Designing for Sustainability: A Philosophy for Ecologically Intentional Design

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The crisis of sustainability, the fit between humanity and its habitat, is manifest in varying ways and degrees everywhere on earth. It is not only a permanent feature on the political agenda; for all practical purposes, it is the agenda. No other issue of politics, economics, and public policy will remain unaffected by the crisis of resources, population, climate change, species extinction, acid rain, deforestation, ozone depletion, and soil loss. Sustainability is about the terms and conditions of human survival....[1]

—David W. Orr

Many individuals, companies, and organizations now recognize the crisis described by Orr and others, and are searching for solutions to the myriad of problems caused by today's industrial and economic practices. The field of design (and all of its subsidiary professions: architecture, industrial design, interaction design, engineering, etc.) has become a major focal point for sustainability, which is not surprising since poorly designed industrial systems, products, and buildings can greatly contribute to environmental and social degradation. "Sustainable," "green," and "environmentally friendly" have become catchphrases in almost every design discipline. Practically every company and industry that manufactures or designs any product has environmental design guidelines or governmental regulations which limit emissions and the use of toxic materials. It is becoming clear, however, that current views of "design for the environment" cannot fully solve the crisis of sustainability because they focus only on a product's physical attributes: material construction, energy use, manufacture, transportation, and disposal. The shortcoming of this perspective is that even if a company could design and manufacture a product that used only solar energy, gave off no toxins, and could be one-hundred percent recycled at the end of its useful life, it would still not be truly sustainable unless every person who used it did so in a responsible manner and returned it for recycling at the end of its life. The idea of a "sustainable product" is misguided because the impact that any product has on the social and ecological environment depends as much on its use as on the technology it deploys. An axe, for example, can easily be made from recyclable steel, but it will still have a negative environmental impact if used to clear-cut a forest. The crisis of sustainability is more than simply

1 David W. Orr, *Ecological Literacy: Education and the Transition to a Postmodern World* (Albany: State University of New York Press, 1992), 83.

an issue of poor technology; it has emerged as an extremely complex sociological dilemma, where the lifestyle that we have adopted is rapidly eroding our ability to survive. It is obvious, then, that to play a profound role in making sustainability a reality, one must persuade the general public to adopt sustainable behavior. The role of the designer in developing a sustainable society is not simply to create "sustainable products," but rather to envision products, processes, and services that encourage widespread sustainable behavior. This goal of designing *for* sustainability can be accomplished through the practice of what I refer to as "intentional design" and the development of a new philosophy to help guide design decisions.

To understand how designers can encourage sustainable behavior, one must first closely examine the extent to which designed artifacts and new technologies affect society and individuals. This issue is explored thoroughly in an article entitled "Declaration by Design" written by Richard Buchanan. Buchanan observes that all design is, either consciously or unconsciously, a form of persuasive communication in which products serve as arguments for how people should live; and every new invention released to the public advocates accomplishing a certain task in a certain way:

> By presenting an audience of potential users with a new product—whether as simple as a plow or a new breed of hybrid seed corn, or as complex as an electric light bulb or a computer—designers have directly influenced the actions of individuals and communities, changed attitudes and values, and shaped society in surprisingly fundamental ways.[2]

The truth of this statement can be seen when closely examining even the simplest of products. Fishing, for example, was originally performed using spears or nets (or even bare hands) which required the fisherman to take an extremely active and attentive role in the process: standing in the water, senses alert, keenly awaiting his passing prey. The invention of modern fishing tackle (rods, reels, lures, lines, and floats) argued that fishing should be performed in a more passive way: allowing the fisherman to keep clear of the water and eliminating the need for constant alertness. Fundamentally, fishing lines and hooks were invented to make the process of catching fish easier, but this in itself is an argument. Rather than emphasizing the importance of skill or the size or type of fish caught, the fishing lure concept argues that the fisherman should be chiefly concerned with reducing the physical and mental effort needed to catch fish. In the same way, the inventors and designers of the first disposable products argued that people should reduce the time and energy spent on cleaning or storing products; even if the tradeoff is increased material use, pollution, and waste. This argument was incredibly successful, resulting in an explosion of disposable products, from

2 Richard Buchanan, "Declaration by Design: Rhetoric, Argument, and Demonstration in Design Practice" in *Design Discourse,* Victor Margolin, ed. (Chicago: University of Chicago Press, 1989), 93.

diapers to cameras to eating utensils. But while, at least from an economic and marketing standpoint, these products are a wonderful triumph, they are catastrophic failures when viewed in the context of sustainability.

