The Role of Science in Defining the Content of Creation Care

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When people find out I have a doctorate in atmospheric sciences, they often ask me, "Do you believe global warming is happening?" Of course, many people ask out of politeness or to engage in small talk. Sometimes, however, they really want to know what I think, and a lively conversation ensues. But why should someone care what a climate scientist believes about global warming? In most areas of life, my expertise gives me no more authority than anyone else; certainly my wife does not care about my Ph.D. when we talk about which movie to see, what color to paint the bedroom, or how to take care of her grandmother. Behind the question about my opinion on global warming stands the assumption that science has some sort of special ability to describe and understand the phenomena of global warming, and that the description science gives affects our decisions about how we should respond. When we ask scientists for their opinions on environmental issues, we assume science has an authority other fields of study do not have.

This authority seems reasonable since science is the study of nature, of how the created world functions, behaves, and changes. Through observation, experimentation, theorizing, and analysis, science has provided an increasingly richer description of the state of the environment. Thus, for many people, debates over environmental problems are debates over the science of the problem: what does science say the problem is, and how should we fix the problem? Or, one side may argue that the science is not yet conclusive, while another may argue the opposite.[1] British environmentalist and politician Jonathon Porritt argues, "The earth is at risk as never before," whereas Danish statistician Bjørn Lomborg replies that the state of the environment is imperfect but "getting better." Yet both authors argue that science shows the truth of their claims.[2]

While those who ascribe such authority to science may greatly value theology and ethics, the content or substance of stewardship is seen as justified by the science: theology tells us *why* we need to care for creation, ethics gives us standards by which we can evaluate *how* a healthier environment flows from and contributes to the moral life, and science tells us *what* a healthier environment is and the actions that are required.

In this present work, I will argue that for all its descriptive power, science is not, in general, "policy-prescriptive," and it does not directly prescribe the content of environmental stewardship. Thus, debates over what constitutes an environmental problem (pollution, deforestation, global warming) and what practices are needed to fix the problems (air quality controls, land-use regulations, alternative energy research) cannot be settled solely by an appeal to science; science needs the help of ethics to define policy. First, I will consider philosophical arguments about whether science determines policy goals and find that science alone cannot, in general, do so. (If abstruse philosophical discussion does not interest you, just skip this section.) Second, I will consider how policy goals are translated into policy choice, and find that here too science and ethics working together determine which policies to implement. Finally, I will propose an alternative model of determining the content of creation care, one marked by greater humility for science and a greater potential for success.

Philosophical Arguments about Scientific Justification of Policy Goals

As science is defined as the study of nature, science provides the truest, most objective, and authoritative description of the state of the environment. Whether through the meticulous work of botanists measuring plant growth in tropical rain forests, or geosynchronous NASA satellites sensing the swaths of radiation given off by different types of land cover, science acts as the photographer of the earth's "family portrait," showing us the state of the environment today and as it has changed over the years. Some features of this portrait would have remained unknown without science, as many parts of the environment are either inaccessible (too small or too far removed from human presence), or change so slowly that only the statistical analysis of data from long-term monitoring will detect the change. For instance, we would have had no awareness, let

alone understanding, of the depletion of stratospheric ozone without the monitoring of ozone concentration aloft and fundamental research in atmospheric chemistry that revealed the connection between that depletion and chlorofluorocarbon use.

But the picture becomes cloudier when we ask whether science provides the authoritative description of environmental *problems* and the policies to address those problems. This idea may seem odd: if science provides an authoritative description of the state of the environment, and if we define environmental problems as harms to the environment, can we not also conclude that science authoritatively defines environmental problems and the policies to solve them? The difficulty lies in the meaning of "harm." As a normative term, "harm" implies knowledge of what the state of the environment should be, for a harm either destroys an environmental state that should be or moves the environment away from the state that should be. If science alone is not sufficient to define the state the environment should be in, science is not sufficient to specify the goal of policy (which is presumably that ideal state). This, ultimately, also means that science alone cannot determine policy choice.

In this section we argue that science does not have the power, by itself, to specify this normative attribute of the environment, what the environment "should be," and thus requires the input of something else to specify that state. (Throughout this present work, I use "ought" and "should be" in a normative or ethical sense, not in an ontological sense.) That something else is "meaning." We can summarize our argument symbolically as:

science → what is
what is + meaning of what is → what should be

The first relationship expresses the idea that science provides a description of the state of nature. The second relationship says that the meaning, significance, or importance of "what is," when coupled with the description of the state, yields a description of what should be. Consider the statement, "I am hungry." If, in addition to the description of being hungry, we added the meaning of the hunger (as a sign of injustice, or due to war-induced famine, or as proof you are dieting, or as part of a fitness plan), we can infer a normative "ought" from the state description and its meaning. For the case of hunger coupled with the injustice meaning, we would conclude that you ought not be hungry; for the case of hunger coupled with the proof of dieting meaning, we would conclude

you ought to be hungry. Depending on the meaning of the "what is," we can arrive at very different conclusions of what "should be."

