual problems as “global warming.”

For example, the word “climate” evokes the frame of “the weather.” And what do we know about the weather? It is natural for it to change. “Don’t like the weather? Wait 5 minutes.” Furthermore, the weather is something that we traditionally don’t have control over. “You can’t change the weather.”²⁰ It is simply beyond most people’s conceptual understanding to think that we can have any effect on the weather. “Climate” has a more specific meaning beyond just weather, which is the sense in which it is used by climate scientists, but the subtly is often lost. In general, there is a tendency to evoke the metaphor is THE CLIMATE IS THE WEATHER. It is an instance of the GENERAL IS SPECIFIC in which the inferences we have about the general, larger frame are limited by the inferences we have about the specific case.

Conceptions of weather also lead to some interesting paradoxes in the public debate resulting from the fact that it is famously difficult to predict. As hard as we try, the weatherman is accurate as often as inaccurate, and the ability to predict sunny skies or strong winds drops off rapidly as you go just a few days out. To the degree that climate change is identified as an issue of weather, “predictions” are immediately suspect.²¹ The paradox is that climate scientists are equally challenged for admitting uncertainties. This creates a particularly difficult problem when it comes to formulating policies to address either causation or adaptation.

These entailments of the weather—we can’t predict it, we can’t control it, we don’t effect it—are not unnoticed by the environmental advocacy community. The results of focus group

²⁰ This does not mean that people—some people—don’t use a fair amount of emotional energy trying to control the weather. The effort, of course, is futile.

²¹ As this blog post suggests, ““We can’t predict the weather. I don’t know why we should think that we can predict the climate with considerably greater accuracy. Our models remain far too simplistic.” http://msgboard.snopes.com/cgi-bin/ultimatebb.cgi?ubb=get_topic;f=53;t=001307;p=1

testing, for example, suggest to avoid talking about the weather, because it leaves people with the impression that there is nothing that they can do.

Scientifically, however, the ability to predict general patterns is reasonably robust. And the idea that we can't predict general climatic conditions is a little unfair. Quite simply, we know it will be colder in winter than in summer.

The degree to which the “weather” overrides a true understanding of “climate” is worthy of more specific research. Certainly “climate” as meaning the general conditions over time is understood. We know for example that certain climates are better for growing good wine grapes, while others are perfect for pineapples. The word “climate” is also used to describe general conditions in other frames. We speak of the “political climate” and the “business climate,” for example. “We could never pass the Kyoto protocol in the current *political climate*.”

Nature as a human agent

Another reason we view the weather as something we don't have control over is the conceptual metaphor of NATURE AS HUMAN AGENT. Like other conceptual metaphors, we use it in our everyday speech. “The wind blew the window open” is the classic example. Natural causes are forces exerted by the human agent, and natural events are the effects of these forces. The entailments of this metaphor are most of the inferences we hold about humans. Human agents have intention. Humans are aware. Humans can communicate. All of these get mixed up in our understanding of climate change. So, for example, we say that nature is trying to *tell us* something with the recent hurricanes in Florida. Or, alternatively, we are looking for *signals from nature* that climate change is happening. The idea that nature is aware often leads to the notion that nature will self correct—will literally *see* a problem and adjust. We can *insult* nature, and we question how long nature will *endure* our insults, such as carbon dioxide emissions, before reacting.

Climate change as an object in motion

Can we stop global warming? Can we slow it down? For the concerned activist, the goal is to stop or slow climate change before it is too late. The Green House Network, for example, sponsors the “Race to Stop Global Warming.”²² The climate change deniers, on the other hand, will point to predictions that warming is inevitable and say, “They admit it will do no good, so

²² <http://www.greenhousenet.org>. I am leaving aside the “race” part for the moment, but this is obviously worth exploring as well.

what is the point?”²³ That is, global warming can’t be stopped. Our understanding of what “slowing” or “stopping” climate change means is influenced by conceptual metaphor.

The dominant metaphor for change is CHANGE IS MOTION. It is a primary metaphor. (Similar to AFFECTION IS WARMTH, which we explored with global warming.) In this conceptual framework different states are locations and changes of location are changes of states. Things *went* from bad *to* worse. In addition, external events are conceived as large objects or substances.²⁴ Again: *Things* went from bad to worse. Furthermore, causes are understood as forces. If motion happens, for example, some force initiates the motion. If the climate is changing it must have a cause, something *forcing* it to change, to move.

Putting it all together, CLIMATE CHANGE IS AN OBJECT IN MOTION. This is nothing unique, simply a special case of understanding of CHANGE IS AN OBJECT IN MOTION. As understood in the context of climate change, *climate change* is the object. The *change* in the climate system is the motion of the object. The *impacts* of climate change are collisions with the object. The causes of climate change are the forces directing the object.

The entailments of this CHANGE IS AN OBJECT IN MOTION metaphor are both informative and sobering. When conceptualized as a large object in motion, some important entailments include: objects have momentum, “impacts” are collisions with the object, objects are either moving or still, application of enough force can stop an object.

Many entailments are appropriate and useful. For example, the entailment that heavy objects in motion have momentum is appropriate. Global warming is driven by atmospheric concentrations of carbon dioxide, a gas whose residence time in the atmosphere is about 100 years.²⁵ So the idea that once reaching a certain state, changing the state is difficult—i.e., there is momentum—is important and valid. Importantly, this metaphor works best if the object is considered to be a big heavy object. The lead author of a recent report on climate changes in the Arctic, for example, referred to the “supertanker of climate change.”²⁶ Pragmatically, momentum is important to consider, because the release of carbon dioxide is largely due to the burning of fossil fuels, which has unquestionably a certain momentum, being linked to economic activity.

²³ Joseph Farah, “The global warming hysteria.” WorldNetDaily.com. Posted 23 March 2005. http://www.worldnetdaily.com/news/article.asp?ARTICLE_ID=43431

²⁴ Lakoff and Johnson, *Flesh*, p. 179.

²⁵ Because of the complexities of carbon dioxides removal from the atmosphere, the residence time is, in fact, quite difficult to determine. However 100 years is an often used rule of thumb.

²⁶ “Study Finds that Climate Change is Causing Polar Ice to Melt,” EarthNet News, 10 November 2004. http://bulletmailer.vpi.net/envirocitizen/preview.php?issue_num=117

The specific case of the conceptual metaphor dressed up as a supertanker, there is opportunity for honest reflection. At least, this is my own subjective opinion. It seems to me that we are, metaphorically, in a situation that even if it were possible to “shut off the engines” of the fossil fuel machine, humanity would be heading towards an inevitable collision. And indeed, it is frequently noted that even if all fossil fuel burning were to cease today, there is enough carbon dioxide already in the air to cause temperature and other changes. That is, we can’t even talk of shutting off the engines, because the engines are also the life support system for three quarters of the boat’s inhabitants. With a supertanker, the engines would need to be put in reverse, which is, talk of carbon sequestration aside, less than likely. Certainly in the current political climate.

Another entailment of an object is that it is either in motion or it is not. The is particularly sobering with respect to climate change. Unpacking the history of the general progression of thought around “slowing” vs. “stopping” climate change is beyond the scope of this project. But, again subjectively, my own perception is that for a long time, and still in many circles, the question is: How can we “stop” climate change. From the Greenhouse Network’s “Race to Stop Global Warming” to Greenpeace’s stated aim of “campaigning globally on a variety of fronts to stop climate change,”²⁷ the notion the climate change is something that can be stopped is pervasive. It often seems to me that people believe that if we could just get enough people in front of the boulder we could bring it to a halt.

The articulated goal of “stopping” global warming removes the sense of degrees and nuances that really are at the heart of the actual phenomena. It is in many ways unfortunate, since this makes it one of those things that if the alternate case can be imagined, the essential truth can be discarded. That is, if it cannot be stopped, then it cannot be stopped. What good is slowing it? As an example, witness the response to a recent interview in *Der Spiegel* with Dr. Hermann Ott—(Berlin office director for the Wuppertal Institute for Climate, Environment and Energy, a European climate policy research organization). Ott states:

It's too late to stop climate change, that's for sure, but we can still influence the degree of changes and the degree of impacts. We can prepare for a softer landing.

Prompting the following response from a blogger:

IF the toboggan ride has already started, and nothing humans can do will change the outcome, then why are we striving for an impossible result? Hang on and enjoy the trip.²⁸

²⁷ http://www.greenpeace.org/international_en/campaigns/intro?campaign_id=3937

²⁸ <http://www.freerepublic.com/focus/f-news/1346904/posts>

Indeed, there are legitimate debates to be had between trying to prevent something and preparing for the consequences. If the toboggan is going to jump the tracks, effort spent in an unsuccessful attempt to stop it may interfere with taking a position to protect the body from injury upon impact.

The notion of “stopping” climate change also feeds into our goals and conceptual hopes. If climate change is something to be stopped, when will it hit? When will it happen? The notion that we may stop climate change in our lifetimes is, no doubt, endemic among the hopeful. Perhaps necessarily, it directs our efforts and informs our strategies. Hence, the urgency (of the relatively immediate goal) of educating the general public to change behavior. The reality, unfortunately, is grim. Realistically, carbon dioxide concentrations are not going to return to pre-industrial levels in the lifetime of any human alive today. Were we to recognize this, we might set different priorities in our response.²⁹ The important point to recognize is this: our strategies and our initial impulses are shaped by our conceptual metaphors. We aim to “stop” climate change, because our conceptual understanding of it is as an object in motion. But we may have unrealistic expectations because of it.

Turning our attention to the entailment of effects as *impacts*, the understanding of the damages of climate change coming from collisions is also important, though it also makes for an important misconception. That is, a collision tends to be a single event, rather than a process that unfolds over time. We imagine climate change may be avoided by changing the direction of the object, or, (as importantly), getting out of its way. The question becomes *avoiding* climate change, rather than adjusting to and responding to it. And indeed this common conception is evident in the very idea that climate change impacts will affect the poor nations of the world more than rich. The rich, that is, have the resources and freedom of movement to step aside from the path of the moving object.

The object in motion understanding also informs our expectations of what the solution looks like. Oh, if we put enough effort into stopping the object, then it will, well, be stopped, end of story. Right? That is, it is a problem that can *and will be* solved. And then not reemerge. This

²⁹ For example, Donald Kennedy’s 2005 Energy and Resources Group Annual Lecture focused on the difficulties of communicating climate science to the American public, specifically noting that we do not tend to think in the long-term very well. Ironically, however, our goal seems still to have a rather short term focus—convincing people to act now. Were we ourselves to take a longer term perspective in our goal, we might find it useful not to spend our energy arguing in the climate change debates, rather allowing nature itself to do the convincing with ecological disasters, etc. A longer term goal might be preparing the philosophical underpinnings for the sort of value system humanity may need to live in rapidly changing world. This, incidentally, is the take home message of this paper. Seriously. It is the purpose for writing this paper: “A longer term goal might be preparing the philosophical underpinnings for the sort of value system humanity may need to live in rapidly changing world.” It is here presented as a footnote, because the secondary take home message is that the wisdom and the miracles are to be found in the places one would not think to look—the footnotes of the first few pages of a paper.

largely informs, for example, the goal of a “transition” to a clean energy economy. Once we have the “clean” energy the problem is “solved,” without ever looking into the deeper questions such as: how much energy *should we* have? Or: Is it a good idea to have access to unlimited clean energy?³⁰ *How* we use the energy never gets examined.

Just as the metaphors for time have a MOVING TIME/MOVING OBSERVER pair, a variation on the object in motion theme is the notion of that climate change is a hazard or obstacle impeding one’s path. In this case, the metaphor is THE EARTH AS A VESSEL/SHIP. Buckminster Fuller is usually given credit with coining the phrase “spaceship earth.” If the Earth is a ship, then CLIMATE CHANGE IS A HAZARD/OBSTACLE. As avoiding the hazard involves a change of course, or a stoppage of movement, avoiding climate change here means getting on a *path* to clean energy. The integrity of the vessel or ship also becomes important. A rather common analogy is to imagine the earth as an airplane with rivets holding it together. Loosing one rivet might not be a cause for concern, but if the plane starts loosing lots of its rivets, it is not a plane one would want to rely upon.³¹ Similarly with a ship.