It is important to realize that the negative influence of disposable products, and other inventions which undermine sustainability, does not indicate malicious intent on the part of their designers, but rather is evidence that the social and cultural impact of such inventions was not considered to its fullest extent. This is precisely the problem. Designers in the modern world focus almost entirely on the physical issues surrounding a new product or technology. While it is important that new products be functional, aesthetically pleasing, ergonomic, safe, environmentally benign, and easy to manufacture (along with a host of other "design for X" characteristics considered in "good design"); it is imperative to always remember that design is, at its core, "an art of thought and communication that can induce in others a wide range of beliefs about practical life for the individual and for groups."[3] Failure to recognize this aspect of design, and its influential power, results in products that make unconscious or unintentional arguments about how people should live. This failure, perpetuated, created our current sustainability crisis. No designer ever intentionally suggested that people should value sloth over their own health, that economic gain outweighs environmental destruction, or that convenience is more important than competence, but today we can look back on a sea of products and services that encourage these beliefs. The alternative to this unconscious design is recognizing that any artifact makes an argument for how people should live and what values they should hold and consciously designing products that encourage positive, constructive ways of life. This is the meaning of "intentional design," and I believe that through this practice designers can have a consistent, positive, and lasting effect on social behavior, and thus can play a significant role in the transition to a sustainable society.

Applying intentional design to promote sustainability requires a redefinition, or more precisely an expansion, of current environmental design principles. If the new goal is designing products that are more than simply nontoxic or recyclable, but actually serve as tools for shaping peoples' lives and values, then we must take a step back and examine what traits, values, and behaviors people must have in a sustainable society. Looking at an even broader picture, we need to develop a firm understanding of what is really meant by an ecologically sustainable society. The time has come to develop a unifying ecological design philosophy that can guide design decisions in order to ensure that new artifacts combine materials and resources in environmentally conscious and beneficial ways while, at the same time, ensuring that the values and lifestyles communicated through artifact rhetoric serve to promote an ecological-

3 Ibid, 94.

ly sustainable society. Such a philosophy can be conceived as four interconnected, hierarchal components: a philosophy of resources, a philosophy of form and function, a philosophy of purpose, and a philosophy of spirit.

At the top of the hierarchy is an encompassing philosophy of spirit; the fundamental goal that we hope to accomplish through design. In its broadest definition, design is the art of shaping society through new products, organizational structures, processes, services, and methods of communication and interaction. Correspondingly, the overall goals of design are the overall goals of society: what we hope to gain from life, the aesthetics we embrace, what drives us, and what we are passionate about. The modern world has been driven by the undying pursuit of scientific advancement and economic profit, a system which has failed because products, organizations, and practices conceived in this spirit are concerned primarily with what new technology can be created and what bottom line can be met, with little regard for the effects on people, society, or the natural world. Sustainability requires a new philosophy of spirit a new set of goals on which we base our social practices. In his book *Ecological Literacy,* David Orr touches on this new spirit when he observes that ecological sustainability "is driven by the sense of wonder, the sheer delight in being alive in a beautiful, mysterious, bountiful world." [4] The goal of a sustainable society, and the goal of ecological design, is to create an environment in which people live meaningful, peaceful, and fulfilling lives in beautiful harmony with the natural world. The philosophy of spirit is the quest for "the good life." It is the inspiration for ecological sustainability.

With this fundamental goal in place, we now can look at what is perhaps the most important piece of the ecological design philosophy: the philosophy of purpose. This area is particularly interesting because it guides the practice of "intentional design." The philosophy of purpose expresses what arguments designed products should make: it must dictate a set of values, attitudes, and characteristics that designers wish to promote. The overall goal established by the philosophy of spirit is the formation of a sustainable society, so the arguments made through design should promote sustainable lifestyles. This presents a difficult challenge because sustainable living involves different practices and values for different people, depending on their local environment, so attempting to determine a universal philosophy to encourage it seems antithetical. A successful philosophy of purpose requires a set of values, traits, or characteristics that encourage sustainable living in any setting. Orr examines this in detail, and concludes that sustainability will be achieved when every individual possesses a fundamental set of skills that he calls "ecological literacy." These are the characteristics that enable people to live in harmony with their local surroundings. Ecological literacy is based on "knowing, caring, and practical