That meaning may come from any of a variety of sources (religious, ethical, or others). It is important to note, however, that these meanings do not come from the "what is" description itself: the meanings require an outside source.[3] For instance, consider a husband who comes home and tells his wife, "I had a busy day at work today." What does such a statement mean? To answer this question, the wife would presumably need to know whether her husband found busy days exciting and invigorating or stressful and tiring. She might also need to know whether in the past he made such statements to ask for comfort and sympathy, or as inconsequential small talk. And, in thinking about her reply, she would probably consider her own physical and emotional state: perhaps she is tired herself and needs to rest before talking with her husband about his day, or she might have urgent news she needs to share with him that cannot wait for him to finish his own sharing. Thus, the husband's statement is not self-interpreting; its meaning only becomes clear with additional information about his preferences, interests, context, and values.

Likewise, descriptions of nature are not self-interpreting. Science can describe the state of nature, but cannot give it meaning. To adapt a schema used by C. S. Lewis, science apprehends something by looking *at* that something; meaning, on the other hand, comes from looking *along* something. Consider the case of a wetland that has been impacted by development. Science can describe much about the situation: the extent of the wetland in the past and present, the rate of wetland loss, the changes in the plant and animal species populating the wetland. But what does this description mean? We might answer that our scientific description shows development has damaged or degraded the wetland. But science has done no such thing: science has shown that development has decreased wetland extent, but not the undesirability of this decrease. The use of terms like "damaged" or "degraded," because of their normative content, automatically confer a meaning on the decrease in wetland extent, but that meaning comes from the implicit value judgments carried with those words (that plentitude in animal life is a moral good, humans should not alter their landscape, and others), not from the scientific description itself. Thus, in order to infer an "ought" from a scientific description of nature, we need a non-scientific meaning partnering alongside the description.

In contrast to our argument above, many believe science can determine, without external aid, what the state of the environment should

be. Here, we will consider two proposals for how science could define "what should be," and will find them wanting. In one proposal, it is argued that a truly authoritative scientific description of the state of the environment will determine what that state should be. Symbolically, we can express this as:

science → what is
what is → what should be

The first relationship, as before, expresses the idea that science provides a description of the state of nature. The second relationship expresses the idea that from this state description we can directly infer a normative description of nature.

The terms in that second relationship, however, are not logically entailed, that is, "what should be" is not a logically necessary conclusion of "what is," or vice versa. Returning to our hunger example, a person could say, "I am hungry," but that does not mean they should be hungry; perhaps they just finished a large meal. Conversely, a person could say, "I should be hungry," but that does not mean they are actually hungry; perhaps their stomach has adapted during a fast and they feel full. The mere fact something exists does not mean that it ought to exist, and the mere fact something ought to exist does not mean it does.

If "what is" does not determine "what should be," perhaps science directly describes both the what is (the state of the environment) and the what should be (the ideal state of the environment). In this proposal:

science → what is
science → what should be

The second claim of the proposal, however, seems like the conclusion of a *reductio ad absurdum,* as it suggests that the study of ethics is identical to the study of nature.[4] Such a claim is inconsistent with the common sense definition of science as an enterprise that uses mathematical-logical reasoning in conjunction with empirical experiment and observation. If science is, in any meaningful way, different than ethics, the second claim cannot be true; otherwise, arguments about virtue are fundamentally no different than arguments about frictional coefficients. On the other hand, if science is not, in any meaningful way, different than ethics, then we have shown the kind of science needed to define "what should be" is really a hybrid of common sense notions of science and ethics. This conclusion supports our original argument that science (as commonly understood)

is not enough to define what the state of the environment should be.

