Society of Building Science Educators
2002 Annual Retreat

The Disciplinary Blinders that Enframe Sustainable Design

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Introduction

We building science educators tend to understand the emergent concept of sustainable design as a continuation of the discourse concerning *energy economics* that emerged following WW II. In the historical context of post-war politics, American scientists recognized that unrestrained access to energy was a primary national security concern. It was that discourse among scientists that, some years later, provided quantitative fuel for the environmental movement ignited by the publication of Rachel Carson's *Silent Spring* in 1963, and that foreshadowed the OPEC oil-embargo of 1972. It is this tradition of scientific concern for the energy supply that supports our disciplinary claim that the now ubiquitous term, *sustainability,* derives from a discourse initiated by engineering and architecture. This logic holds that, the pioneering research of Victor and Aladar Olgyay, among others, put architecture at the center of scientific discourse and that the secure future of the nation and planet depends upon our discipline. It is our mission, then, as building science educators, to extend the logic of energy economics into the contemporary discourse concerning sustainable development. This world-view is what English scholars Simon Guy and Elizabeth Shove characterize as the "techno-economic view of energy efficiency." It suggests that "… if technical knowledge is rigorously tested and demonstrably proven, and if market forces are undisturbed, then technical diffusion should flow smoothly ... ."[1]

In this paper I will argue that nothing could be further from the truth. Rather, I'll hold that the concept of sustainability emerges from at least five disciplines external to our own and has been imposed upon architecture from without. To make matters even worse, I'll argue that our insistence upon equating the concept of sustainability with the reductive concept of energy efficiency subverts our claim to salience in the design studio. How could this be so?

What follows is an argument for the study of building technology that emphasizes, rather than suppresses, the cultural context of technological choices. By reducing the study of building science to the simple manipulation of instrumental, quantitative techniques, building science educators will succeed only in convincing the most talented students that technology is unrelated to the project of cultural interpretation. The project of cultural interpretation is, of course, what motivates the best students to adopt architecture as a medium of action. Our mission, then, should be the inverse—to help students recognize that making technological choices is a primary site of cultural interpretation and intervention. To do so it is necessary for us to venture out from what Peter Haas refers to as our "epistemic community," or, "an epistemological domain of [our]

own making, necessarily and deliberately cut off from the confusing diversity of construction practice" and the cultural complexity of the communities served by architecture.[2] In other words, technological and ecological literacy is made, not by isolating knowledge claims, but by situating them in their cultural context.[3]

The Cultural Context of Technological Choices

To provide evidence for these outrageous claims I will briefly review selected events from philosophy, physics, biology, politics, and public health. Figure 1 provides an overview of these external discourses that prefigure, or provide a cultural background for the contemporary concerns of building science and architecture:

	Philosophy	**Physics**	**Biology**	**Politics**	**Public Health**
primary concepts	Sylva culture (1664) Deep Ecology (1980's) Social Ecology (1980's)	entropy (1865) energy economics (1920's)	evolution (1859) ecology (1866)	Enlightenment project of rights extension	"the sanitary idea" and "civic economy" (1850) germ theory (1880) new ecology (1945)
major figures	John Evelyn (1620-1706) Arne Naess (1925?-)	Rudolph Claussius (1822-1888)	Charles Darwin (1809-1882) Ernst Haekel (1834-1919)	John Locke (1632-1704) Karl Marx (1818-1883)	Jeremy Bentham (1748-1832) Edwin Chadwick (1800-) Michel Foucault (1926-1984)
ethical dilemmas	What is the human relation to nature and who has moral considerability?	Given an emergent state of chaos what is our moral obligation to future generations?	Does an anthropogenic world diminish evolutionary prospects?	(1) Shall indivi-dual rights be preferred to the health of the ecosystem? (2) How shall natural re-sources be justlydistributed?	Shall we prefer the suppression of environmental risk to the experience of otherness?
objective indicators	the instrumental degradation of nature	global warming	species loss and loss of reproductive choices	relative rates of resource consumption and environ-mental risk	environmental and techno-logical threats to public health