As a brief digression, consider how these metaphors can be dressed up as analogies. For example, my own favorite—the Titanic Analogy. The collective human experience, culture, economy, etc. is represented as the ship, speeding along, in reasonable luxury and with a sense of invincibility. Its momentum is such that it cannot change course quickly. The boat is “guided”—(as we may believe our human economy is)—with proper leadership. An iceberg, an obstacle, comes in to view. A something to be avoided. As a further digression, dig deeper into the real Titanic story and remember that the boat was much less maneuverable than the captain had experienced with all the other boats of his career. (Because of its scale, incidentally.) Similarly, our human economy and our potential to change the world is now of a scale with which we have no experience. Could we be our overconfidence that we can fix or avoid climate change? Embellishing it a little further, imagine that the survival of passengers relies on not only the boat staying afloat, but also on the engines running at full speed. That is, we can’t risk slowing down the economy to address carbon emissions, because people will die without the engines running.

In my own subjective translation of what I see around me today, we have hit the iceberg already. The boat is taking on water and is even listing. A small group of people is running

³⁰ Should a baby hold a gun?

³¹ Eleanor Sterling, PhD., “Rediscovering Biology: Expert Interview Transcripts,” Annenberg/CPB, 1997-2004, Accessed 9 May 2005. <http://www.learner.org/channel/courses/biology/units/biodiv/experts/sterling.html>. The analogy is more often applied to biodiversity, but it has been adopted enough in other ecological concerns to be mentioned here.

around trying to convince people we need to slow down and not hit the iceberg. Oh, that is brilliant. (Other are pretending that we can still not hit it as hard as we already have. Meanwhile, a larger group have decided that the best thing is to bail. They, unfortunately, are focused not on the bailing. But rather they are devoted to convincing people that bailing is important. All of this, even more tragically, are a small minority. Most people are engaged in an elaborate gambling game. Or chasing skirts. Or the riot on deck 2.

Like many metaphors and analogies, certain elements do not map from the source to the target. What is the sinking (target) represent in climate change (source)? What are the lifeboats? The analogy can—actually, does—create more confusion than understanding. Nevertheless, it is presented here to illustrate how images and commonly held stories can be expanded upon conceptual metaphors to “get across the bridge” certain realities of the situation. For example, the scale of response to climate change—today—is not even close to commensurate to the scale of the problem. It is like trying to bail the Titanic with a bucket brigade. To end the digression, it is rather ironic to consider that soon there may soon be no more icebergs that could sink a Titanic.

A last entailment of the CHANGE IS MOTION metaphor—(and the event structure it derives from³²)—is that CAUSES ARE FORCES. That is, for an object to move or change direction, some external physical force must be applied. The importance of this entailment is both the expectation of identifying a cause, as well as disagreement over the cause. Taking the latter first, natural events such as climate change are attributed to NATURE AS A HUMAN AGENT. Nature itself is seen as a human pushing, pulling or otherwise applying the force necessary for the change. Not mankind. With this metaphor as a conceptual hurdle to jump, it should not be a surprise that the first thing to prove is that *human* causation is not just important, but possible.

When it comes to identifying human causation of climate change, consideration of scale comes into play. Does carbon dioxide cause climate change? Carbon emissions? Is it the size of our economy? Is it overpopulation? Or is it the *values* of capitalism that are to blame? Actually, it is not just consideration of scale, but of conception, that are in play. “Greenhouse gases” are considered the driver of global warming, so we focus our efforts on curbing emission while holding all else equal (i.e., energy consumption. This is indicative of the shallow nature of our exploration of causation. We do not even consider what else not to hold equal. This, I suspect, informs the degree to which our solutions are largely technical—not cultural—in nature.

³² See Lakoff and Johnson, *Flesh*.

Greenhouse gases

The 19th century scientist Jean Baptiste Joseph Fourier was likely the first to suggest “that the atmosphere acts like the glass of a hot-house, because it lets through the light rays of the sun but retains the dark rays from the ground.”³³ The greenhouse metaphor, therefore, is not entirely new. Nor, in fact, is a reasonable estimate of the effects of a doubling of CO₂ on the earth’s globally averaged surface temperatures, which Svante Arrhenius calculated back in 1896.³⁴ While “greenhouse” has replace “hot-house” in our common usage, perhaps to the chagrin of climate change activists, the metaphor has remained the same.

Like the other metaphors associated with climate change, it originated out a need to explain a potentially complex scientific finding in a clear and simple manner. By this measure, the “greenhouse effect” is actually remarkably elegant. For the physicist, all energy can be characterized by its wavelength. But to start talking about “short-wave” and “long-wave” radiation masks the simple distinction between visible light and heat. So the image of a greenhouse that lets in light but keeps in heat is spot on. In addition, a greenhouse tends to be a place that is reasonably comfortable, neither too hot nor too cold.

But while “greenhouse gases” describes the mechanism well, and is scientifically honest, it comes with entailments that are not so obvious. Linguistically, “greenhouse gases” is rich and complicated. Like “global warming,” it is a metonymy. As the “global warming” metonymy places an emphasis on temperature, “greenhouse gases” emphasizes their heat-trapping characteristics over their place in other natural cycles. “Greenhouse” is also a linguistic blend. That is, it merges the concept of “green” with “house.”

The metaphor evoked is THE EARTH IS A GREENHOUSE. Which in turn suggests the metaphors THE EARTH IS A GARDEN and THE EARTH IS A HOUSE (or THE EARTH IS A BUILDING.) Taking THE EARTH IS A GARDEN first, our notion of a garden is something that is planted, tended, and whose purpose is either sustenance or aesthetic beauty. Gardens require someone to tend them, either god or humanity—your preference. Conceptually, therefore, nature is something that can be managed and planned. And though this notion is by no means limited to the greenhouse metaphor, the effort to plan, manage and control is inherent to the Kyoto protocol with it’s attempt to set emissions targets and stabilize CO₂ concentrations.

³³ Svante Arrhenius, "On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground". *Philosophical Magazine* 1896

³⁴ *Ibid.*

Another, and perhaps more important, metaphor is also suggested—THE EARTH IS A BUILDING. The greenhouse is a special case. It is a common metaphor. How often do we hear “the Earth is our home?” If the planet is a building, then we are its inhabitants. Space is outside the building. The atmosphere is the inside. This metaphor comes with an important entailment. Conceptually we understand that we can control the environment of a building. In a modern society, we adjust temperature by fiddling with the thermostat. Many of our buildings are “climate controlled,” and so it is not uncommon for people to use the term “climate control” when talking about climate change.³⁵ This, unfortunately, is an improper inference, because though we can affect the climate, the point is we cannot control it.³⁶

The EARTH IS A HOUSE metaphor shows up in the language used by climatologists and physicists alike. For example, climate scientists may refer to the earth’s “sticky thermostat.”³⁷ Physicists refer in turn to the “windows” by which certain wavelengths of energy enter or escape our atmosphere.

There are other entailments of THE EARTH IS A BUILDING. A building has a structure. Buildings are constructed. Buildings have foundations. Thus, we worry about the “collapse” of our ecosystems.

Though these entailments and more basic metaphors are important, the “greenhouse” image itself is still dominant. And ultimately, we are inclined to see more greenhouses as a good thing. Most scientific explanations of the greenhouse effect start off by explaining that greenhouses are good, that without them the earth would not be habitable. The issue is one of balance. Too much heat trapping gas making the windows too thick. But the idea that greenhouses are good shows up in the argumentation of the skeptics and those who argue that more CO₂ will not only enhance plant growth, but also make certain geographies hospitable to growing crops that may not have been before. Siberia as the next bread basket is the poster child example.³⁸

The greenhouse also can be taken *too* literally. In an issue analysis column on Alan Keyes' RenewAmerica.com website, author Fred Hutchinson—who believes “scriptural truth is the essential foundation for wisdom and knowledge and an indispensable antidote to self-

³⁵ This is largely anecdotal, but I have found it to be a very common slip among people not deeply familiar with climate change, and, one presumes, not conditioned to the use of the term climate change.

³⁶ Someone is dreaming about it, no doubt. And I would not want to be premature and say it is impossible. However, I am entirely *not* sure that such a degree of human control is a desirable state of affairs.

³⁷ Tim Appenzeller and Dennis R. Dimick, “Signs of Earth,” *National Geographic Magazine*, September 2004. p.11

³⁸ David Cohn, “Global Warming’s Silver Lining,” *Wired*, 28 March 2005.
<http://www.wired.com/news/planet/0,2782,66981,00.html>

deception"—misunderstands the essential scientific mechanism of a greenhouse. It is the ability to refract light, he believes, that leads to the trapping of heat:

Like glass, both water and ice refract light, resulting in rainbows or rainbow images. Clouds can refract light and produce rainbows because clouds consist of water droplets. Rainbows are more visible and spectacular just after a rainfall when the clouds begin to clear and sunbeams pierce the air when it is still filled with tiny water droplets. Since water droplets in clouds refract light in a manner similar to greenhouse glass, cloud cover as a metaphor for a greenhouse is logically valid.

However, there are no carbon dioxide clouds above the earth, because liquid CO₂ evaporates at 71 degrees below zero Fahrenheit.¹

This is a truly disturbing phenomena which may not have an immediate solution. But it does point out one of the difficulties of communicating science to those that do not practice it. This is particularly true considering the degree to which our current mass media communication tends towards the simplification of complex issues, both socially and scientifically. The tendency to have a simplified and misinformed conceptual understanding of scientific phenomena is unlikely to go away. While simplifications can help communicate essential ideas, they may also facilitate the rather complex mistrust of scientific experts in favor of the lay person “common sense” and “think for yourself” mantras of the radical right.

As Stanford Professor Stephen Schnieder often points out in his talks, the country at the moment seems stretched between two different extremes—the “doubt-test” paradigm and the “faith-belief” paradigm. While most scientists would place themselves in the “doubt-test” camp, where understanding of the world is explored and adjusted through asking questions and observing the results of experimentation, nearly 50% of the populace (by his off the cuff estimate) falls into the “faith-belief” circle.³⁹ Hence, our faith in scientific facts to motivate change may turn out to be irrelevant.

The Scientific Frame

“Global warming,” “climate change,” and “greenhouse gases” all have in common their origin in a scientific frame. The terms and the metaphors come from attempts to clarify and communicate scientific understanding. Indeed, it is the science that has been the focus (and the hope) of those working to raise public awareness about climate change. The belief that communication of the “scientific facts” to the public will be enough to raise concern and compel changes in behavior has been the dominant working assumption for years.

³⁹ Stephen Schnieder, unpublished comments during keynote address at UC Berkeley Breslauer Symposium. February 2005.

But there are multiple difficulties with this approach. To begin with, non-scientists don't generally think like scientists or understand the norms of science—i.e., ranges of uncertainty, degrees of confidence, caveats and qualifications. Most lay people expect simple answers.⁴⁰ A statistician will be loath for you to confuse and conflate the difference between “confidence levels” and “probability,” but such subtle distinctions are lost on the average person. The caveats, ranges of uncertainty and other qualifications that scientists use are only confusing to the larger public.

An important consequence is that climate change is understood not as an event, but rather as a scientific debate. This scientific framing has been exploited by those in whose interests it is to ignore climate change—the fossil fuel industry. It is a matter of public record that the fossil fuel industry has conducted a public relations campaign to frame climate change and global warming as a “theory,” and then to attack it as unproven.⁴¹ That the word “theory” to a scientist means a widely accepted explanation is of no consequence, to the average person a “theory” is something unproven, what a scientist would label a “hypothesis.” The public relations effort has been remarkably successful.

On a very practical level, the dominant question for years has been “is climate change happening?” Answering this question has relied heavily on reading the temperature signal. This is completely understandable given the nature of the overarching metaphor “global warming.” Unfortunately, demonstrating a warming trend is not a trivial process, and demonstrating that the current trend may be anomalous is also shaky. One must first battle over the proper time frame to examine. One must then be convinced that the observed trends are not “natural.” This is not to mention whether the change is considered a cause for concern.

Even when rising temperatures can be demonstrated, the locus of debate shifts to a more difficult question—is climate change attributable to human activity? It is proper for the scientist to be careful about attributing causation too quickly without a solid theory or direct evidence. But the “so called” skeptics have twisted this pragmatic caution of the scientist, by insisting the issue is one of proving or not proving human causation, rather than discussing the effects and events related to the climate's shift. The threshold for proving human causation to climate change is very high. (Or, at least it can be set high.) Indeed, as discussed in more detail below,

⁴⁰ This particular inference might be disproved with careful research, but I will state it without proof with a reasonable degree of confidence.