If science by itself cannot define what the ideal state of the environment should be, and if the source of the meaning required lies in ethics and values, we would expect that for controversial environmental issues, appeals to science would have little effect in dampening the controversy. Given the "facts" as given by scientific studies, each party would interpret these observations in light of the meanings they found compelling, based upon value commitments apart from science. Analysis of the role of science in environmental issues finds just such a dynamic: from climate change to nuclear waste disposal to genetically modified foods, in all but the most trivial cases, disagreements that are fundamentally political and value-driven cannot be solved on the basis of science. Instead, as science-policy scholar Daniel Sarewitz has noted, science tends to exacerbate environmental controversies.[5] Because science in the course of its normal functioning generates such a large body of knowledge, it suffers from an "excess of objectivity" and provides multiple lines of evidence that can be interpreted by the various parties in a controversy to fit their own agendas.[6] The meaning of the scientific descriptions thus originates not in the science itself, but in each party's value judgments, and the scientific description is used as justification after the fact. This is not an accusation of dishonesty, but rather an argument that relying on science to settle environmental controversies is a categorical mistake; value disagreements must be settled through value debates, not scientific debates. Only when significant political controversies are solved by other means will all parties consider scientific solutions as obvious.[7]

Moving from Policy Goals to Policy Choice

Thus far, we have seen that science alone cannot define the ideal environmental state, and thus cannot define the goals of policy. Science coupled with meaning can define the ideal environmental state and thus the goals of policy. Once that goal is determined, however, the choice of actual policies to achieve the policy goal is still not a value-free task, requiring only the application of technique. Science and ethics must still work jointly in choosing which policies to implement. In this section, we consider the ways science and ethics together achieve this.

All problems can be thought of as having the following form: $A → B$, where A is some action or activity, B is some consequence with undesirable traits, and "→" is the causal connection between A and B. For the case of global warming, A might be anthropogenic emissions of carbon

dioxide, B might be increased global mean surface temperature, and "→" the greenhouse effect. Thus, the three possible solutions to any problem (not including doing nothing) are to eliminate or remove A, to eliminate or remove the connection between A and B, or to isolate B so none of the undesirable features of B can affect others. Symbolically, we can write these three possible solutions as:

1) $\cancel{A} \rightarrow B$
2) $A \cancel{\rightarrow} B$
3) $A \rightarrow \boxed{B}$

For the case of global warming, examples of solution 1 would be measures to decrease emissions of carbon dioxide, such as by decreasing fossil fuel use, capturing and sequestering carbon dioxide at the point of power generation, and improved energy conservation measures. We call these responses "mitigation." An example of solution 2 is a proposal to place gigantic parasols in space to shade the earth from part of the incoming solar radiation, to balance out the increase in temperature due to the increase in carbon dioxide. We can call this type of response "geoengineering."[8] Lastly, examples of solution 3 include moving houses out of areas vulnerable to increased storm activity (such as floodplains), building sea walls to combat sea-level rise, and so on. These activities are known as "adaptation."

If the policy goal defined by science and ethics is to prevent or remove undesirable traits of B, in principle any of the above three solutions will suffice. The policy goal, in and of itself, does not determine which solution is preferable, as any of the three types of solutions can achieve the policy goal. What then determines which of the three types of solutions (or a combination thereof) to choose? Here too, we encounter the temptation to assume that science will provide the authoritative answer: that the cumulative effect of feasibility studies, impact statements, and basic research will produce the obvious solution. Indeed, because science is perceived as providing true, authoritative, and objective knowledge, policymakers and advocates of all views routinely appeal to this status to back their own agendas.[9] The phrase "best science possible" is used as a directive in a number of environmental statutes.[10]

As the science-policy research described earlier shows us, however, the obvious solution only seems obvious after value debates have been settled by other, non-science-related means.[11] Whether we acknowledge it or not, many times scientific descriptions actually play second fiddle

to value assumptions when it comes to making specific policy choices. The debate over global warming, particularly in the evangelical church, provides an illustrative example, and also provides warnings to us as we wrestle with the content of creation stewardship.

Many, if not most, attempts to articulate the content of stewardship (Christian or secular) regarding global warming use a logic similar to the following:

1) Science demonstrates that the earth's global mean surface temperature is increasing, and that this increase is very likely due to the emission of anthropogenic greenhouse gases.

2) Studies suggest the increase of global mean surface temperature may result in a number of effects, such as changes in rainfall patterns, the dynamics of extreme weather events, and others.

3) Many of the effects described in point 2 are undesirable, being injurious to ecosystems, species, and people.

4) One of the most important anthropogenic greenhouse gases, carbon dioxide, is emitted as a by-product of the use of fossil fuels in power generation and transportation.

5) Thus, to prevent the possible harms due to global warming, Christian stewardship entails personal and collective action to decrease the use of fossil fuels in power generation and transportation (mitigation).

Suggestions for action, such as driving more fuel-efficient cars, using compact fluorescent light bulbs, enacting a carbon tax to discourage fossil fuel use, are then given as examples of proper stewardship. Implicit in this schema is the idea that science, which has proven the reality and cause of global warming, naturally tells us what the solution is, namely mitigation by decreasing fossil fuel consumption through changing personal and societal patterns of energy use. Thus, these action steps have the implicit imprimatur of science and its attendant authority.