4 Orr, *Ecological Literacy,* 86.

5 Ibid, 92.

competence."[5] People in a sustainable society must observe their local environment and how they relate to it, recognize the causes of health and decay in natural systems, and break away from the current expert-based society to embrace a broad knowledge. They must develop a feeling of kinship—a spiritual connection and sense of stewardship—with the natural world. Finally, sustainability requires people with the practical competence to develop sustainable solutions to local problems.[6] If these are the characteristic traits and values of people in a sustainable society, then our intent when designing products and services should be to cultivate ecological literacy in their users: new artifacts should communicate the value of broad knowledge, nurture a sense of connection between people and their environment, and encourage the practical competence to build a sustainable society from the ground up. Arguing for broad knowledge involves encouraging the user to truly understand how a specific product or technology is used to accomplish a specific objective. Buchanan uses the example of two different dividers used to measure distance on a chart or map. One divider makes its use of technology apparent; when interacting with the object, one can easily see the technological reasoning that went into making it work, and the product encourages active contemplation of its form as it is used. The second divider (a more modern approach) hides its technology under a shell, thus disconnecting the user from its inner reasoning and function, encouraging focus only on its end use.[7] Arguments for caring and intimacy with nature can be made with products that encourage people to interact with their local environment, and display how cooperation with natural processes can benefit our lives. As people develop an appreciation for how natural systems can enrich their lives, they will develop a respect for nature that is uncommon in our current culture. Buildings that incorporate natural daylighting and passive solar heating, for example, demonstrate that embracing natural systems can improve the comfort and aesthetic appeal of an interior space. Finally, products must encourage competence in the public by promoting the active participation of the user. New technologies should reduce peoples' dependence on outside experts and corporations, allowing them to do more for themselves. Victor Papanek points out that:

> The job of the designer is to provide choices for people. These choices should be real and meaningful, allowing people to participate more fully in their own life decisions, and enabling them to communicate with designers and architects in finding solutions to their own problems, even—whether they want to or not—to become their own designers.[8]

People act as their own designers when they are able to recognize needs in their lives or their communities, and develop solutions to meet those needs. This is the definition of "practical competence."

6 Ibid, 86–87.

7 Buchanan, "Declaration by Design," 98.

8 Victor Papanek, *The Green Imperative: Natural Design for the Real World* (New York: Thames and Hudson, 1995), 59–60.

By establishing these three characteristic traits, the philosophy of purpose helps to guide the practice of intentional design to ensure that new products will promote sustainable living.

As illustrated by the divider example, the aim of promoting ecological literacy has important implications for the philosophy of form and function; which addresses how a product interacts with the physical world, its ecosystems, and its people—before, during, and after its useful life. To effectively argue for broad knowledge, a product must be intuitive and encourage the user to recognize how its form and function are related. Extending this idea further, the ideal sustainable product uses different disciplines and processes. For example, it incorporates natural biological systems along with electrical and mechanical systems in order to accomplish a certain task, thus improving people's understanding not only of a wide range of subjects, but also of how different fields can cooperate in order to solve practical problems more effectively. Integrating living organisms and natural processes into new technologies also cultivates a sense of connection between people and nature by showing users how harmony with the natural world can improve their lives. Making the form of a new product respond to the native forms of the place where it is used promotes intimacy between people and their local environment. Arguments for widespread public competence are accomplished through the simplification of a product's processes and components, so that users can easily assemble and maintain the product themselves. Another implication for the form of a product is decentralization: products that make people dependant on large, centralized, distant organizations (current power companies and large power generation plants are prime examples) encourage people to be ignorant of how they work and their environmental impact. All of these form and function guidelines are consistent with the ideas of "proponents of ecological sustainability [who] regard nature not just as a set of limits but as a model for the design of housing, cities, neighborhoods, farms, technologies, and regional economies," writes Orr. "Sustainability depends on replicating the structure and function of natural systems."[9] We can see that natural systems display the same characteristics described above for products that promote ecological literacy. First, the form of natural organisms is reflective of their function. The leaves on a tree have large surface areas to collect sunlight, and veins to carry nutrients and water to and from the leaf. In animals, visible muscle contractions and tendons which connect muscle to bone are visual cues for how limbs are manipulated. Obviously, the function of a natural system is dictated completely by the local environment in which the amount of sunlight, water, and nutrients determines how the local ecosystem operates and what organisms it contains. Natural systems also tend to be dispersed and decentralized. Rather than a single large leaf to collect solar energy, a tree has hundreds of small leaves, all working together to accomplish a large task. One obvious advantage of this decentralization