Figure 1: The transdisciplinary origins and ethical dilemmas of sustainable development [4]

Philosophers have been concerned about the problem of *moral considerability* since Rene Descartes (1596-1650), but building scientists have generally ignored our ethical relation to nonhumans. The dominant

characterization of modern philosophy is that, beginning with Descartes, Europeans understood themselves to exist outside of nature. Such convenient distancing from other species allowed humans to exploit nature without concern for its well-being. Although this overly simple characterization has some merit, it suppresses the existence of a counter-tradition in which early modern thinkers attempted to construct a vision of human life as inherently related to natural conditions. For example, the first scholarly book on sustainable practices to be published in English may be John Evelyn's, *Sylva*: *A Discourse of Forest, Trees and the Propagation of Timber,* published in 1664. In a slightly later example of 1713, Hans Carl von Carlowsky used the term "nachhaltigkeit," translated from the German as, "sustainability," in *Silvacultura Oeconomica: the directive for wild tree-breeding in accordance with nature*.[5] Both of these examples document that, within the discourse of natural philosophers, the concept of a sustained yield realized through the human management of natural resources was well understood if not universally practiced. We might, then, credit the natural philosophers of seventeenth century Britain and eighteenth century Germany with initiating the modern discourse on sustainable practices. That discourse was imported to North America by Gifford Pinchot (1765-1846), who was named Chief Forester of the U.S. Forest Service by President Theodore Roosevelt. Pinchot later became Governor of Pennsylvania.

Physicists have concerned themselves with the instrumental and ethical dilemmas associated with entropy, but building scientists have tended to focus only on the narrow problem of resource sufficiency. Within the discipline of physics, Rudolph Claussius (1822-1888) is generally credited with development, in 1865, of the Second Law of Thermodynamics, commonly referred to as *entropy*. Based upon his observation of thermal transfer, Claussius argued that one couldn't finish any real physical process with the same amount of energy as which one started. Once energy is expended, changing it from a usable to an unusable form, it can't be replaced. In any closed system--like our own solar system--entropy measures the amount of energy not available to do work. By the 1920's this modern understanding of basic physics prompted natural scientists to develop the doctrines of *energy economics* referred to above. These doctrines express various ethical and economic imperatives to expend energy as efficiently as possible thus delaying the inevitable chaos associated with advanced states of entropy. In the 1960's, the Olgyay brothers applied the implications of entropy to architecture in their seminal book, *Design With Climate*.[6] However, it was not until the OPEC energy crisis that began suddenly on 19 October 1973 that most architects began to appreciate the salience of Clausius' research to the design of buildings and cities.

Biologists have considered the implications of *anthropogenesis*, or a "nature" constructed by human activity, yet building scientists have generally failed to understand how diminished evolutionary prospects might influence design. We are accustomed to saying that the 1859 publication of Charles Darwin's *On the Origin of Species* introduced the concept of evolution. This is not exactly correct. Although there were highly respected scientists, such as Harvard's Louis Aggassiz, who tenaciously argued that nature was unchanging,

there were other contemporaries of Darwin, the English philosopher Herbert Spencer and the French naturalist, Jean-Baptiste Lamarck, for example, who had advanced the idea that nature evolves over time. What was so radical about Darwin's book, then, was not the idea of evolution per se, but the idea that the changes in nature were not guided by supernatural intelligence. The idea that evolution was determined, not by God, but by random chance, introduced the possibility of anthropogenesis that would subsume natural order. With the intellectual possibility of an anthropogenic world came an ethical and pragmatic crisis that was not confronted until the mid-twentieth century.[7] Without Darwin (1809-1882) we could not have the contemporary discipline of environmental design.