As we saw earlier, however, the competence of science extends only to describing the state of the environment and thus can only supply points 1, 2, and 4. The meaning of the environmental state (and thus the description of the goals of a global warming policy), described in point 3, comes from sources outside of science, from ethics or religion. And, since the

solutions for any given problem are, in general, of three different types, and the choice between those different types is not determined by the policy goals defined by point 3, something else besides the scientific findings or the policy goals justifies the mitigation policy choices described in point 5. That justification is an unsaid and implicit value claim: it is morally superior to remove the cause of an environmental problem, like global warming, than to allow it to continue and deal with the problem in some other way. Some possible reasons for this justification include:

- Romantic idealism: Nature is best understood and appreciated in its pristine wildness, so it is undesirable for humans to alter nature.

- Ecocentrism: Nature can be considered as having a moral status independent from humans, perhaps with a good of its own, and thus humans should not interfere with nature, permitting it to attain its own good on its own terms.

- Minimalism: It is a categorical moral imperative to minimize human involvement in the environment, whether "positive" or "negative."

For evangelicals, I believe there is another reason people on both sides of the global warming issue will agree that if there is a problem, the primary solution is to eliminate the cause of the warming: when evangelicals consider moral issues, we use the "sin model" as our default point of reference. In the sin model, we categorize all human actions, individual and corporate, as sinful or not sinful. We reject activities that participate in or enable sin, provisionally accept those that do not, and analyze situations using the mindset "how do I avoid sin." This model has no small amount of scriptural backing, as God clearly loves righteousness and hates unrighteousness. Applied to personal acts defined as sinful in the Bible, this model yields some of the most important negative guidance found in Christian ethics. Stealing is sinful, so do not steal. Coveting is sinful, so do not covet. Adultery is sinful, so do not commit adultery. Applied to the environment, this mindset implies certain ways of treating the environment are also sinful. Littering is sinful, so do not litter. Polluting streams is sinful, so do not pollute. Emitting carbon dioxide is sinful, so do not emit carbon dioxide. Because we evangelicals habitually use the sin model in evaluating our behavior, this predilection to think in terms of avoiding wrongdoing contributes to a bias for solutions that stop causes of environmental problems. This inclination comes not from science but cultural values.

The Perils of Unconscious Value Assumptions for Defining the Content of Creation Care

We have seen how science, for all its power in describing the state of the environment, is unable by itself to determine either what the goals of environmental policy should be or the specific policies needed to implement those goals. For both goals and policies, science needs the partnership of ethics in order to arrive at the content of stewardship. Both evangelicals and the public at-large, however, continue to treat science as if it has the power to prescribe policy. In doing so, we pretend that value assumptions are unimportant, and yet at the same time we implicitly make value assumptions that have enormous effects on what policies are considered proper stewardship.

As a result, our attempts at properly defining the content of creation care may suffer. A misplaced confidence in science feeds an ignorance of the importance of values in determining policy responses. That ignorance encourages the view that debate over science is crucial but the debate over values is unimportant, which reinforces the misplaced confidence in science. The resulting "scientization"[12] of environmental problems feeds a dismissive attitude towards opposing viewpoints (after all, science proves your side is correct) and prevents the values debate that is needed to reach agreement as to what values should determine policy goals and policy choice. This downward spiral eventually runs right up against the need for value assumptions in order to determine policy, which though ignored, never went away. Unfortunately, when we do use values for determining policy, we do so unconsciously, with little intentionality or transparency.

When we apply value judgments latently, rather than consciously and thoughtfully, distortions in the policymaking process can arise. First and foremost, the lack of conscious consideration means that the policymaking process does not benefit from the rigorous scrutiny and analysis that can clarify whether a particular value assumption is appropriate or applicable to the given problem. An unconscious assumption cannot yield a conscious understanding of the strengths and weaknesses of the value assumption. Second, the lack of a forthright values debate inhibits the creation of a democratic consensus behind whatever policy results. Compromise is not possible when it is unclear what the disagreement is

all about. Finally, the unconscious application of value assumptions means the results of those assumptions are also hidden. If the value assumption artificially limits the range of policies available to be considered, or if the value assumption justifies policies that end up worsening the problem, no one will realize it was the value assumption itself that was flawed. Misassigned blame results.