⁴¹ See Ross Gelbspan, *The Heat is On*, (Cambridge: Perseus Books, 1997) for the most complete account. However, there are numerous sources.

the belief that the earth is too big to be effected by humans is quite common. An editorial by William Rusher illustrates the point:

The simple fact is that the Earth's climate fluctuates, to a degree and owing to causes far more vast than any specified by the global-warming alarmists. We should respect that fact, and not permit these fluctuations to be tampered with by a bunch of hysterics who have no idea what they may be unloosing in the name of their cockeyed political agenda.⁴²

Furthermore, the notion of a debate, with two opposing points of view, is a source of distortion when it encounters our mass media driven culture. As Stephen Schneider pointed out in 1989:

There is a tension between the scientific culture of caution and reticence and the media's penchant for the drama, dread, and debate that keeps the show lively and the audience tuned in...there is a growing mismatch between the complex nature of reality and the way such problems are usually reported in the popular media or perceived by the public...If information is distorted by an overemphasis of extreme opposing views, then the policy-making process will not be rooted in the level of understanding appropriate to the reality of the issues.⁴³

Though the balance of scientific evidence does not support doubt about the predictions of global warming theory, skeptics are brought into the media debate for the supposed goal of “objective” or “balanced” presentation. That this is the opposite of balance—more weight is given to the skeptics than their research supports—is ignored.

Furthermore, attempts to question the skeptics' motivations by pointing out their funding sources—i.e., the fossil fuel industry—has only led to the same tactic being turned on mainstream scientists, who we are told are trumping up a global warming hoax for the purpose of lucrative research grants. Even if unfounded, repeated accusations of climate science as “junk” science eventually work their way into the public mind until they stick. The Orwellian irony that careless hacks can frame careful and thorough science as “junk” is entirely unsettling. The term “junk” is quite powerful given the conceptual metaphor THEORIES ARE BUILDINGS. “Junk” immediately suggests that the theory has no foundation, no support, in short, no integrity.

⁴² William Rusher, "Global warming can't account for Earth's vast climate changes," Pasadena Star-News, 20 March 2005. <http://www.pasadenastarnews.com/Stories/0,1413,206~11851~2773339,00.html#>

⁴³ Stephen Schneider, *Climate Change*, Sierra Club Books, 1989. p. 237

The social metaphor

There is more going on here than simply a scientific debate or a gap between the culture of science and the culture of sensationalized media. As Theodore Brown points out in *Making Truth*, "metaphors that underlie the science are transformed as they find their way into the larger public discourse."⁴⁴ That is, the scientific knowledge and the actual changes in the physical world have consequences and implications for society. Thus they become increasingly important as policy question, social debates, etc. Brown writes:

...the metaphor that began life as an element in climate model building has been transformed. To the extent that it now conveys images associated with political and economic considerations, global warming has become a social metaphor. And this is by no means a unique instance of such a transformation. Metaphors associated with genetically engineered plant and animal products, strategies for combating the AIDS epidemic, and contraception come to mind as further examples.⁴⁵

Because of its implications for humanity, the term global warming is no longer simply a metaphor about science. It has become a "social metaphor." That is, "In this larger arena the term *global warming* does not bring to mind the underlying scientific ideas."⁴⁶ It is as much a political topic as it is a scientific one.

It is such a hot political issue, that the Bush administration forbids EPA scientists from even using the words "global warming" or "climate change."⁴⁷ Or as a post on realclimate.org points out:

If someone asks me in my capacity as a climate scientist whether I "believe in 'global warming,' they are not asking the question in a literal sense. They are asking 'what am I to make of this confusing topic called "global warming"?' [Perhaps] the phrase "global warming" has become too loaded with confusion and political baggage to be used effectively by scientists in public communication."⁴⁸

The glaringly obvious point is not only that climate change is connected to other cuts of our collective worldview, but also that there is a tendency to understand the issue through the particular frame that is most important or of the most salient concern to any particular individual. Since many of these social issues are played out in the political sphere, climate change cannot avoid being a political issue. For example, as Roger Pielke, Jr. points out, even realclimate.org, a website devoted to the scientific facts cannot avoid primarily responding to political speech:

⁴⁴ *Making Truth*, p. 179.

⁴⁵ *Making Truth*, p. 182.

⁴⁶ *Making Truth*, p. 179.

⁴⁷ "Bad Science and the Bush Record: How the Bush administration has systematically distorted science to weaken regulations and serve political ends," NRDC, Accessed 9 May 2005 <http://www.nrdc.org/bushrecord/science/default.asp>. In a related item, the Bush Administration in fighting a NEPA lawsuit has had to rely on scientists outside the government to argue that global warming does not exist, because the government's own scientists claim otherwise.

⁴⁸ realclimate.org

"[RealClimate] claims to be "restricted to scientific topics and will not get involved in any political or economic implications of the science." This is a noble but futile ambition. The site's focus has been exclusively on attacking those who invoke science as the basis for their opposition to action on climate change, folks such as George Will, Senator James Inhofe, Michael Crichton, McIntyre and McKittrick, Fox News, and Myron Ebell. Whether intended or not, the site has clearly aligned itself squarely with one political position on climate change." And to this I'd add that the comment section of RealClimate (moderated in some way?) is mostly about politics and policy, not science.⁴⁹

The implications are grave as well as illustrative. Scientific facts do not frame our ethical responsibilities. Climate change is *in practice* a political question, which in turn demonstrates that our conceptual understanding is seldom dictated by facts.

In the political sphere, framing of the issue trumps the scientific view. Which is why George Lakoff argues that understanding and framing climate change as an environmental or scientific issue is problematic:

Environmentalists have adopted a set of frames that doesn't reflect the vital importance of the environment to everything on Earth. The term "the environment" suggests that this is an area of life separate from other areas of life like the economy and jobs, or health, or foreign policy. By not linking it to everyday issues, it sounds like a separate category, and a luxury in difficult times.

...When environmental issues are cast in terms of health and security, which people already accept as vital and necessary, then the environment becomes important. It's a health issue—clean air and clean water have to do with childhood asthma and with dysentery. Energy that is renewable and sustainable and doesn't pollute—that is a crucial environmental issue, but it's not just environmentalism. A crash program to develop alternative energy is a health issue. It's a foreign policy issue. It's a Third World development issue.

If we developed the technology for alternative energy, we wouldn't be dependent on Middle East oil. We could then sell or give the technology to countries around the world, and no country would have to borrow money from the International Monetary Fund to buy oil and then owe interest. This would turn Third World countries into energy producers instead of consumers. And it's a jobs issue because it would create millions of good jobs in this country. So thinking and talking about environmentalism in limited terms like preservation of wilderness is shooting yourself in the foot.

That's why the frame is so important. Most environmentalists believe that the truth will make you free. So they tell people the raw facts. But frames trump the facts. Raw facts won't help, except to further persuade the people who already agree with you."⁵⁰

Which is why it may be hopeless to actually address climate change effectively through science. Once the issue has become a social—and therefore political—metaphor, the only facts that are useful are the facts make you feel good with people who already agree with you. Hence it is not surprising that the “anti-climate” op-eds paint the scientific consensus as a clique you can only join if you already agree.

The defining example of this is probably Rush Limbaugh. He believes global warming is "almost a hoax," His December 17, 2004 broadcast, for example, is revealing:

...those of you on the left who believe this global warming stuff -- and you know who you are -- and you believe it in your heart because you want to believe America is that rotten; you want to believe we are that

⁴⁹ http://sciencepolicy.colorado.edu/prometheus/archives/climate_change/index.html#000316

⁵⁰ Katy Butler, "Winning Words," *Sierra Magazine*, July/August 2004.

powerful yet we would purposely destroy the planet. We would purposely cause all this destruction, and that's why you are fringe figures anymore...

...So global warming and militant environmentalism is just one element of this whole industry here, which has as an ultimate aim the downsizing and the weakening of the United States of America as it exists today. They will fail, but they will keep trying.⁵¹

As a social metaphor, global warming cannot be separated from Rush's view of the political left as "America hating," and, therefore, gets conflated into the context of the current polarized politics in the United States today. (It is, of course, rather ironic, for while Rush is suspicious of those concerned about global warming—accusing them of ignoring facts because their career depends on it—he himself has made a career out of simplified polarization.) The point is, Rush sees environmentalism as part of "this whole industry here." That is, as part of something else, not environmental.

Of course, there are the religious overtones as well. Consider Joseph Farah, a conservative columnist, who holds the view that:

Most scientists not compromised by the desire for government grants to study global warming or some political motivation will tell you there is little if anything man could do to heat up the earth's atmosphere. The earth is just too big. Man's presence is just too small. That's just the way God planned it.⁵²

If your conceptual understanding of the world is that God created it—(for example, in seven days)—then it would shake the foundations of your core belief system to recognize evidence that mankind collectively is exerting an influence. But like Rush, Mr. Farah's concern is more political than religious:

Because it fits a broad political agenda for further government control – in this case, international government control – over the lives of ordinary people. There is no other explanation for it. The global-warming doomsayers all believe Big Government is the only answer. We need more centralized power, more command-and-control bureaucracies, more regulations – all of which translates, like it or not, to less freedom.

This is a power grab. It's about stealing your liberty. It's about destroying the last vestiges of self-government and imposing international tyranny on Americans and the rest of the world. It's part of a broad scheme to make decisions for you with no accountability – no elections, no representation, rule by a pseudo-scientific elite. Marx would be so proud.⁵³

What is going on here? Global warming *is* a social metaphor. And the historical context—that is, the current context—is one of profound philosophical upheaval. As Native American scholar John Mohawk observes, the abandonment of the enlightenment tradition and the resurgence of the search for truth in scripture has made for some odd bedfellows:

⁵¹ Rush Limbaugh, Transcript, December 17, 2004

⁵² Joseph Farah, "The global-warming hysteria," WorldNetDaily.com.
http://www.worldnetdaily.com/news/article.asp?ARTICLE_ID=43431

⁵³ *Ibid.*

The debate over global warming highlights an unexpected phenomenon in U.S. culture. The U.S., an enthusiastic participant in the 18th century intellectual movement known as the enlightenment, seems poised to turn its back on the method of skeptical inquiry into patterns of fact and revert to old ways which sought answers to all questions in Scripture.

Some Indian prophecies predict very difficult times, but not an end to all life. Contemporary American culture, especially its political culture, is influenced by expectations of a biblical end-time, a "second coming" and the end of nature. Who would have thought a time would come when the Indian prophets and the scientists would be on one side, and the end-of-nature crowd would direct environmental policy from Washington?⁵⁴

Implications of the social metaphor and framing

The implications global warming's transformation into a social metaphor complicate the picture of conceptual understanding. Piecing the science together is hard enough with geochemists, atmospheric scientists, biologists, physicists all examining parts of the puzzle from their distinct disciplinary training. Filtering understanding through economics, politics, social justice, and religion necessarily distort the picture.

Indeed, George Lakoff is correct, climate change *is* a health issue, it *is* a human rights issue. One can start with the science, but in tracing back the causation, or rather the chain of connections, one touches on aspects of every human issue, and practically every ecosystem as well. Global warming, in this way, is not unique. One could talk about water, for example, and the same connections and same ability to frame it from multiple angles is true.

This is a humbling note, as it implies that the chances for a comprehensive conceptual understanding of global warming are slim. Geochemist Daniel Schrag suggests it is not easy:

For example, in thinking about the earth as a complex system, I've appreciated how important it is to also think of how you frame your system. People who have discussed the issue of climate change have taken a focus that is perhaps too small. They need to think about the larger system and understand all the dimensions of that larger system. This can be exhausting at times.⁵⁵

He uses the story of the king who receives a gift of an elephant from another king, and sends out his wise men to investigate and tell him what it is. Having spent their whole life inside reading, the wise men are blind in the sunshine. Each taking different parts of the elephant—one the trunk, one the tail, one the legs, etc.—they each have a completely different idea of what it is. The exhausting part is not only that it takes a fair amount of effort for any individual to picture the whole elephant, but one is constantly having to interact with others who only have a grasp of a part, say the trunk. It can be draining to interact with people who are passionate about the

⁵⁴ John Mohawk, "Mohawk: Climate Change in America," *Indian Country Today*, March 25, 2005.

⁵⁵ Daniel Schrag. Presentation at Thought Leaders Forum, 2003. Credit Suisse/First Boston LLC 2003. http://www.csfb.com/thoughtleaderforum/2003/schrag_sidecolumn.shtml

part they know. When one person thinks it is a serpent, and another understands it be an elephant, different strategies to move the elephant would come into play. Thus, in the context of a sound bite and media driven society, the task of the well informed scientist can simply be too much to take.