Only a few years after the publication of Darwin's book the term *ecology* was coined by the German zoologist, Ernst Haekel (1834-1919). In his *Generelle Morphologie* of 1866, Haekel did not fully develop the scientific concept as it is understood today, but he did help to popularize the notion that biological entities cannot be understood outside their natural environment. Haekel reasoned from a philosophically monist position that is opposed to the Cartesian dualist assumptions of Western science. It is not surprising, then, that the latter-day supporters of ecology, awakened by the 1962 publication of Rachel Carson's S*ilent Spring,* would reject a purely quantitative approach to the conservation of nature. It is this holistic approach to design that was adopted in the 1960's by pioneers such as the landscape architect and planner Ian McHarg.

Political thinkers have continued to theorize the Enlightenment project of *rights-extension* while only a handful of modern building scientists concerned themselves with the question of distributive justice. In the discipline of politics, the linked concepts of ecologism and sustainability can be partly understood as a continuation of the Enlightenment project of rights-extension. The Scottish Enlightenment in particular, under the influence of John Locke (1632-1704), introduced the notion that all men, not just the landed-aristocracy, are possessed of natural rights. From that early beginning western societies have gradually extended rights to an ever-increasing list of beings—First, men of color, then women, and in contemporary society, organizations such as Earth First and PETA (People for the Ethical Treatment of Animals) argue for the natural rights of various plants and animals.[8] In the summer of 2002 the federal government of Germany will be the first to consider legislation guaranteeing selected animals basic rights. The field of environmental ethics is, however, divided over the granting of such rights. While some, like PETA, argue for the rights of individual animals, others, like Deep Ecologist Arne Naess, argue for the superior rights of the ecosystem as a whole. It is this latter view that has had much influence upon the late twentieth century projects of architects such as Brenda and Robert Vale in England and New Zealand.

And lastly, the advocates of public health have concerned themselves with the broad question of *civic economy* while building scientists have been engaged in the development of minimum standard codes that barely define the threshold of criminality. The discipline of public health is, of course, a hybrid of medicine and engineering that first appeared in nineteenth century England under the