9 Orr, *Ecological Literacy*, 33.

is resilience: if a few leaves are damaged or destroyed, the tree will continue to live. In parallel, if instead of large central power plants, our electrical system consisted of many small solar power systems on top of buildings and homes—and dispersed wind turbines—the chances that a problem would result in massive blackouts would be minimized. Using nature as a model involves creating products that take advantage of natural solar, wind, water, and geothermal energy, respect the diversity of the local ecology, and strive to promote its health. In addition, the philosophy of spirit implies that nature should influence aesthetic design, so that products exist in sensual harmony with their surroundings. The philosophy of form and function dictates using natural organisms and processes—the only examples of truly sustainable designs—as the model for products designed for sustainability.

For this same reason, the material flows employed by the natural world provide the model for an ecologically responsible philosophy of resources. A strategy for managing resources recently was developed and put into practice by William McDonough and Michael Braungart. Their tactic is explained in great detail in their book *Cradle to Cradle,* which, among other things, provides an insightful and practical method for managing energy and materials in a sustainable way, providing a nearly complete philosophy of resources. Their strategy is based on the principle that, in nature, waste equals food: the waste of one living organism is the food of another. McDonough and Braungart suggest that a similar ideology must be adopted when managing the resources used in a new product. Rather than the current "cradle-to-grave" system under which products are made, used, and then discarded into landfills, we must develop a "cradle-to-cradle" methodology in which products are designed so that, after their useful life, the materials they are made from become nutrients for new products or for living organisms. Accomplishing this means distinguishing between biological nutrients—materials that are can biodegrade safely and provide food for living organisms—and technological nutrients; those materials which cannot be returned to natural processes but can be reclaimed, completely recycled, and used again in a closed loop. Any material that cannot exist purely in one or the other of these cycles—if it cannot either be completely recycled or completely returned to natural systems—cannot be used in a sustainable system.[10] This is only a brief synopsis of McDonough's and Braungart's plan. A complete plan for resource management is much more complicated and involves the examination of how different materials release toxins while they are used, manufacturing processes, how materials are obtained, and many other issues that are topics for other discussions. For the purpose of this paper, however, the foundation of an ecologically sustainable philosophy of resources is in place: designers must practice cradle-to-cradle design so that every part of a product can be returned to either a biological or closed-loop technical cycle.

10 William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002).

To effectively practice this set of ecological design philosophies in order to promote sustainable behavior, designers must embrace a set of skills above and beyond the traditional eye for form and function. Designing for sustainability requires skilled communicators who can, through artifact rhetoric, conceive effective arguments for how a group of people should live in the context of their environment. The greatest challenge is that sustainable living will mean different things to different people, depending on their local customs, needs, and ecosystems. Overcoming this obstacle requires designers who can enter a local environment, observe and understand how its people relate to each other and to the natural world, and develop methods for improving those interactions. We must develop practical problem-solving skills and a working knowledge of ecology, biological systems, psychology, and cultural anthropology, as well as engineering and aesthetic principles. In essence, the fundamental skill of designing for sustainability is ecological literacy. In order to help create a sustainable society, designers must possess a broad knowledge of science, art, engineering, communication, and human interaction; they must be concerned with nature and humanity, and desire to promote harmony between them. They must have the experience and competence to solve practical problems.

Recognizing ecological literacy as the fundamental skill of design provides something that has eluded many designers concerned with the crisis of sustainability: a starting point. In order to help develop a sustainable society, designers first should focus on developing their own ecological literacy. We must practice observing the natural world and how people relate to it, improve our ability to recognize the difference between health and decay in natural systems, and to discover the causes of both, and then take that knowledge of the situation and ask "What then?" [11] Our goal as designers must be a broad knowledge of the many disciplines which contribute to any project, a sense of kinship and spiritual connection with all life around us, and the practical competence to create sustainable solutions. A designer who becomes an expert in these things will be well-equipped to use the ecological design philosophy to spread ecological literacy to all members of society through intentional design. If we recognize the true nature of our field, and consciously utilize its power to influence society, designers will play a profound role in establishing a society that exists in beautiful harmony with the natural world.

11 Orr, *Ecological Literacy*, 86.