As a social metaphor, climate change becomes an economic, moral, religious, and political issue. Thus, concepts emerge in the economic language—carbon markets, cap and trade systems, emissions targets, carbon tax, carbon credits, clean development mechanisms—as well as framings that have to do with “balancing nature” with “economic interests.” Climate change is seen as a threat to the economy, both through damages from natural process—extreme weather, drought, etc.—but also from the costs associated with trying to mitigate or reduce emissions. On the other hand, climate change is also a business opportunity. Notably, for example, SwissRE, a reinsurance company—(i.e., insurance wholesaler)—is creating a whole line of products to make money on not only the need to insure for damages from natural disasters, but also from the potential economic impacts of new regulations or taxes.⁵⁶ Or, it something that competes with economic issues. As Bjorn Lomborg sees it, for example, “global warming is not anywhere near the most important problem facing the world. What matters is making the developing countries rich and giving the citizens of developed countries even greater opportunities.”⁵⁷

In the social sphere, climate change is related to justice and struggles of class. It is no surprise therefore that there is also a tendency to fall into the dichotomy of victims and perpetrators. Hence, terms such as “climate justice” and “climate equity” are not only prevalent, but already well established. Other social relations between developed and developing nations are encapsulated in the diplomatic language of the Kyoto Protocol with “clean development mechanisms,” “joint implementation,” “no regrets policies.”⁵⁸

The question of whether science can stand alone from social concerns is slippery by nature. With issues of resource use and scientific facts, there are always social and political questions involved. At least, when attempts are made to argue based on science, they tend to mask other social issues and social relations that are necessarily part of the picture. (Many scientists are wary of making ethical or action oriented prescriptions based on their research as a matter of principle.) Science, for many, is not an advocacy role.

⁵⁶ www.swissre.com

⁵⁷ Bjorn Lomborg, *The Skeptical Environmentalist*, New York: Cambridge University Press, 2001, p.323.

⁵⁸ no regrets, actually, is not really a Kyoto term.

It is, therefore, a little odd, if not downright puzzling, why environmentalists and activists have relied so heavily on a “if only the public knew the scientific facts” approach to motivating action on climate change. There is an historical problem in addressing an issue like climate change. We are hampered by the fact that people’s opinions, perceptions, and understanding of the world is not determined by rational, logical examination of the “facts,” but rather is influenced by a whole host of factors, most of which cannot be changed. For example, that the “environmental community” has framed “the environment” as a separate thing—setting up the dualism of “the environment” vs. “civilization” or “progress”—cannot easily be undone, even if the whole movement were to adopt a different strategy today. The frame has already been set, and many are comfortable with it.

And the truth is that the environmental community could not possibly transition so quickly either, as the recent flap over *The Death of Environmentalism* has illustrated. While the authors, Ted Nordhaus and Mike Shellenberger point out the problems with framing the environment into its own category, Carl Pope of the Sierra Club defends the idea:

S&N complain that "Most environmentalists don't think of 'the environment' as a mental category at all - they think of it as a real "thing" to be protected and defended. They think of themselves, literally, as representatives and defenders of this thing."

So?

Without being too precious, the environment is a real thing. There is a global carbon cycle, human interventions are a small if meaningful part of the evolutionary process, homo sapiens depend upon a complex web of both geochemical and biological processes. Natural processes -- eutrophication, competition, speciation, nutrient cycling, sequestration -- continue around us according to their own dynamics. We influence, but do not control, the climate. Of course our understanding of these phenomena proceeds through mental constructs which are not the phenomena themselves -- we've known that since Kant.

But I don't think that the definition of what constitutes an environmental problem is the arbitrary and troublesome source of weakness that S&N suggest.⁵⁹

The passionate defense of the framing that is comfortable is deeply disappointing. Ultimately questions of the environment or nature are *not* separate from health, security, etc. Climate change touches everything, and so, in a way, it is the same as social security, the same as Medicare, the same as the war, and on and on. In the meantime, however, the category of environment is deeply entrenched.

Nordhaus and Shellenberger’s insistence “that modern environmentalism, with all of its unexamined assumptions, outdated concepts and exhausted strategies, must die so that

⁵⁹ Carl Pope, “Carl Pope Response to 'the Death of Environmentalism': THERE IS SOMETHING DIFFERENT ABOUT GLOBAL WARMING.” http://www.sierraclub.org/pressroom/messages/2004december_pope.asp

something new can live,”⁶⁰ is a bold and insightful thought. But at the same time, the public pronouncements insisting on creating yet another, new, unifying vision—rebuilding this ship in mid-ocean, if you will—is also a bit naïve. Such an insistence has been a distraction from the useful point their controversial paper illustrates. The environmental concerns are social concerns as well:

If, for example, environmentalists don’t consider the high cost of health care, R&D tax credits, and the overall competitiveness of the American auto industry to be “environmental issues,” then who will think creatively about a proposal that works for industry, workers, communities and the environment? If framing proposals around narrow technical solutions is an ingrained habit of the environmental movement, then who will craft proposals framed around vision and values?⁶¹

To understand the entrenchment of the “environmental” frame, just take a closer look at the characterization of carbon dioxide as “pollution.”

Carbon emissions as pollution

“If we can reverse the emission of the pollution that causes climate change in time...”

— GEOFFREY LEAN, *THE INDEPENDENT*

Is climate change a pollution problem? The framing is pervasive. It is quite natural to understand it this way, especially considering the focus on fossil fuel emissions as a primary cause. Our prototypical image of pollution is the pipe oozing sludge into the river, or the smoke stack spewing dark clouds into the air. Fighting pollution is almost the defining activity of the modern environmentalist, particularly the strand of it that has followed the publication of Racheal Carson’s *Silent Spring*. The now classic book can probably be credited for presenting a pollution that was essentially invisible, expanding the prototypical image. But it did more than just that. For the real life story of the book’s publication, as much as the book itself, set up the players in the pollution drama—polluter, polluted pristine nature and concerned ordinary citizens. The ensuing dynamic of monolithic industry vs. informed populace taking grassroots action to uncover proof of the effects of invisible unconsidered pollution is a drama that a whole generation of environmental activists have cast themselves in for nearly half a century now. I know. I’m one of them.

The legacy of Racheal Carson’s method remains as well. For those forms of pollution which are essentially visible need some indicator to expose evidence of a problem. Racheal

⁶⁰ Michael Shellenberger and Ted Nordhaus, “The Death of Environmentalism.” The Breakthrough Institute, 2004. http://www.thebreakthrough.org/images/Death_of_Environmentalism.pdf

⁶¹ Michael Shellenberger and Ted Nordhaus, “The Death of Environmentalism.” The Breakthrough Institute, 2004. http://www.thebreakthrough.org/images/Death_of_Environmentalism.pdf

Carson was fortunate enough to uncover the “robin’s egg.” The current concern over genetic engineering has the death of scores of monarch butterfly, and climate change has its own as well—changes in the timing of the season, migration of species, etc. Certainly this contributes to the confidence environmentalists have that “the public” will make the connection if simply presented with the information.

As nuanced as environmental wonks can get about the subtleties of the science, in the average mind the pollution frame is dependent on the prototypical version of pollution. It is something we can see. Or smell. Or hear. It is dirty. The label pollution implies something that in and of itself is toxic or harmful to human health or ecosystems.

But can carbon dioxide really be considered pollution in this way? We do, after all, exhale it ourselves. It is like oxygen for plants. It doesn’t create acid rain. It is not inherently toxic. It is an integrated part of the natural cycle of carbon and life. To call it pollution is a weak proposition that sets up a cognitive disconnect. Though extremely misinformed on the science, Fred Hutchinson provides the extreme example of how the disconnect plays out:

Although neither nitrogen or oxygen has an influence on the greenhouse effect, for some reason CO₂ is assumed by environmentalists to influence the greenhouse effect so as to cause global warming. We are all waiting for an explanation of how CO₂ differs from nitrogen and oxygen in its influence on the greenhouse effect. Until such explanation is forthcoming, it seems reasonable to suspect that the theorists are failing to differentiate between wholesome CO₂ and poisonous CO (carbon monoxide) and other toxic gases that accompany CO₂ in industrial pollution. Why are the global warming theorists singling out a wholesome gas that is necessary for life on earth as the culprit of the impending disasters they are predicting?⁶²

Carbon dioxide is “wholesome,” while the expectation of pollution is that it is “toxic.”⁶³ The confusion really is understandable, and has not been made any clearer with the discussion of “global dimming,” or other characterizations of aerosols and particulates in the atmosphere.

Carbon dioxide is not the only important factor in affecting the earth’s energy balance.

Particulate matter and aerosols can have either an absorbing effect, or a cooling affect depending on their concentrations and compositions.

A recent study published in *Nature* found that the previous “global dimming” trend—i.e., less sunlight reaching the earth because of particulate pollution—has been reversed in the last decade, probably as a result of the collapse of communist economies and the ensuing reduction in industrial pollutants.⁶⁴ It is undoubtedly ironic that more pollution helps offset warming trends

⁶² Fred Hutchinson, “Common Sense on Global Warming,” March 19, 2005. RenewAmerica.com

⁶³ It is, admittedly, hard to take Hutchinson seriously, especially given comments claiming that science has not explained how CO₂ is any different than other gases. It has, of course.

⁶⁴ Quirin Schiermeier, “Clear skies end global dimming,” *Nature*. 5 May 2005. <http://www.nature.com/news/2005/050502/full/050502-8.html>

and masks the true global warming situation. The irony was not lost on Rush Limbaugh, however:

Our planet's air is cleaned up in the past decade or two, it allows more sunshine to reach the ground, two studies in Science magazine say. So some people are saying, "Should we start polluting more in order to fight global warming?" But then people say, "No, no, the pollution causes global warming." Well, wait a minute. How can pollution cause global warming if we're getting rid of pollution and that's causing global warming? So there's nothing we can do, folks. ... And I said, "Well, hell, if we can't stop it, how in the hell can we be accused of causing it?" It's just asinine. It's totally a hundred percent absurd.⁶⁵

Of course, particulate matter and carbon dioxide gas are two entirely different matters. But when the concept of pollution is applied to them both (or pollution is applied in general to the otherwise benign carbon dioxide) it becomes difficult to unpack conceptually. The prototypical case is just too strong.

Another problem with the pollution frame is that it has a simple and known solution. Clean it up. Stop polluting. Or at least get it out of sight. At the very practical level, seeing climate change as a pollution problem may give us a false sense of confidence in solving it. As the logic goes, all we need is clean energy, which again points towards technological solutions at the expense of other changes in cultural or societal thinking.

Lastly, the pollution frame reinforces the notion of environment as a separate thing, and sets up a dualistic conflict with good guys and bad guys. In order to have “pollution,” you must have a “polluter” and something that gets “polluted.” In general, pollution comes from the activities of human society. More specifically, it is considered to come from industry—i.e., factories. The thing polluted is the environment, which entails an unpolluted landscape starting in a “pristine” or perhaps even “innocent” state.

That is, it tends to put the issue into an “US vs. THEM” dualism, very similar to others, such as jobs vs. the environment. The obvious consequence is that simple win-win, or creative solutions, or, heaven forbid, radically different ways of approaching the problem are discouraged. The important questions lean towards assigning blame, dividing the world into perpetrators and victims, and generally attempting to put the burden of responsibility for the problem onto someone else, the polluter. Hence, it is no surprise that the battle lines are drawn over SUVs, and the drama plays out between individuals slinging moral accusations back and forth over “contributing” to the problem. Activists for Greenpeace shut down a United Kingdom Range Rover assembly line labeling it a “climate crime scene.”⁶⁶

⁶⁵ Rush Limbaugh, "Clear Skies Worsen Global Warming!," RushLimbaugh.com, May 6, 2005. http://www.rushlimbaugh.com/home/daily/site_050605/content/global_warming_update.guest.html

⁶⁶ "Greenpeace shuts down Range Rover assembly line," Greenpeace International, 16 May 2005. <http://www.greenpeace.org/international/news/range-rover-shut#>

The pollution frame, however, may be too tempting to resist. As a frame that many are already familiar with, it becomes a convenient short cut for environmental organizations attempting to make a complex problem easier to understand. Carl Pope defends the notion, going so far as to suggest that “global warming is mainly a problem about who is going to pay.”