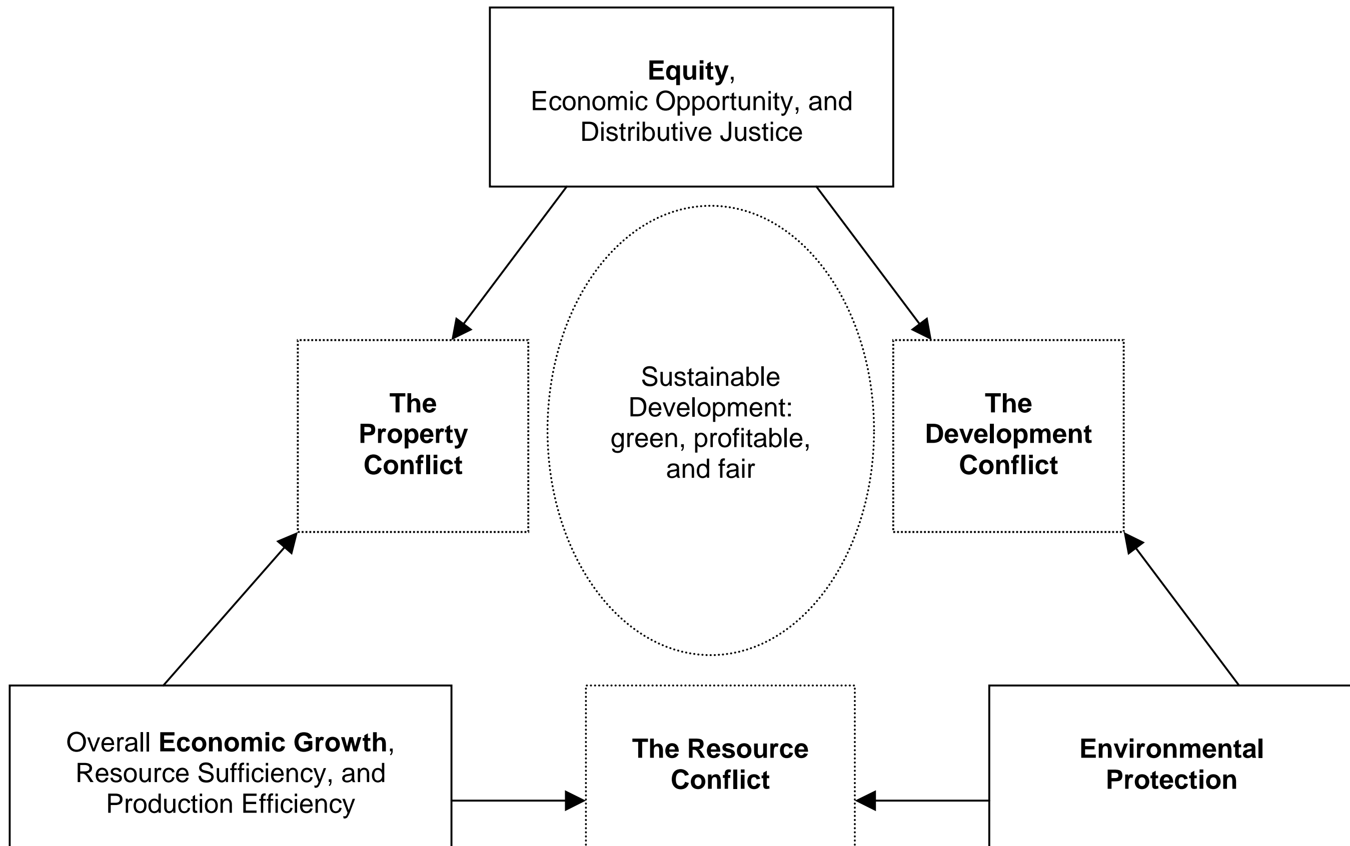
leadership of Edwin Chadwick (1800-1890) who was directly associated with the Utilitarian philosophers Jeremy Bentham (1748-1832) and John Stuart Mill (1806-1873). In contrast to the prevailing social privatism of that time, these social activists argued that a healthy economy requires public investment in the health and productivity of its citizens. The threats to the public health in the nineteenth century were those now rare diseases like yellow fever, diphtheria, and smallpox. By the end of WWII, however, the English “sanitarians” and those who inherited that tradition in the West had largely eliminated such epidemic diseases. By the early 1960’s the developed world realized that, although common bacterial threats to public health were likely a matter of the past, new threats to public health, such as polluted ground water and fouled air, had emerged as the unintended consequences of industrial development. The concept of sustainability is a direct descendent of Chadwickian public health theory. In the view of contemporary environmental activists like David Orr of Oberlin College, architects are granted a license to practice by the State, which is a type of monopoly, in exchange for guarding the public health, safety, and welfare of the citizenry. How we architects choose to define public health for the twenty-first century may well determine the social viability of our discipline. Of course, the flip side of public health standards applied to architecture can be understood, through the lenses of a figure like Michel Foucault. In his view, the Benthaminian concept of public health is simply a call for the sterilization of complexity and otherness. The point here is that the history of public health provides a rich opportunity for cultural interpretation through architectural design. To reduce the topic to the banal study of, say, minimum dead-end corridor distances or minimum air-change requirements is to miss the point of a university education.

The cumulative argument to be drawn from this interdisciplinary review is that by equating the broad cultural discourse concerning the human relation to nature with the reductive concept of energy efficiency we are in danger of misunderstanding our historical situation. If we do so as teachers, surely we will also misunderstand the motivations for change that bring our brightest students into the design studio. The ethical dilemmas and opportunities for cultural interpretation and intervention found in our cultural situation are far deeper and more complex than the epistemic community of building science has generally been willing to recognize. It has been our bias to get the numbers right and leave the theorizing to others.