Consider, for instance, the sin model described in the last section, which, despite its prevalence, is seldom discussed. Because it is often a hidden assumption, there is little examination of its substantial weaknesses when applied to environmental issues. First, it is not clear that all activities that result in some sort of environmental harm are, in and of themselves, offenses to God. Second, while Scripture teaches us that no amount of sin is acceptable, it is not clear that the same is true about actions that impact the environment. Is the discharge of any amount of pollution, say trace amounts of engine oil from a boat into the ocean, immoral? Is the emission of any amount of anthropogenic carbon dioxide unacceptable? If not, how much constitutes a sin? Finally, the sin model, because it tends to narrow the scope of policy choices, risks discarding better alternatives without a hearing. For global warming, this means we focus on mitigation (eliminating carbon dioxide emissions) rather than adaptation to the possible impacts of climate change. These weaknesses are nontrivial, and would suggest that efforts by evangelicals to base creation care on this default value assumption may lead to poorly conceived, even damaging, policies. But because the sin model is applied unconsciously to environmental problems, these possible deficiencies are generally left unexamined.

An Alternative Method of Defining the Content of Creation Care

The efforts by evangelicals to contribute to the debates over climate change and other environmental problems are commendable, for even a cursory reading of Scripture will tell us how much God cares for the creation he has made and his desire for us to faithfully steward his handiwork. Unfortunately, we have inadvertently applied the clarity of the biblical imperative of creation care to the content of creation care. Assuming that science prescribes what action we must take to safeguard the environment, and lacking awareness of the value assumptions underlying our policy choices, we have defined stewardship using a flawed process. In this final section, we will consider an alternative model of determining the content of stewardship.

Given our earlier arguments, this alternative model starts with giving science a humbler role in defining what creation stewardship entails, challenging us to avoid using science alone to decide the content of environmental stewardship. Besides making room for the explicit consideration of values to inform the content of creation care, eschewing a policy-prescriptive role for science has an additional benefit in increasing both the quantity of possible policies as well as the quality of the actual policies. When science is seen as determining policy, stakeholders focus their efforts on debating the science. When science is no longer seen as policy-prescriptive, other ways of linking science, ethics, and policy become available that can provide the tools needed to adjudicate between competing demands.

As an example, consider the Interior Columbia Basin Ecosystem Management Project (ICBEMP), a project that began in July 1993 as an effort by the United States Forest Service to create a "scientifically sound, ecosystem-based strategy" for the management of national forests in eastern Washington State and eastern Oregon.[13] The final environmental impact statement was released over seven years later in December 2000.[14] While the project genesis uses language that sounds as if science will dictate the stewardship content for the interior Columbia Basin ecosystem, in reality, research scientists and land managers, in extensive collaboration with stakeholders, worked together laboriously, and sometimes contentiously, on developing a plan.[15] Indeed, lessons drawn from the project suggest that in such large-scale stewardship projects, science cannot go it alone, starting with the definition of the problem itself. As Thomas Mills and Roger Clark, both with the Forest Service, note, "neither the scientists nor policy-maker can effectively define the problems in absence of the other," a claim consistent with our earlier arguments that science needs values in order to define what constitutes an environmental problem.[16] In ICBEMP, science acted mainly to provide information rather than make decisions and focused on describing the effects of various alternatives rather than advocating for a specific policy.[17] Projects like ICBEMP illustrate how science, when used to expand policy options in a real partnership with non-scientific players, can help bring disparate stakeholders together and result in better management solutions.[18]

Science-policy researcher Roger Pielke Jr. comes to a similar but broader conclusion. He describes a taxonomy of four different ways scientists and scientific expertise can interact with policymaking (as a pure scientist, an issue advocate, a science arbiter, or an honest broker of

policy alternatives); he then examines how each of these different roles for science are beneficial in some contexts but harmful in others.[19] He finds that for problems characterized by minimal consensus of values and high uncertainty (two conditions commonly found in the most difficult environmental problems), there is a need for scientists to act as honest brokers of policy alternatives who work to expand the scope of policy choice.[20] Such honest brokers, as opposed to specific policy advocates, creatively work to describe the full range of options available and the consequences of each action. In this way, honest brokers provide the raw material for finding a way out of seemingly intractable environmental controversies; they seek to present more choices that may lead to a compromise acceptable to all parties.[21] Pielke notes that in the case of the debate over stratospheric ozone depletion in the 1970s and '80s, science played just such a humbler role in conjunction with policymaking. Policy consensus preceded scientific consensus, not the other way around, and policies implemented in the 1970s that separated essential and non-essential uses of chlorofluorocarbons (CFCs) helped spur advances in CFC alternatives that eventually obviated debates over a CFC ban.[22] Expecting science to prescribe policy, particularly for environmental controversies, puts the cart before the horse and can prevent the healthy give-and-take between science and policy that can lead to policy alternatives that might otherwise remain hidden.