But if we frame global warming as pollution, and assert that the polluter should pay, then suddenly this otherwise completely abstruse, overly technical problem becomes much easier for the public to understand.⁶⁷

Pollution, therefore, is a short cut. Limit the scope of the problem to achieve a desired end. But it is also the old way of thinking. Carl Pope as much says this:

It's a conceptual problem. And it's a conceptual problem that environmentalism dealt with before, when it encountered the early view that "the smell of pollution is the smell of money." ⁶⁸

This sort of reliance on the “we’ve dealt with this before” thinking is a great failure of the imagination. It is also a failure to note that climate change is the sort of issue that does *not* fall into any of the comfortable categories of environmental problems we have encountered before. It is worth noting in passing that such shortcuts also short-change our collective effort. By providing a “easy” frame, and easy answer, there is little incentive—much less need—to develop a more complex view that might illuminate global warming as a profoundly challenging crisis. That is, crisis in the almost cliché “Chinese characters” definition of crisis: “danger and opportunity” together. Global warming offers an opportunity to engage difficult collective issues, but not if we are satisfied with the easy framings.

Cap and Trade, Carbon Markets and the Economy metaphor

An example of a solution encouraged by the pollution framing is the creation of tradable pollution permits. Such systems have been quite successful in regulation of sulfur and other emissions that cause acid rain. The situation with carbon, unfortunately, is quite different than with sulfur, so such confidence that the pollution permit model will work is, from a purely technical standpoint, questionable. Technologies exist for the “scrubbing” of sulfur from the exhaust gas of power plants. The emissions themselves are primarily from a few large facilities. And the sulfur itself is a trace element in the coal that is being burned. Carbon, on the other hand, not only is perhaps the main element in coal, but capturing it requires whole new plants rather than technologies that can be capped onto the top of smoke stacks. Lastly, of course,

⁶⁷ Carl Pope, “Carl Pope Response to 'the Death of Environmentalism': THERE IS SOMETHING DIFFERENT ABOUT GLOBAL WARMING.” http://www.sierraclub.org/pressroom/messages/2004december_pope.asp

⁶⁸ Carl Pope, “Carl Pope Response to 'the Death of Environmentalism': THERE IS SOMETHING DIFFERENT ABOUT GLOBAL WARMING.” http://www.sierraclub.org/pressroom/messages/2004december_pope.asp

contributions to greenhouse gas concentration are not limited to large power plants, but also come from millions of individual automobiles and other small yet plentiful sources.

Nevertheless, the Kyoto protocol has now been ratified, which means that the infamous climate change treaty will “come into force” soon. This is an historic moment in the climate change story, because, in theory, the nations of the world will have “binding” commitments to reduce their carbon dioxide emissions to below 1990s levels. It also means engagement of a whole set of metaphors.

A key “mechanism” for controlling emissions is a “cap and trade” system, based on the experience of regulating sulfur emissions. That is, the “right” to emit carbon dioxide will be given to specific people or companies, who may then trade these rights among others in a market. So we now have the idea of “trading carbon,” and “carbon credits,” “carbon budgets,” and most importantly, “carbon markets.”⁶⁹

First, trading shares on a virtual exchange—as all shares markets have been since they first appeared in England (sometime after they started burning coal, I believe)⁷⁰—is never really trading in the actual physical thing. Natural gas, for example, is traded virtually, with only a tenuous relationship to the actual moving of gas through a pipeline, or physically receiving it somewhere.⁷¹ Carbon markets are even one more step removed, because what is being sold is not a transfer of actual carbon, but rather an implicit right, permission, or permit to evaporate a quantity of geologic carbon into the atmosphere. That is, pump millions of years old oil from miles underground, or dig into a mountain and load millions of years old coal onto a train, and burn it. Or, returning to the pollution frame, a share of collectively allowable “pollution.”

This sort of abstraction of the physical world into virtual commodities is a natural part of the notion of substitutability central to our modern capitalist economics. The point of all this is that markets are an abstraction and do not represent, conceptually, what “carbon markets” actually activates in the mind. But also, there is the confident justification that the markets *do* connect back to the physical world. The markets are seen as the arbiters of what we do in the world, not just who gets the biggest number at the end of the day.

Metaphorically, the introduction of concepts like “carbon markets” and “carbon trading” is mapping a business frame onto nature. That is, the climate is something that can be managed

⁶⁹ Kyoto also has other terms “joint implementation,” “hot air,” “clean development mechanisms,” which will not be taken up in this paper.

⁷⁰ I do not have a specific reference for this that I have time to track down. This thought is based on a memory of a lecture about the beginning of corporate ownership and markets, that included a description of the early days in England where, literally, a bunch of men were doing deals in the park. It seems a little urban myth to me, but that’s the reference here.

⁷¹ [Energy Markets with Severin Borenstein.](#)

like a business. NATURE IS A BUSINESS, or in this special case THE CLIMATE IS A BUSINESS. Society is the CEO. Countries and other political organizations are the middle managers. As we assume that company policies and rules can direct the functioning of a company, we assume that society will be able to construct rules to control carbon emissions. At a more general level, climate change is simply understood as another constraint on markets, like taxes, or like interest rates. It is taken out of the scientific frame. And, importantly, it is assumed that business people and politicians can make decisions about the optimal conditions of nature.

On the one hand, such a commoditization of life is the logical progression of a capitalist mindset, which whole traditions of study have deconstructed and examined from all angles from Adam Smith to Marx. The translation of carbon into a commodity is one of the supreme abstractions of our modern age, along with the patenting of gene sequences. The point at hand is to notice that notions of creating private property out of carbon emissions, and relying on market mechanisms to arbitrate our collective efforts to regulate our interaction with fossil fuels, is to conceptualize the world as something that can be planned, projected and managed.

The dominance of the economic world view as a conceptual framework is profound. It is, of course, blind to what it does not know, and serves quite well to presuppose the validity and reliance upon the economic activity of turning the world from “natural resources” to “products.” Notions of balancing the needs of nature with the assumed progress of man, for example, are assumed, not challenged.

Who owns the sky?

Trying to apply notions of private property to something like the carbon in the atmosphere is not an easy task. Arguing for a way that is fair and equitable leads to an interesting question, “How can you own the sky?” This is the question that Peter Barnes, founder of Working Assets, puts forth with his book, *Who Owns the Sky*, which is an interesting attempt to incorporate our economic system into efforts to control carbon emissions. In it, he advocates creating a “sky trust” that will earn dividends for people based on taxes collected for using carbon. It relies on notions of human rights, that simply by living we would own a share of the sky. One person, one share. There are cultures, mostly indigenous, whose notion of ownership would not include the ability to own the land, much less the sky. We are in the long run, perhaps limited by our own economics when it comes to understanding what we can or cannot achieve addressing climate change.

Carbon offsets and carbon neutral

Googling “carbon offsets” yields 14,000 listings. The conceptual understanding that leads to something like “Carbon offsets” is essentially economic. It is directly economic in neoclassical sense, by providing for the notion of substitution of inputs. If you drive your car here, you can buy the idea that the carbon emitted will be taken out of the atmosphere somewhere else. The idea of substituting is a conceptual understanding of the world in which money can be replaced for things, or events. Everything has a price.

The notion of carbon offsets, however, is also based on an idea of moral accounting. Our good deeds earn us credits, and our bad deeds count against us. The whole mindset behind offsets, in fact, is based on a moral reasoning, not a necessity. The curious aspect of it is the degree to which the thinking is individualized. The goal is for everyone to change their own personal behavior, but it is essentially up to the individual’s sense of duty to do it, and guilt is the expected driver. For the individual action to be taken, requires a sense of personal moral duty, and the sum of all individuals with a heightened sense of moral duty eventually adds up to the desired change.

As long as you are doing your part, you are not guilty. This is somehow just another side of the “who is to blame” worldview, where as long as we can find ourselves innocent, we can excuse ourselves out of being part of the problem. It’s the other guy’s fault. That guy, driving the SUV. People attempt to live “carbon neutral” lifestyles where they offset their calculated (and abstract) contribution to carbon dioxide emissions by yet more purchasing.

Underlying this conceptual system is an emphasis on self-opinion. One tries to live carbon neutral so one can “sleep at night.” But where does self opinion lie on the maturity scale? How far does feeling good about oneself get the collective whole? While we sit please with ourselves for taking on the guilt of melting the icecaps, we do nothing to build a new conceptual understanding that might see the problem in as a more collective dilemma that moves beyond who is to blame. That is, who is good and who is evil. We all put ourselves in the good camp. Right?⁷²

The atmosphere as a container

Setting targets or deciding proper concentrations of carbon in the atmosphere invokes a metaphor worth at least a passing mention: THE ATMOSPHERE IS A CONTAINER. It is not

⁷² [this section can be backed up with direct quotes from organizations marketing offsets.]
[there really are profound ethical implications here. It is like paying someone else to do your “hail mary’s”]

uncommon to hear someone speak of “filling up the atmosphere,” “pumping carbon dioxide into the atmosphere,” and “running out of atmosphere.” The container is the atmosphere. The contents of the container are the gases. Emissions are the things that go into the container. We run out of atmosphere when there is not more room in the container for more carbon dioxide. It gives us the concept of limits and finite space.

Conceptual metaphors that relate to containers are fairly common. For example we use them to describe personal states. “I can’t get out of my depression.” There are contradictions, however, when applied to the atmosphere. For example, physically, there is not a limit to how much carbon dioxide would “fit” in the atmosphere. But if we are trying to set a limit, to “cap” it, then the container has a fixed size. One of the difficult entailments with this conceptual metaphor is that the container will limit our output. If we have a container of a fixed size, we will be physically limited at a certain point. In reality, the atmosphere is more like an infinitely expandable container. It is only our own self-restraint that limits our inputs. But the conceptual understanding conflicts with the reality of the limits.

Investment and Debt and Liability

The idea of debt and investment is largely missing in the climate change discussion. There are many angles on this question, however. Indeed, many questions. For example, as Paul Baer and Tom Athanasiou argue in their book *Dead Heat*, what debt does the industrialized world owe to the developing world for accepting limits on future carbon emissions? Though their arguments are a challenge in the academic circles of economics, just raising the question illustrates how complex and difficult is the task of balancing the moral accounts.⁷³ But what about our debt to nature?

Did nature invest in fossil fuel? If so, do we owe a debt for raiding the vault? What is mankind’s debt to nature now? Now that we have overseen the latest great extinction? And the overheating of the engine of life? What would it mean to see geologic reserves of fossil fuels as an investment by nature? The responsibility for burning it up may be more than is possible to wrap one’s head around. It took billions of years for life to develop on the earth. What an effort and dance it was to for bacteria to evolve to cells, and cells to plants, and then forests! And all that fossilized organic matter—that we now “must” use to keep us warm, feed us, and survive—is what put the oxygen into the air. Literally. These amazing first forests, and first marine life, we are now burning. The bones of our history, thrown into the fire to fuel our Hawaiian vacation.

⁷³ Tom Baer and Tom Athanasiou, *Dead Heat: Global Justice and Global Warming*, Seven Stories Press, 2002.

Climate change as a threat

One of the grand worries about climate change is the threat it poses. Climate change does, in fact, threaten many things. The survival of species, the smooth functioning of the human economy, and, if we are paying attention, even our notions of our place in the world. When people consider climate change as a threat, the predominant issue of concern tends to be the survival of the human species. The altruistic and perceptive may go so far as to notice the potential for extinction of other species, the loss of entire ecosystems, if not “the earth” itself. Enlightened business executives perceive a threat to the human economy. Not surprisingly, it is the insurance industry—the sector devoted to running the numbers on risk—that has found religion on climate change. Ironically, however, for the politicians beholden to the trough of disposable cash in the system, it is not the threat to the economy from climate change’s direct effects, but rather the threat to the economy posed by the solutions that is of concern.

Climate change as an invading force

“Experts see states as force in fighting global warming.”

—*NEW YORK TIMES*

The notion of a threat falls into the general category of difficulties or opposition. Among our basic conceptual metaphors is the notion that OBSTACLES ARE OPPONENTS. Opponents can be individuals or groups. The result is the idea of “fighting” climate change. Here we have CLIMATE CHANGE AS A THREATENING ENTITY. Or, perhaps CLIMATE CHANGE AS AN INVADING FORCE. Climate change is the enemy, the battle is the effort to reduce carbon dioxide emissions, and the soldiers are the people working on the issue. This frames climate change as an outside threat that must be fought off. It tends not to see it as something of our own making. It also frames the advocates for industry and oil burning as on the other side. On the other hand, the fight highlights the idea that climate change is a serious threat. But it is put on par with say, the war on drugs or abortion. Of course, an entailment of this metaphor is the idea of enemies and villains. This conceptual understanding also adds a sense of urgency. As a battle or a war, it is an ongoing activity.

Climate changes as a threat to the economy

The idea of CLIMATE CHANGE IS A THREAT is also seen from another angle. As already mentioned, the threat is to the economy—jobs and people’s livelihood—from the implied

response to mitigate climate change (reducing emissions). This is the position, undeniably, taken by the U.S. government and the Bush administration most recently. Specifically, the claim is that the U.S. cannot “afford” to curb emissions or reduce energy consumption without threatening its competitive position in the world economy. It is a threat to the “health” of the economy. And it is implied that meeting reduced emissions targets will be a threat to jobs.