However, Guy and Shove have shown, for example, that the introduction of the same quantitatively correct building technology into different cultural contexts, despite very similar economic and environmental benefits, has been met with very different estimates of environmental and social risk.[9] In other words, the adoption of even the most rational, efficient, and environmentally provident technologies is far from inevitable. Without better understanding the cultural situation into which their technological choices get thrown, our students will only become discouraged and blame their failures upon the imagined stupidity of others. The study of building science, then, requires investigation of the “co-evolution of social and technical systems.”[10]

The Cultural Context of Ecological Literacy

Fortunately, the literature concerning sustainable development offers insights that will help us to remove the disciplinary blinders that enframe sustainable design. The planner Scott Campbell has proposed a triangular model of sustainability, illustrated in Figure 2, that is elegantly simple if not entirely satisfying.



After Scott Campbell, "Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development," in APA Journal (Summer 1996): 468.

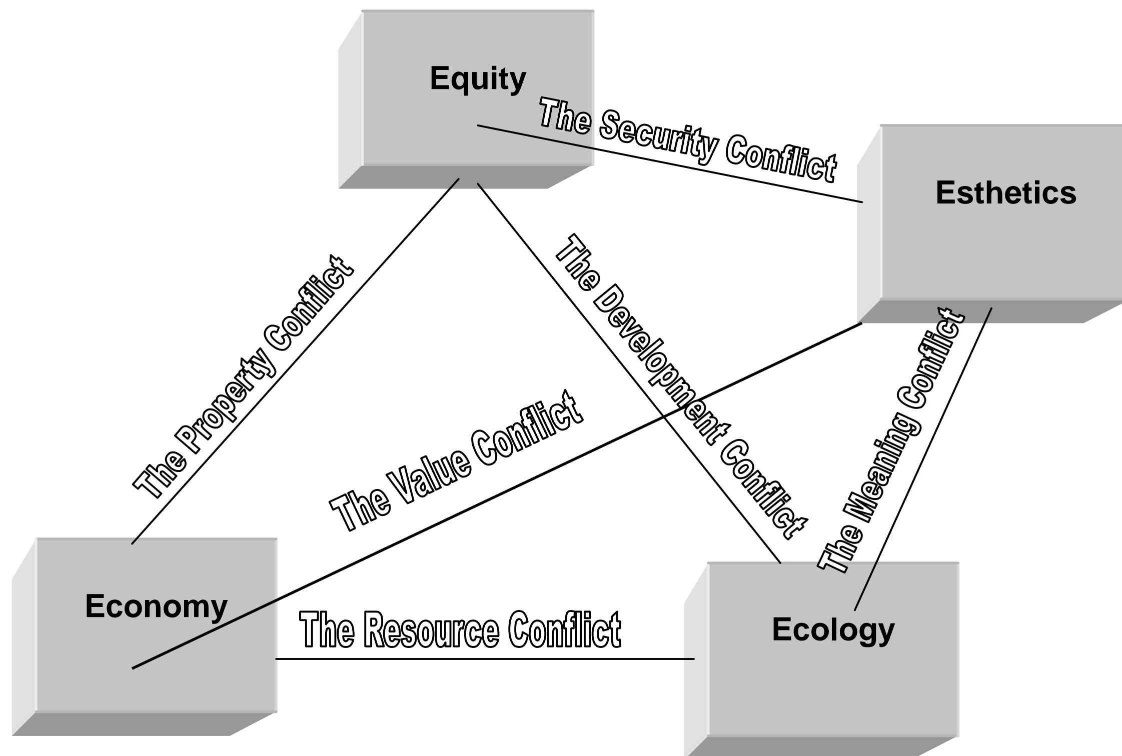
The Concept of Sustainability is inscribed within a triangle of competing interests. In this construction, the concept is necessarily discursive and democratic.
The Development Conflict sets those with an interest in protecting the environment against those with an interest in distributing available resources.
The Property Conflict sets those who control the means of production against those with an interest in distributive justice.
The Resource Conflict sets those with an interest in economic development against those with an interest in resource conservation.
The Sustainable City is one that negotiates and balances each set of competing interests.