Along with a humbler role for science, an alternative method of defining the content of creation care will explicitly consider and debate the hidden value assumptions that inform our policy preferences. Such debates have the potential to open up discussion of controversial issues, to identify the roots of disagreements, discover possible avenues for compromise, and consider a wider range of policy options than previously possible. Of course, these discussions may never meet their potential if they merely reveal previously existing conflicts, but that revelation at least offers the possibility of reconciliation, something impossible if left hidden. In the discussion over how to act as stewards, the evangelical church is steadily moving away from the possibility of compromise and reconciliation. With the increase in popular attention and sense of urgency regarding environmental issues, battle lines are hardening between Christians of different political and economic outlooks. Though the church has moved towards agreement that God commands us to steward the earth, we are moving away from agreement as to what that entails. On the issue of global warming, for instance, some advocate a mitigation strategy predi-

cated on rapid decarbonization of the global economy brought about through a combination of market incentives, regulation, and substantial government investment. Others caution against precisely just such action, arguing for gradual decarbonization and a strategy centered on adaptation. Both of these groups, and the untold others representing other possible policies, find justification in Scripture and science, but what separates them is, to a large extent, neither. Rather, unsaid and implicit value assumptions (like the sin model), worldviews, and political preferences drive the disagreements.

Perhaps, at the end of the day, what hinders the evangelical church from moving forward in unity in defining the content of creation care is that all of us believe our own visions of what constitutes creation care are authoritative. In other words we see them as authoritatively justified on the basis of Scripture and authoritatively described on the basis of science. I have argued that the latter justification is untenable. Regarding the former, I suggest that while God commands environmental stewardship, the content of this command is defined differently from other commands. Unlike debates over doctrine, which are addressed primarily on the basis of exegesis, and unlike debates over social practices like abortion and the definition of marriage, where biblical mandates can be translated into action via ethics, in creation care both values and science play a critical role in translating scriptural command into action. Given the high esteem for science in the public consciousness,[23] however, the introduction of science also tempts us to assume science tells us what we must do. This is a mistake, and taken to the extreme, it works against any openness to considering alternative ways of specifying the content of creation care.

In the final analysis, my argument for a humbler role for science and the explicit consideration of values is an argument for understanding many environmental problems as different from other problems (such as personal sin) in a fundamental way. There are many valid solutions instead of only a few solutions, and the best solutions require dialogue and compromise. To move forward in creation care, we need to do more than engage in advocacy. We need more than mutual respect and tolerance. To achieve better stewardship solutions, we actually need the insights of those we disagree with. Conservatives need to read the works of liberal environmentalists, and liberals need to read the works of conservative environmentalists: the ideas of Matthew Sleeth, Thomas Sieger Derr, Calvin DeWitt, E. Calvin Beisner, and others are all needed. Organize discussions. Build trust. Formulate policies that have the broadest possible

support. For as we saw earlier, the science-policy literature suggests such a route may be our best hope in defining the content of environmental stewardship for the most pressing and contentious problems—in all their messiness of uncertainty and competing values. Advocacy has its place, but for some of these issues, going for the win for your side may be counterproductive; for the most contentious environmental issues, we win only when we all win.

I love science and in particular my sub-specialty of climate dynamics. It is a great joy to "think God's thoughts after him," and science gives us information and understanding of the world other forms of knowledge cannot. Science, however, must not be used for purposes in which it lacks competence: prescription of policy is just such a case. Even more than science, I love the body of Christ, but in our current debates over the content of creation care, we are moving towards a disunity that does not have to be, and which may hinder the very goal we all share. For most of all, like my fellow brothers and sisters, I love Jesus. I want to be faithful to his command to be a steward of his creation, as an expression of love for him and others. By giving science a role that avoids seeing it as policy prescriptive, by explicitly addressing the value assumptions that inform our policy choices, and by understanding that environmental problems have many valid solutions, we improve our chances of defining stewardship content in ways that address environmental issues in all their complexity and difficulty, with more thoughtfulness and humility, less haste and vitriol. Choosing such a way, we may also find ourselves better stewards of our relationships with one another as we jointly work out our stewardship of the earth.

Response: R. Boaz Johnson

Dr. Johnny Lin has done us a great service in dealing with the issue of environmental care from the perspective of a scientist. He has done well to give science a "humbler" place in determining environmental ethics and public policy. It is a very good corrective to the reigning notions that that science is neutral, that scientific method is totally objective, and that science should be the new canon law for every human decision.