Among the many metaphors at play here is the SOCIETY IS A BODY metaphor. Energy is sustenance. Consuming energy is eating. Emissions are the natural body’s waste, which is perceived as inevitable. We know that insufficient nutrition is a threat to health, so a “restricted” energy diet is a threat to economic health as well. Though not explicit, it may be that there are even conceptual mapping to the type of energy. Fossil fuels are high energy content substances and would map to protein, while solar and wind energies by comparison are like a vegetarian diet. But more importantly, the body’s waste is inevitable. We cannot eat food without needing to excrete our waste later. So the same goes for emissions. They are seen as inevitable. At least the only way to reduce them is perceived to be to “eat” less, which, as mentioned, is implied to be an unacceptable risk.

The metaphor is also evoked by the environmental community in the idea of being “addiction to oil.” It is an apt inference. The definition of addiction entails that the body will not function properly if the addict does not get the accustomed dose. The addict refuses to admit the addiction. The addict will fight to get what he needs. The addict will become increasingly belligerent to others who try to point out the addiction. The parallels in the current international situation are uncanny.

The SOCIETY IS A BODY metaphor also interacts with another metaphor, The ECONOMY IS A RACE. The body of the United States is seen as in a competition with other bodies/societies. In this context, the need to consume to keep the advantage is simply assumed. The race is a special case of the larger competition frame, which can include competitions of life or death. So the need to compete, and win, the competition is not inferred to be a matter simply of pride, but rather of life and death.

THE SOCIETY IS A BODY metaphor is important for other reasons. For we use it to conceptualize society’s contribution to the causation regarding climate change. Thus, scientists talk of the “human fingerprint” as the specific evidence that anthropogenic activities are influencing climate. (Largely, this fingerprint is found as expected.) But we also understand

CAUSES AS FORCES and human agents as entities that direct force. This is implicitly inferred when we talk about “man-made” climate change.

Metaphors of the body are extremely important. As we understand “health” in relation to our own body, a crisis like climate change is conceptualized as a threat to the “health” of various bodies. These bodies can be society, as mentioned, but also “the earth,” or “the nation” or “the economy.” Which body is of concern is a matter of subjective reasoning, with no clear answer. As a generalization, environmentalists are concerned with the body of the earth, capitalists with the body of the economy, and social activists with the body of societies (or multiple societies). All these groups might see threats associated with climate change, but can legitimately come to different conclusions about the proper response.

In addition, the different viewpoints will clearly vary the degree to which any particular notion of a threat is taken seriously or not. This, in turn, leads to a war of name calling, with people on all sides using various terms to describe themselves and each other. Self identified “climate skeptics” are labeled “climate deniers” by the other side. Passionate and informed environmentalists are labeled “wackos,” “chicken littles,” and “scaremongers.”

Skeptics shouldn’t be called skeptic

The targeting of the fossil fuel industry as the polluter and the one who should pay has, not surprisingly, produced a strong response in the form of an effective and pervasive public relations campaign calling into question the science around global warming. In fact, google “global warming” and the top link is “globalwarming.org” a site by the “cooler heads coalition,” dedicated to “to dispel the myths of global warming by exposing flawed economic, scientific, and risk analysis.”⁷⁴ Another link in the top ten is to skepticism.net whose global warming page warns:

“when dealing with things coming out of the environmentalist camp, you need to use your brain and decide for yourself to what extent global warming poses a threat to humanity.”⁷⁵

No doubt, a history of exaggerated dramatization of many environmental issues—while perhaps necessary to counterbalance an equally exaggerated *lack* of concern—makes legitimate this claim of the skeptics. But the emphasis on disregarding expert opinion and relying on just one’s own “common sense” is an important if not profound subtlety in the battle over conceptual framings of the world.

⁷⁴ <http://www.globalwarming.org/about.htm>

⁷⁵ http://www.skepticism.net/faq/environment/global_warming/

The framing of the environmentalists as “crazy” and the skeptical as “cool headed” is implicit in the word skeptic, as George Monbiot points out in a recent editorial in *The Guardian*:

We flatter [them] with the label "sceptics". If this is what they were, they would be welcome. Scepticism (the Latin word means "inquiring" or "reflective") is the means by which science advances. Without it we would still be rubbing sticks together. But most of those we call sceptics are nothing of the kind. They are PR people,⁷⁶

Indeed, he is correct. The use of the word “skeptic,” reinforces the idea that the debate is validly scientific. If one is skeptical of something, it implies that one is willing to take the time to look more closely at something. One is skeptical when someone else is trying to make claims that go against what you know. The implication, furthermore, is that the skeptic is coming from a grounded and rational mindset, which usually entails that what is rational and common sense is a materialistic and economic understanding of things.

In the reasonably constant stream of skeptics editorials on climate change, they have taken the characterization so far as to imply that the scientific community is not willing to question its “orthodox” beliefs.⁷⁷ This, of course, is a view completely antithetical to the spirit of science. Scientists funded by grants are seen as greedy freeloaders, and therefore in need of overstating the cause for concern. There is little need to point out the obvious irony here, which is that it is the lack of effort to check things out for oneself—deeply—that allows people to accept the claims of the editorialists that climate change is a product of “junk science” (It is so one can continue with “business as usual” that one avoids the scientific truth.) This is part and parcel of the fact that global warming is a social metaphor.

As it turns out, studies examining the peer reviewed science find there is no legitimate peer reviewed contradictions of the basic global warming theory. In fact, the scientific consensus is remarkably unanimous.⁷⁸ Nevertheless, the skeptical use loaded labels such as “myth,” “hysteria,” “wackos,” etc. to make their case that it is all a great conspiracy to control people. Perhaps, it is the conclusiveness of the science—which leaves little for the skeptic to use as evidence—which makes the skeptical resort to name calling. And, in fact, the more conclusive the science, the more vocal the denial.

⁷⁶ George Monbiot, “Mocking Our Dreams,” *The Guardian*, February 15, 2005

⁷⁷ Robert Matthews, “Leading scientific journals 'are censoring debate on global warming',” *The Telegraph*, 01/05/2005. <http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2005/05/01/wglob01.xml&sheet=/news/2005/05/01/ixworld.html>

⁷⁸ Naomi Oreskes, “BEYOND THE IVORY TOWER: The Scientific Consensus on Climate Change.” *Science*, Vol. 306, Issue 5702, 3 December 2004, p.1686.

Common sense wackos and “myths”

“[climate change is a myth, sea levels are not rising]”

—INTERNATIONAL POLICY NETWORK ⁷⁹

Words are powerful, however. Charges of “hysteria,” or “wacko” evoke the image of the irrational. It is emotion over reason. It reinforces the frame that the proper approach toward the world is “rational.” Rational in this case coming from a worldview where economic “necessity” must be balanced against “nature.” To protect something for its own sake, for example, is irrational—sacrificing humans for animals. And since humans are above animals, (or landscapes, or ecosystems) it is irrational to protect them.

The “wacko” label does more, of course, than simply suggest that emotions are trumping rationality, it also calls into question the truth of the basic science itself. For example, Michael Crichton, in a 2003 speech argues:

I am going to argue that extraterrestrials lie behind global warming. Or to speak more precisely, I will argue that a belief in extraterrestrials has paved the way, in a progression of steps, to a belief in global warming.⁸⁰

While this may seem like a stretch, the fact of the matter is that Michael Crichton, through his celebrity, is able to reach more people, and have more people take him seriously than most scientists. As does Rush Limbaugh, who, as we have seen, calls global warming “almost a myth.”

For those that would rather not recognize climate change is a reality, the term “myth” is often used. “Myth” is a very powerful word, both understood as important cultural stories, but twisted in our modern usage to refer to ideas that have made it into popular knowledge but are “just stories.” It is, in a way, the ultimate dismissal of knowledge.

Chicken Little and Scaremongers

In the back and forth debate on the seriousness of climate change, climate activists are often labeled “chicken little,” “scaremongers,” and other terms designed to connote an either willful or ignorant attempt to scare the public. Labels such as these are by no means limited to the debate on climate, and, in fact, their usage calls on many previous situations, which therefore entail many assumptions about the nature of the crisis.

⁷⁹ While the “myth” term is used, this example is taken from a recent speech by Bill Moyers—“the administration's friends at the international policy network, which is supported by Exxon Mobil and others of like mind, have issued a new report that climate change is “a myth, sea levels are not rising,” scientists who believe catastrophe is possible are “an embarrassment.” I was unable, however, to find this inference or the words myth or embarrassment in any of the reports on the International Policy Network website.

⁸⁰ Michael Crichton, “Aliens Cause Global Warming.” Speech on January 17, 2003. http://www.crichton-official.com/speeches/speeches_quote04.html

The story of “chicken little” conveniently ties into global warming, which makes it particularly salient. In the fable of Chicken Little, an acorn falls on Chicken Little’s head, which leads him to conclude that the sky is falling. Rushing off to tell the king, he easily convinces others to follow his sense of panic. Blinded by crisis, the animals lack their sense of judgment and are tricked by the wolf into being his dinner. The obvious moral is that following chicken little can be dangerous.

The concern for overreacting to climate change (i.e., stop the sky from falling) could, in fact, lead to disaster is not entirely unwarranted. If, for example, we shut down all the power plants abruptly in, say, a day, a far more immediate and life threatening crisis would ensue. Society is, for better or worse, in the short term dependent on the flow of electricity for its basic life support. One might also use a driving analogy to make the point. I myself once fell asleep at the wheel of my van, waking up as my vehicle started running off the side of the road. Frantically trying to correct, I *over* corrected and rolled. Had I not overcorrected, but rather coasted to a stop on the shoulder I would not have totaled my van or endangered my life.

Questions of judgment and proper evaluation of risk is something that is always a challenge, never has absolutes, and almost always must be approached on a case by case basis. Thus disagreements about the real threat of climate change are unlikely to go away any time soon. And opposite “chicken little” there are a whole host of labels for skeptics which describe a culture in denial.

Global-warming ostriches and climate deniers

“There are also more than 50 global-warming ostriches in the Senate.”

—BOSTON GLOBE, EDITORIAL, DECEMBER 27, 2004

Use of imagery that suggests the irrational is not limited to the skeptics. This wonderful statement from *The Boston Globe* evokes the well known image of the ostrich, who when confronting danger puts it’s head in the ground, an extremely irrational behavior. We know, of course, that this does not protect the ostrich, but the ostrich pretends there is no problem, since it can’t be seen anymore. The senators, as ostriches, of course, are the people who refuse to see the problem even when it is put in front of them. Their response to the problem is to avoid seeing it. We know from this frame that the response is not adequate. Furthermore, those who don’t see a problem are simply wrong. The realization that ignoring the problem won’t make it go away is one of the signs of maturity.

The term “climate deniers” has started to appear recently with more and more regularity. As a means of not giving climate change doubters the legitimacy of “skeptic” it is a sign of a good trend. And the degree to which it entails all of the frames that go along with denial—death, grief, delusion, etc.—it is powerful. There is certainly an element of truth in our collective denial of the potential seriousness of global warming. At the same time, the degree to which denial is necessary to ignore global warming is truly astounding. As George Monbiot points out in *The Guardian*, while uncovering the truth behind a false claim by David Bellamy—that the glaciers of the world were not in retreat—you must go out of your way:

It is hard to convey just how selective you have to be to dismiss the evidence for climate change. You must climb over a mountain of evidence to pick up a crumb: a crumb which then disintegrates in the palm of your hand. You must ignore an entire canon of science, the statements of the world's most eminent scientific institutions, and thousands of papers published in the foremost scientific journals. You must, if you are David Bellamy, embrace instead the claims of an eccentric former architect, which are based on what appears to be a non-existent data set. And you must do all this while calling yourself a scientist.”⁸¹

Bellamy’s error likely cost him his job as a figurehead of two wildlife organizations. Nevertheless, Bellamy mistake was latched as truth by the deniers, and Bellamy given the courageous title of “heretic,” evoking the idea of science as religion.⁸² There is no small irony in the fact that the climate “deniers” are projecting the idea of science as a rigid “orthodox belief system” which drives out skeptical questioning.

Climate Change as an experiment⁸³

“industrialized nations were using the Arctic as a guinea pig in an uncontrolled experiment on climate change.”