Figure 2: The planner's triangle

Campbell's model, as illustrated here, is generally self-explanatory so I won't expand upon it other than to say that it attempts to relate the historic opposition between economic development and environmental protection by adding a third variable—social equity. His point is that it is impossible to talk about economic health and a healthy forest, for example, without also talking about healthy forest workers. Many scientists will, of course, object on the grounds that equity cannot be quantitatively measured, thus it cannot be effectively managed. This is what the philosopher Paul Thompson would characterize as a "non-substantive" use of the term "sustainability," meaning that it is hard to find empirical evidence that correlates social equity to environmental protection.[11] There are, of course, many who disagree with Thompson's position, including myself.[12] Those who argue in favor of including equity as the third variable of sustainable development generally hold that citizens must be included in making those technological choices that will determine the long term sustainability of dominant social practices. In other words, technological fixes imposed by a technocratic elite from above will only be subverted in the daily lives of citizens if they are not complicit in the conceptualization of the technologies that comprise their "life-world."[13]

At the literal heart of Campbell's diagram is the argument that sustainable development is necessarily a discursive practice. I would like to go one step further, however, and argue that the concept is essentially *democratic* because it involves the resolution of private conflicts in public space. But, as much as I admire this diagram I find that it lacks one dimension—the esthetic. By this I mean that many of the conflicts related to environmental sustainability that I observe by reading the morning newspaper derive from citizen's esthetic sensibilities—What should "nature" look like? Can quantity be a substitute for quality? Or, is environmentalism only for the rich? So, as a friendly amendment to the Planner's Triangle I propose to make the concept three dimensional as illustrated in Figure 3.

The benefit of adding the fourth dimension to the definition of sustainable development is that we are less likely to reduce architecture to some quantitative formula enforced by well intended, but drab technocrats. It was this strategy that was employed in the 1960's and 70's and that is largely responsible for discrediting environmental architecture in subsequent decades. To erase the esthetic from our criteria of the good would hardly enhance our situation—it would only keep us from ever wanting to get out of bed. On the other side of the question, the problem with adding the fourth dimension to the definition of sustainable development is that we are even less likely to measure, and thus satisfactorily manage the elusive variables at play. Expanding the number and nature of the variables to be considered only makes empirical data harder to gather and interpret. To be perfectly honest, I am, at the moment, unsure if my expanded definition is a step forward or merely a helpful heuristic device that warns us of the reductive practices of traditional science. My hope is that this problem might serve as a topic for further discussion.



The four variables of sustainable development:

- **Economy** includes the interests of those who produce wealth, upon which the other variables depend.
- **Ecology** includes the interests of non-human species, without which life cannot be reproduced.
- **Equity** includes the interests of those who, like future generations, have legitimate claim upon increasingly scarce natural resources.
- **Esthetics** includes the interests of those cultural practices without which life is unsatisfying.

The six conflicts inherent in sustainable development:

- In the **Property Conflict**, those who own the means of production come into conflict with those who promote distributive justice.
- In the **Development Conflict**, those who wish to preserve natural resources come into conflict with those who need natural resources to develop.
- In the **Resource Conflict**, those who depend upon natural resources to generate wealth come into conflict with those who wish to preserve natural resources.
- In the **Security Conflict**, those who suffer economic insecurity come into conflict with those secure enough to consciously cultivate beauty.
- In the **Meaning Conflict**, those who believe in the intrinsic value of nature come into conflict with those who understand nature to be a site of interpretation.
- In the **Value Conflict**, those who value quantities come into conflict with those who value qualities.

Figure 3: The four E's, or the planners' tetrahedron

Conclusion

This move will force me to conclude by arguing that in expanding the concept of sustainability to include the un-measurable cultural context in which technological choices are made--the esthetic as well as the political--we will help students to achieve real ecological literacy. By this point in this paper it must be clear that by "ecological literacy" I do not refer only to knowledge of the natural sciences and the physics of building performance. Rather, I refer also to the social systems in which all natural systems are embedded. Ecological literacy, then, requires one to be able to manipulate the symbols of meaning shared by a cultural group that refer to the biological context that we all share. Such literacy must begin by better understanding the cultural context in which technological choices are made. Such choices effect, not just the spawning rates of the Barton Creek salamander, but the investment rates of corporate developers. To uncouple such relationships in the classroom, by studying only those quantitative variables traditionally manipulated by our epistemic community, is to foster isolation, not literacy.