Professor Lin's paper reminds me of the approach found in the third division of the Hebrew Bible called the Writings, which includes poetry and wisdom literature. The books of this section, particularly Proverbs and Job, raise wisdom questions of the kind raised by science and the liberal arts. Responses to these questions are given from the perspective of the Torah. A good example may be seen in Psalm 19. The first six verses of this psalm describe the revelation of God as seen in creation, pointing to the role of the sciences. The second part of the psalm deals with God's revelation through the Torah. Both of these must go hand in hand with each other. Both enable the Christian church to appreciate the full revelation of God—the what, the how, and the why. Unfortunately, in the history of the Christian church, there have been swings of the pendulum in one direction or another. In the medieval church, there was opposition to this newly emerging field called science as people who had power in the church persecuted philosophers and scientists. Today, science is the new canon. Even Christian apologetics finds its ultimate strength in conformity with current science. It seems to me that the Christian church would do well to listen to the wisdom of the Bible and the wisdom of Lin. General and special revelation both need to be considered in making public policy, goals, and decisions.

In some circles, Christians do with their interpretation of the Bible what many modern environmentalists do with their approach to science. I usually tell my students at North Park University, the following: "It is true the Bible is God's word. It is the inspired word of God. However, I must recognize that I am human, and my judgments and analysis are fallible. I must approach the Bible with humility. I, therefore, do my study of the Bible, I do my research in Hebrew, Greek, and Aramaic, and I study numerous commentaries. Based on all this work, I come to some exegetical conclusions. At the end of the day though I must always say, "This is my tentative conclusion, based on the best of my research and ability. I must say, this is my interpretation of what is written in the inspired word of God." If I do not take this humble stance, I can become haughty and proclaim that what I am saying is God's word. There has been too much dissension and bloodshed in the history of the church because people declared their interpretation of the Bible to be God's determinative word. It seems to me that we must avoid this in our deliberations regarding environmental ethics and public policy.

One of the reason's I enjoy teaching at North Park University is the

fact that every day I come to the realization that all truth is God's truth. Programs like the Dialogue program enable me, a biblical theologian, to see complex issues from complex perspectives. My prayer is that scientists, ethicists, and biblical theologians would take Lin's advice on humility seriously.

Response: Karl Clifton-Soderstrom

As a philosopher and Christian ethicist, I greatly appreciate Dr. Lin's contribution to this issue of *The Covenant Quarterly*. In addition to the wisdom of his insights, he demonstrates an admirable facility with philosophical argumentation, scientific analysis, and ethical reasoning.

The *telos* (goal) of Dr. Lin's article lies in his model for determining the *content* of creation care, which offers an alternative to a common, but problematic, method to formulating environmental policy adopted by many evangelical Christians. This approach stems from two basic commitments, one involving a view of science and the other a view of moral action. I am convinced by much of his argumentation in the body of his article, and I find his critique of the "sin model" operative in much of the evangelical discussions on creation care particularly insightful.

First, I would like to offer a critique. While I support Dr. Lin's call for humility among scientists with regard to the nature of their claims about the world, I believe that his philosophical description of the nature of scientific claims is oversimplified. In a paper of such length, some simplification is inevitable, but I think he draws too stark a separation of the activities of *describing reality* from *finding meaning in reality*. I would argue that the activity of describing something suggests (though not determines, usually) the available frameworks within which it can become meaningful.

Take, for example, the statement "I am hungry." Indeed what one means in communicating this statement is dependent on something distinct from the hunger itself that involves the subjectivity of the hungry person (for example, as a cry of injustice, as a complement to the chef, etc.). Nevertheless, the experience of hunger itself is an *essential* element of the meaning of the statement. The experience of hunger, and recognizing it as hunger on the part of the subject, suggests a limited set of meaningful responses. Hunger is a state of affairs that once recognized suggests its own alternate state of affairs: the desire imposes its own "should" upon the world. Now the ascetic, dieter, or poverty-stricken person may choose or be unable to promote that suggested alternated state of satiety, and

thus give it a more complex meaning. But hunger, however objectively or scientifically described, includes its own *telos*.

I believe there is a whole host of phenomena that scientists attempt to analyze and describe that, in being recognized scientifically, suggest a limited constellation of suggested states of being. Dr. Lin later will recognize the promise of science for increasing the number of alternative responses to a given problem. Nevertheless, science is not without values of its own. I believe perhaps *life itself,* which of course must be defined within some parameters, can be described with scientific integrity, that is, within the language games of science itself. But these descriptions, to the extent that they are accurate, do suggest the living phenomena's own preferred state of affairs—namely to flourish as a living thing.

Endnotes

1. The website Climate Debate Daily <http://climatedebatedaily.com/> provides a particularly vivid example for the issue of global warming.