—JENNIFER MORGAN, DIRECTOR OF THE WORLD WILDLIFE FUND’S GLOBAL CLIMATE CHANGE CAMPAIGN

If there is one thing that is clear about the global warming science, it is that there is a universe of uncertainty about how the world will look in a few decades because of it. The fact of uncertainty is used on the one hand to caution. That is, advocate for the precautionary principle. On the hand, the fact of uncertainty is also used to dismiss the truth that we do know unambiguously. We know, for example, that increased concentrations of carbon dioxide will lead to profound changes of Earth’s systems. Exactly what those changes will be, however, is, well, uncertain. So it is that climate change is often characterized by scientists as an experiment.

Specifically climate change is an “uncontrolled” experiment. “Uncontrolled” refers to the scientific concept that if you change one variable—in this case carbon dioxide

⁸¹ George Monbiot, "Junk Science: David Bellamy's inaccurate and selective figures on glacier shrinkage are a boon to climate change deniers," *Guardian*, Tuesday May 10, 2005. <http://www.guardian.co.uk/comment/story/0,3604,1480279,00.html>

⁸² Jonathan Leake, "Wildlife groups axe Bellamy as global warming 'heretic'," *Times Online*, May 15, 2005. <http://www.timesonline.co.uk/article/0,,2087-1612958,00.html>

⁸³ MSNBC website

concentrations—you must also have a separate experiment where you hold that same variable constant in order to compare the results. This means that it is hard to discern what specific effect is coming from the increase in carbon dioxide that wouldn't be happening without it.

The experiment metaphor is actually quite useful. It emphasizes the fact that we have changed one of the basic “parameters” of the climate “equation.” It also turns out to be an opportunity to interject a sense of time, for as the geologists have noted, “we haven't tried this experiment for 50 million years” or so.⁸⁴ An experiment entails that there people conducting the experiment, and so emphasizes the human role in driving climate change. But really, most importantly, the uncontrolled experiment metaphor highlights that there is a lot we just do not know.

⁸⁴ Daniel Schrag, Presentation at Thought Leaders Forum, 2003. Credit Suisse/First Boston LLC 2003. http://www.csfb.com/thoughtleaderforum/2003/schrag_sidecolumn.shtml

What is missing?

“A model is most interesting when it doesn’t work well, because it tells us that something’s missing.”

— DANIEL SCHRAG, PROFESSOR OF GEOCHEMISTRY, HARVARD UNIVERSITY ⁸⁵

The fact that we cannot accurately predict how the earth will change once the feedbacks in our climate system kick in, the fact that we don’t know what kind of world we are really headed for is perhaps more of an opportunity than we have yet to recognize. Furthermore, because our conceptual understanding is generally governed by our physical experience of the world, it should not be surprising to find that the general conceptual picture of climate change held by most people is, upon examination, lacking.

To be sure, humans have the capacity to expand their imaginations, sense of time, and breath of knowledge to overcome the limitations of the standard conceptual metaphors we start with. Just because there is a natural tendency to conceptualize global warming as a large object in motion, and so respond accordingly with attempts to avoid, stop and slow down a *thing*, it does not mean that we are incapable of recognizing—either individually or collectively—the likely fallacy and limitations of such a view. Just because we do not generally hold a long view of time, does not mean we are not capable of it.

And we should cut ourselves some slack. We are, after all, each of us limited by our life spans, ability to move, and limitations of our embodied experience. My four year old daughter, for example, while darn smart, has a conceptual understanding of the world that is necessarily limited by what she has had an opportunity to experience, and what she has had an opportunity to reflect upon. She has not, for example, shot a gun, driven a car, given birth, broken a bone, buried a peer, or (more to the point) seen a familiar landscape change over the course of decades. She may be intellectually capable of understanding aspects of many of these things, but it is safe to say that her conceptual picture of the world is limited by her lack of experience in it.

Similarly, most humans live to an average age of about 70 years. One can learn a lot in that time, and extraordinary humans even more, but on average, for many of us, our understanding of the world, our patterns of being in it, and even our expectations are largely set in the first 20 years or so. The stereotypical midlife crisis only serves to illustrate that at some point we realize we missed out on something and have gone on with life too long with a preset

⁸⁵ Dan Schrag, “Abrupt Climate Change.” *Living on Earth*, March 5, 2004
<http://www.loe.org/shows/shows.htm?programID=04-P13-00010>

notion of things. Most of us were born into a world with already elevated levels of carbon dioxide, but only the youngest of us were born into a world that was collectively aware of it.

And what of civilization? Our modern civilization based on agriculture is only about 10,000 years old. It has developed entirely in an interglacial period on Earth. That is, civilization has not been through an ice age. How robust is our collective understanding of what the world can and cannot look like? On the one hand this is a rhetorical question. But on the other hand, it is also practical. For we are using the frameworks that have developed within the context of civilization—economics, politics, technology—to try to address a problem that is arguably of the greatest scope yet faced by man. Not to mention an atmosphere the Earth has not seen in 50 million years.

As we have examined with conceptual metaphors such as *THE EARTH IS A BODY*, or *CHANGE IS AN OBJECT IN MOTION*, the way we think about climate change is often oversimplified. Sometimes the oversimplification can be helpful in communicating basic understanding. But the improper simplification, when acted upon may end up making the problem worse.

Quite apart from the standard attempts to convey a conceptual understanding of the mechanisms behind climate change, there are also some missing metaphors. For example, a picture of climate change with respect to geologic time is noticeably absent. From a geologic time perspective, our fossil fuel emissions are not a slow but steady accumulation of carbon dioxide, but rather more of a massive burp of carbon (a great de-sequestration) into the atmosphere. A general understanding of oil as a geologic resource is not obvious in the portrayal of coal and oil. The cliché understanding of oil—it is the dinosaurs—while prevalent, is misleading, and does not communicate that coal and oil resources come initially from plant life, nor that it took a very long time to accumulate.

There are no common metaphors that convey the picture of changed stocks and flows with respect to energy. For most of earth's history the energy model for life has been an “abundant stock, limited flow” model. The sun provides a virtually infinite stock of energy, but the flow is limited by how much reaches the earth per unit of time, and how much plants have been able to capture. Since tapping fossil fuels, this has shifted to an abundant flow, limited stock model. The reserves of coal and oil are ultimately limited, but the flow rate we consume them is now more abundant. This is a fundamental and essential system condition change, for which there is little conceptual understanding, and no common metaphors that communicate it. Some

analogies are possible—“drawing down on retained earnings.” But the stock and flow conceptual understanding if it does exist, is not the dominant picture.

The role carbon plays in storing the sun’s energy is also not generally understood, much less appreciated.

The idea that the carbon we have been releasing took a long time to sequester, and that it is carbon that life uses to store energy is also absent. Ironically, one of the best analogies comes from Svante Arrhenius, the first person to calculate the effects of a doubling of carbon dioxide. He said, “We are evaporating our coal mines into the atmosphere.”⁸⁶

Who will cry for the ice?

While we discuss the conceptual understanding of climate change, the great glaciers of the world and the polar sea ice is melting, and the permafrost of the Arctic is thawing, quite unconcerned with our conceptual understanding. And when the ice is gone, who will weep for the aesthetic and spiritual loss? Hopefully, we will have developed our conceptual picture to see it for what it is, a deep, collective and profound tragedy.

The sad reality is that despite our best “can do” attitudes and addiction to being “hopeful,” there is little we can do to stop the ice from melting. The lifetime of my daughter will not only see the human advances of technology—from cell phones to implanted communication chips, no doubt—but also unfathomable transitions in the geologic formations of ice.

If humankind is to have a glimpse into geologic time, may be through ice. Humans alive today have the opportunity to experience an aspect of geologic time that perhaps no other humans have been able to experience. I am not talking about what you can produce with your freezer, but rather the great ice sheets and the great (and minor) glaciers. These formations are to ice itself as humans are to carbon. (What are humans after all but water bags made of carbon.) If the ice formations were sentient, their perception of time would be quite different than ours.

Ice sheets are the geologic formations that carve the earth and leave in their rested form, motion. Long Island, for example, is a terminal moraine. Think about it. Though as children we may learn that great ice sheets covered the earth during the most recent ice age, the true profundity of the fact can elude us for a long time. Ice sheets and glaciers are geologic formations that can change, or come and go, on extremely short time scales. No other geologic feature changes so quickly. Great sheets of ice that covered most of North America, and

⁸⁶ As quoted by Andrew Revkin, *Global Warming: Understanding the Forecast*, American Museum of Natural History, Environmental Defense Fund. Abbeville Press: New York. 1992. p.57.

flattened out the Midwest, retreated in 10,000 years. These were 4 km thick sheets of ice, higher than most mountain ranges. Incredibly large geologic features. Gone in the blink of a geologic eye.

In the meantime, we are all arguing over a how to detect the temperature signal, and it's right there in the ice. Much has been made of the idea that the summer Arctic ice cap may disappear within the next 70 years or so. This cap has been thinning for some time, which we know from recently declassified data from the US Navy subs. The sea ice is critical not only to the Arctic ecosystem, but also to the human imagination. Few put it as aptly as Barry Lopez:

To stand at the edge of this four-foot-thick ice platform, however, is to find yourself in a rich biological crease. Species of alga grow on the bottom of the sea ice, turning it golden brown with a patchwork of life. These tiny diatoms feed zooplankton moving through the upper layers of water in vast clouds—underwater galaxies of copepods, amphipods, and mysids. These in turn feed the streaming schools of cod. The cod feed the birds. And the narwhals. And also the ringed seal, which feeds the polar bear, and eventually the fox. The algae at the bottom of this food web are called "eponitic" algae, the algae of the sea ice. (Ringed seals, ivory gulls and other birds and mammals whose lives are ice oriented are called "pagophylic.") It is the ice, however, that holds this life together. For ice-associated seals, vulnerable on a beach, it is a place offshore to rest, directly over their feeding grounds. It provides algae with a surface to grow on. It shelters arctic cod from hunting seabirds and herds of narwhals, and it shelters the narwhal from the predatory orca. It is the bear's highway over the sea. And it gives me a place to stand on the ocean, and wonder.⁸⁷

Since I read this paragraph as an undergraduate, I have been haunted by the image of the sea ice, and the implication of its importance in issues of the imagination. And what of the wonder of ice? What would the world be without it? What aesthetic loss would there be? What will be missing when we come to miss ice?

Ice is the fabric of places like the Arctic. As it melts away, the fabric of life comes undone. As the sea ice retreats from the shore, for example, not only are traditional coastal villages threatened by erosion, but also traditional peoples are cut off from their hunting grounds, and each other.⁸⁸ In addition, the polar bear has no more highway to its food, the seals have no where to calf, and the algae have no where to grow.

At the other pole is Antarctica, which is, because of its icy landscape, the one continent humans never inhabited. As such it offers a place on the planet that is a clean slate. A place truly capable of emptying the mind or emptying the self.⁸⁹

Antarctica has the oldest ice on the planet, at least a million years at the bottom of its ice sheets. And we believe that it has been covered in ice for 40 million years. This is also an opportunity to engage the human imagination. Ice that is a *million* years old? Let that sink in.

⁸⁷ Lopez, Barry. *Arctic Dreams*. p.124

⁸⁸ <http://inuitcircumpolar.com/>

⁸⁹ Stephen Pyne, *World Fire*, University of Washington Press, 1997. See the chapter "White Darkness."

The glacial limit and the robin's egg for climate change

The ice also provides a very practical and reliable service. It is a remarkably accurate climate change signal. The extent to which glaciers advance, the point at which they melt off, is, in fact, an important indicator of average temperature at a given altitude or latitude. This furthest extent of glaciers is called the “glacial limit.”

The glacial limit is very similar to the “snow line,” that point of elevation where rain turns to snow. It is a quite dramatic indicator of temperature, as anyone who has seen the snowline can attest to. It helps to be in a canyon or deep valley during a storm where it is raining at the valley floor, and if it is visible looking up the hill one can see the point at which a “frosting” appears. Everything above is snow. What is dramatic is the precision of the line. For a glacier, there is also a snowline that works on different time scales.

In the same way that the snow forms where the temperature changes, glaciers also respond to changes in temperature. Differences in thickness and accumulation means that glaciers have different “response times” in adjusting to a new equilibrium state. The length of glaciers is a very real and physical indicator of how temperatures are changing in altitude and latitude. And since most glaciers have a response time that is longer than a year, their furthest extent is a reasonable indicator of multi-year trends. In fact, a paper by J. Oerlemans in *Science* used glacier length and other characteristics to recreate globally averaged surface temperature. The data match the other proxies from ice cores and pollen records.⁹⁰

With the sea ice, the indicator is not only the thickness of the ice sheet, but the timing of the sea ice's formation and break up. Just as spring is arriving earlier and summer lasting longer (as recorded by the timing of flowering plants), the sea ice has been forming later and breaking up earlier in the Arctic. All of these things are quite accurate proxies for average temperature change.