Notes

Portions of this paper will appear in:

Steven A. Moore, "Energy Efficient Design," in *The Encyclopedia of Twentieth Century Architecture*, R. Stephen Sennott, ed. (Chicago: Fitzroy Dearborn Publishers, forthcoming).

-----, "Environmental Issues," in *The Encyclopedia of Twentieth Century Architecture*, R. Stephen Sennott, ed. (Chicago: Fitzroy Dearborn Publishers, forthcoming).

-----, "Architecture, Esthetics, and the Public Health," in *The Difficult Dialogue*, edited by Sanda Illescu (Charlottesville, VA: University of Virginia Press, forthcoming).

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[1] Simon Guy and Elizabeth Shove, *A Sociology of Energy, Buildings, and the Environment: Constucting Knowledge, Designing Practice* (London: Routledge, 2000), p. 58.

[2] P. Haas, "Introduction: Epistemic Community and International Policy Coordination," in *International Organization* 46 (1):1-35.

[3] Barbara Allen, "Cyborg Theories and Situated Knowledges: Some Speculations on a Cultural Approach to Technology," in *Souped-up and Unplugged: Proceedings of the 86th ACSA Annual Meeting and Technology Conference*, pp. 30-35.

[4] The first scholarly book on sustainable practices to be published in English may be John Evelyn, *Sylva*: *A Discourse of Forest, Trees and the Propagation of Timber,* published in 1664. The term "nachhaltigkeit," roughly translated from the German as, "sustainability," was used by Hans Carl von Carlowsky in "Silvacultura Oeconomica: the directive for wild tree-breeding in accordance with nature," 1713. The term "sustainability" was first used in its current environmental, economic and social context in "World Conservation Strategy," a 1980 publication by the Union for the Conservation of Nature (IUCN). That document defined "sustainable development" to mean "… those paths of social, economic, and political progress that meet the needs of the present without compromising the ability of future generations to meet their own needs."

[5] This literary discovery was made by Ralf Brand, a Ph.D. student in the UT Community and Regional Planning program at UT. Brand is investigating alternative, non-technological models of sustainable development.

[6] Victor and Aladar Olgyay, *Design with climate: bioclimatic approach to architectural regionalism.* (Princeton, N.J., Princeton University Press, 1963).

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[7] Louis Menand, *The Metaphysical Club* (New York: Farrar, Straus, and Giroux, 2001), pp. 117-121.

[8] The relationship of Enlightenment rights-extension and contemporary ecologism has been studied by Timothy Beatley. See, Timothy Beatley, *Ethical land use : principles of policy and planning* (Baltimore, MD: Johns Hopkins University Press, 1994).

[9] Guy and Shove, *A Sociology of Energy, Buildings and the Environment*, p. 92, 131.

[10] Guy and Shove, *A Sociology of Energy, Buildings and the Environment*, p. 131.

[11] Paul Thompson, "Sustainability: What it is and What it is Not," position paper delivered to the University of Texas Center for Sustainable development 6 February 2002.

[12] For example, see: Thomas Prugh, Robert Costanza, and Herman Daly, *The Local Politics of Global Sustainability* (Washington, DC: Island Press, 2000), and William Shutkin, *The Land That Could Be: Environmentalism and Democracy in the Twenty-First Century* (Cambridge, MA: MIT Press 2000).

[13] There are two traditions that support this position: From political philosophy, see: Benjamin R. Barber, *Strong Democracy: Participatory Democracy for a New Age* (Berkeley, CA: University of California Press, 1984). From the tradition of philosophy of technology, see: Andrew Feenberg, "Subversive Rationalization: Technology, Power, and Democracy," in *Technology and the Politics of Knowledge,"* Andrew Feenberg and Alastair Hannay, Eds., (Bloomington, IN: Indiana University Press, 1995), and *Critical Theory of Technology* (New York, NY: Oxford University Press, 2002).