2. Jonathon Porritt, *Save the Earth* (Atlanta: Turner Publishing, 1991), 15–16, 23; Bjørn Lomborg, *The Skeptical Environmentalist: Measuring the Real State of the World* (Cambridge, UK: Cambridge University Press, 2001), 3.

3. Note that the meaning of the hunger does not come from the descriptions of the feeling and its cause, but because the cause itself comes with meaning attached to it. Famine and diets are not merely descriptions of food shortages and a self-improvement technique, but are terms that carry moral weight and import. Put another way, it is not the description of the cause of the hunger, in and of itself, that gives meaning to the hunger, but the fact that the cause already has meaning associated with it. That meaning is not logically entailed from the scientific description, but rather finds its source in imagination and moral sense.

4. It is not saying that science as the study of the state of nature logically entails normative claims, as that is just an alternate restating of the "what is → what should be" claim refuted earlier.

5. Daniel Sarewitz, "How Science Makes Environmental Controversies Worse," *Environmental Science & Policy* 7 (2004): 385–403.

6. Ibid., 385.

7. Roger A. Pielke, Jr., *The Honest Broker: Making Sense of Science in Policy and Politics* (New York: Cambridge University Press, 2007), 39–53.

8. Technically, "geoengineering" refers to any solution to the global warming problem that involves large-scale alterations to the climate system. Some of these solutions are also mitigation solutions (e.g., suggestions to add iron fertilizer into the ocean to increase plankton production and thus biologically absorb and sequester carbon dioxide). In this present work, however, we will use geoengineering in a narrower sense.

9. See, for instance, a news release from Senator Mike Crapo (R-ID) regarding a cleanup agreement for Idaho National Laboratory, July 1, 2008, http://crapo.senate.gov/media/newsreleases/release_full.cfm?id=300039, or President Barack Obama's inaugural address appeal to "restore science to its rightful place" (Los Angeles Times, January 21, 2009).

10. Mariyetta Meyers, "Maximizing Scientific Integrity in Environmental Regulations: The Need for Congress to Provide Guidance When Scientific Methods Are Inadequate or When Data Is Inconclusive," *Animal Law* 12 (2005): 100–101.

11. Pielke, *Honest Broker,* 39–53.

12. Sarewitz, "Science," 385.

13. USDA Forest Service, Pacific Northwest Research Station, "Project History: Interior Columbia Basin Ecosystem Management Project (March 2000)," http://www.icbemp.gov/html/projectinfo/web/history.htm (accessed February 1, 2009).

14. USDA Forest Service, Pacific Northwest Research Station, "Environmental Impact Statement," http://www.icbemp.gov/html/eiss.shtml (accessed February 1, 2009).

15. Thomas J. Mills and Roger N. Clark, "Roles of Research Scientists in Natural Resource Decision-making," *Forest Ecology and Management* 153 (2001), 189–98.

16. Ibid., 191.

17. Ibid., 195-96.

18. Ibid., 196–97.

19. Pielke, *Honest Broker.*

20. Ibid., 142.

21. Ibid., 140.

22. Ibid.

23. For information regarding public respect for science, see: National Science Board, *Science and Engineering Indicators* 2008, Vol. 1, NSB 08-01 (Arlington, VA: National Science Foundation, 2008), 7-3–7-4.

Becoming Native: Grounding Environmental Ethics in Our Local Places, Narratives, and Communities

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The Moral Life and Its Maps: The Problem with Overabundance

Recently, I needed to take a trip to the far northwestern suburbs of Chicago from my home in the city. Traveling at night in unfamiliar territory, I did what many of us do: I went onto Google Maps, typed in my location and destination, and was given directions on how to get there. I quickly gained a spatial sense of where I was going from the aerial view given me by Google. In addition, I am familiar enough with the major highways in the area to have a kind of intuitive directional sense of where I am in relation to significant landmarks around this massive metropolis. Lastly, my parents offered me their new talking GPS navigation gadget to put on my dashboard for the evening trip. By the time I headed out, I had three different maps available to me. My hope was that shy of knowing how to chart the heavens themselves, these maps were precise and would surely prevent me from getting lost. My hope was dashed. Half an hour into the trip, I was disoriented. The GPS seemed unalarmed, but in my head, I was clearly lost. I wasn't oriented enough in relation to the ground to know how to move toward my destination from my current location. How could this happen with the abundance of charts, diagrams, and signs available to me?

In the midst of my frustration, I realized the problem. I didn't fully trust any one map and would constantly switch back and forth between reading the printed map, listening to the now annoying GPS voice telling me that I made a wrong turn, relying on my occasional recognition of some important crossroad or building, and finally obeying the various road construction detour signs. At any given juncture, I would think to