Ice as a rapidly changing geologic feature

So, while we search for signals that the climate is changing, one of the best indicators is right before our very eyes. The ice. Not only that, as we also search for conceptual understanding, the help is in the ice as well. Remembering that glaciers and ice sheets are geologic formations, the fact that they are disappearing is an indicator that the experiment we are engaged in *is* a geologic event. By evaporating the Earth's oil, gas and coal seams into the air, we are essentially inducing the effects of volcanic activity. It's hard to think of it this way

⁹⁰J. Oerlemans, “Extracting a Climate Signal from 169 Glacier Records.” *Science*. 3 March 2005.

while sitting in rush hour traffic, but we are inducing a geologic event. And the fact that the ice is responding is essential to recognizing this.

It really should be no surprise. We are digging up and burning a geologic resource at an incredible scale. That the response is also geologic in nature should be obvious. At the very least, it is profound.

What is the point and what does it all mean?

In his 1954 book *The Challenge of Man's Future*, Harrison Brown upon examining the direction humanity was heading—and the degree to which it was understood—concludes:

... a substantial fraction of humanity today ... is behaving as if it were engaged in a contest to test nature's willingness to support humanity and, if had its way, it would not rest content until the earth is covered completely and to a considerable depth with a writhing mass of human beings, much as a dead cow is covered with a pulsating mass of maggots.⁹¹

The point is as pertinent as ever. Looking at the question of climate change, humanity as a whole is acting as if we need to continue upon the path we have set for ourselves, without considering there might be another way, or even another purpose. The great tragedy for humanity, is perhaps in loss of freedom. Again Brown is insightful:

Here we indeed find ourselves on the horns of the dilemma. To what purpose is industrialization if we end up by replacing rigid confinement of man's actions by nature with rigid confinement of man's actions by man?...Would the lives of well-fed, wealthy, but regimented human robots be better than the lives of their malnourished, poverty-stricken ancestors? At least the latter could look forward to the unexpected happening—to events and situations which previously had been outside the realm of their experiences.⁹²

As we today debate acceptable levels of CO₂ in our atmosphere and give up our freedoms in the name of “security,” it is worth pondering Brown's version of the challenge facing mankind. Do we really want a life from which we have eradicated surprise and spontaneity? Would it really be life anymore?

With climate change, the more one gets into it, the grimmer the picture. There is a natural tendency to look on the bright side. To seek and to have hope. But this is ultimately an intergenerational problem. It is not going to be “solved” in my lifetime or even my daughter's lifetime. Yet, in order to have hope, we find ourselves moving forward jumping right to the solutions we can see—for example, cleaner energy technologies, energy efficiency—and plow on ahead as if our predicament is just another technical problem to solve.

But climate change offers us the opportunity to at least see a bigger picture. Our collective efforts are changing geology. Like a bunch of termites who have discovered a vein of

⁹¹ *Challenge of Man's Future*, p. 221.

⁹² Brown, 255.

rotten wood. We eat and multiply. If we were to open our sense of time, we might see the explosion of population and industrialization on the landscape like a big inflatable raft inflating like an air bag.

Another image is that of raiding the bank. It's as if someone blew a hole in the bank vault and at first no one was willing to step in front of the hole and guard it. And were you to try to do that now, you would be immoral, because the community that has developed around the bank depends on the money in it not only to uphold a certain lifestyle, but also to just survive.

Or we are like a ship heading towards collision with an iceberg, but which cannot slow down to avoid the collision, because of the belief that half the boat's population would perish if the life support from the engine was cut.

More specifically, and to the point, the tools humanity has developed to help get us into this mess—technology, politics, economics, to name a few—are the same ones we are using to try to eradicate ourselves from it. Excuse me? Are we kidding? To put it bluntly, we got ourselves into this mess by playing God, and we think more playing God is going to get us out of it? That we would consider such grand geo-engineering schemes such as putting big mirrors in space to reflect sunlight away illustrates our hubris, (even if the ability to imagine it is a more or less positive sign.) We need a different approach.

Meanwhile, who will cry for the ice? What will we have lost our alpine glaciers vanish? What will we have lost when we no longer have that landscape?

And if we can't stop or even slow global warming in this lifetime, what would it look like to jump our solutions a generation or two? For we *may* find technical solutions that stabilize climate shifts, but if we don't question deeply what the underlying mess is, then will we have solved anything?

What qualities of humanity are going to be needed (or at least helpful) 200 years from now, when we have reduced uncertainty to the point that we control everything? Where will we find magic? Where will we find poetry? Are there cultural values that can help us? What meaning will we find once the grave and dramatic reality of our alteration of the planet sinks in?

Bill McKibben, probably the most courageous writer on climate change—because he asks the toughest questions—asks, where is the art?:

One species, ours, has by itself in the course of a couple of generations managed to powerfully raise the temperature of an entire planet, to knock its most basic systems out of kilter. But oddly, though we know about it, we don't know about it. It hasn't registered in our gut; it isn't part of our culture. Where are the books? The poems? The plays? The goddamn operas? Compare it to, say, the horror of AIDS in the last two decades, which has produced a staggering outpouring of art that, in turn, has had real political effect. I

mean, when people someday look back on our moment, the single most significant item will doubtless be the sudden spiking temperature. But they'll have a hell of a time figuring out what it meant to us.⁹³

Indeed, one can find reasons—it is too big, too slow, and there are too many villains—but that does not make the question any less important. As McKibben points out it, it is through art and religion that we make sense of what is happening to us. It may fall upon art to stir the imagination enough to actually motivate our collective action. It will undoubtedly take imagination to find the diamond in the rough of this profound crisis.

The climate crisis is a great opportunity to find the best humanity has to offer.

That is, if we have the imagination to rise up to the challenge.

⁹³ Bill McKibben, “Imagine That: What the warming world needs now is art, sweet art.” *Grist Magazine*, 21 Apr 2005. <http://www.grist.org/comments/soapbox/2005/04/21/mckibben-imagine/>

References Cited

- Appenzeller, Tim, and Dennis R. Dimick. "Signs of Earth." *National Geographic Magazine*. September 2004.
- Baer, Tom and Tom Athanasiou. *Dead Heat: Global Justice and Global Warming*. Seven Stories Press, 2002.
- "Bad Science and the Bush Record: How the Bush administration has systematically distorted science to weaken regulations and serve political ends," NRDC, Accessed 9 May 2005
<http://www.nrdc.org/bushrecord/science/default.asp>
- Ballard, Robert. Public Lecture at Marin Civic Center Auditorium. Marin Speaker Lecture Series 2004/2005.
- Brown, Theodore. *Making Truth: Metaphors in Science*. Urbana and Chicago: University of Illinois Press. 2003.
- Cohn, David. "Global Warming's Silver Lining." *Wired*, 28 March 2005.
<http://www.wired.com/news/planet/0,2782,66981,00.html>
- Crichton, Michael. "Aliens Cause Global Warming." Speech, January 17, 2003.
http://www.crichton-official.com/speeches/speeches_quote04.html
- DiPrima, Diane. "Rant," *Pieces of a Song*. City Lights Books. 1990.
- Farah, Joseph. "The global warming hysteria." WorldNetDaily.com. Posted 23 March 2005.
http://www.worldnetdaily.com/news/article.asp?ARTICLE_ID=43431
- Gelbspan, Ross. *The Heat is On*. Cambridge: Perseus Books. 1997.
- Green House Network Web Page. <http://www.greenhousenet.org>.
- "Greenpeace shuts down Range Rover assembly line." Greenpeace International. 16 May 2005.
<http://www.greenpeace.org/international/news/range-rover-shut#>
- Hutchinson, Fred. "Common Sense on Global Warming." March 19, 2005.
<http://RenewAmerica.com/>
- Jeavons, John. "Cultivating Our Garden." *In Context*. #42. Fall 1995. Context Institute 1995. p.32. <http://www.context.org/ICLIB/IC42/Jeavons.htm>
- Kelly, Derek. "The global warming scam." *Asia Times Onlin*. 25 February 2005.
- Lakoff, George, and Mark Johnson. *Metaphors We Live By*. Chicago: University of Chicago Press. 1980.

- Lakoff, George, and Mark Johnson. *Philosophy in the Flesh*. New York: Basic Books. 1999.
- Leake, Jonathan. "Arctic Ice Cap to Vanish in 80 Years, study says." *The Times*. December 22, 2002. <http://www.climateark.org/articles/reader.asp?linkid=18818>
- Leake, Jonathan. "Wildlife groups axe Bellamy as global warming 'heretic'." *Times Online*, May 15, 2005. <http://www.timesonline.co.uk/article/0,,2087-1612958,00.html>
- Limbaugh, Rush. "Clear Skies Worsen Global Warming!" *RushLimbaugh.com*, May 6, 2005. http://www.rushlimbaugh.com/home/daily/site_050605/content/global_warming_update.guest.html
- Lomborg, Bjorn. *The Skeptical Environmentalist*. New York: Cambridge University Press. 2001.
- Matthews, Robert. "Leading scientific journals 'are censoring debate on global warming'." *The Telegraph*, 01/05/2005. <http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2005/05/01/wglob01.xml&sSheet=/news/2005/05/01/ixworld.html>
- McKibben, Bill. "Imagine That: What the warming world needs now is art, sweet art." *Grist Magazine*, 21 Apr 2005. <http://www.grist.org/comments/soapbox/2005/04/21/mckibben-imagine/>
- Monbiot, George. "Junk Science: David Bellamy's inaccurate and selective figures on glacier shrinkage are a boon to climate change deniers." *The Guardian*, Tuesday May 10, 2005. <http://www.guardian.co.uk/comment/story/0,3604,1480279,00.html>
- Oreskes, Naomi. "BEYOND THE IVORY TOWER: The Scientific Consensus on Climate Change." *Science*, Vol. 306, Issue 5702, 3 December 2004.
- Oerlemans, J. "Extracting a Climate Signal from 169 Glacier Records." *Science*. 3 March 2005.
- Parsell, Diana. "Wade Davis on Vanishing Cultures." *National Geographic News*. June 28, 2002. http://news.nationalgeographic.com/news/2002/06/0627_020628_wadedavis.html
- Pope, Carl. "Carl Pope Response to 'the Death of Environmentalism': THERE IS SOMETHING DIFFERENT ABOUT GLOBAL WARMING." http://www.sierraclub.org/pressroom/messages/2004december_pope.asp
- Pyne, Stephen. *World Fire*. University of Washington Press, 1997.
- Revkin, Andrew. *Global Warming: Understanding the Forecast*. American Museum of Natural History, Environmental Defense Fund. Abbeville Press: New York. 1992.
- Rusher, William. "Global warming can't account for Earth's vast climate changes." *Pasadena Star-News*. 20 March 2005. <http://www.pasadenastarnews.com/Stories/0,1413,206~11851~2773339,00.html#>

- Schiermeier, Quirin. "Clear skies end global dimming." *Nature*. 5 May 2005.
<http://www.nature.com/news/2005/050502/full/050502-8.html>
- Schneider, Stephen. *Climate Change*. Sierra Club Books, 1989.
- Schrag, Dan. "Abrupt Climate Change." *Living on Earth*, March 5, 2004.
<http://www.loe.org/shows/shows.htm?programID=04-P13-00010>
- Schrag, Daniel. Presentation at Thought Leaders Forum, 2003. Credit Suisse/First Boston LLC 2003. http://www.csfb.com/thoughtleaderforum/2003/schrag_sidecolumn.shtml
- Shellenberger, Michael and Ted Nordhaus. "The Death of Environmentalism." The Breakthrough Institute, 2004.
http://www.thebreakthrough.org/images/Death_of_Environmentalism.pdf
- Sterling, Eleanor. "Rediscovering Biology: Expert Interview Transcripts." Annenberg/CPB, 1997-2004, Accessed 9 May 2005.
<http://www.learner.org/channel/courses/biology/units/biodiv/experts/sterling.html>
- "Study Finds that Climate Change is Causing Polar Ice to Melt," EarthNet News, 10 November 2004. http://bulletmailer.vpi.net/envirocitizen/preview.php?issue_num=117
- "Topic: Earth climate screwed, says Oxford University." Snopes.com.
http://msgboard.snopes.com/cgi-bin/ultimatebb.cgi?ubb=get_topic;f=53;t=001307;p=1