

Designing Environmental Relations: From Opacity to Textility

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Introduction

In this article, we show that mainstream practices of design in western industrialized societies aspire toward a logic of form that reduces our ability to perceive the depth and scope of our material involvement with the world around us. According to this logic of form, lines or conduits of energetic and material circulation are wrapped up within opaque, enclosing surfaces that conspire to hide these circulations from perception and present the appearance of discrete, finished entities. Drawing on the philosophy of Vilém Flusser,¹ we show that this logic stems from an imperative to cast the material world in the guise of *objects*. The effect is to trap humanity within a vicious circle of increasing environmental alienation. We show how this imperative is pursued across the designed world—in its products, buildings, and spaces—and note how, as a result, it becomes more difficult for people, rather than less, to follow the material traces and environmental consequences of their activity. We then propose a reorientation of the aspirations of design, reimagining form so that it resists the conventional objectification of the material world. Our suggestion is to consider form as *textilic*, the material world as comprising energetic lines, and design as a practice of enriching the weaves that bind people and their environments. We conclude with a note concerning the interdisciplinary activity from which this article has emerged, and with it, issue a call to designers to broaden their disciplinary engagements and the scope of their creative involvement in the continual shaping of the world.

A Flawed Logic

Western industrialized design produces objects by dividing surfaces from what we call “infrastices.”² By *infrastices* we mean all manner of electrical, chemical, and mechanical workings; their parts, structures, and conduits; and the energies, gases, and fluids they carry. *Surfaces* are typically opaque, smooth, and solid layers, such as molded casings, plastered walls, cladding, and pavements. The enclosure of infrastices within a surface breaks their continuity and brings into being a singular and discrete material entity—

1 Vilém Flusser, *The Shape of Things: A Philosophy of Design* (London: Reaktion, 1999).

2 We have coined the term “infrastitial” here (from *infra* = “below, beneath” + *stare* = “stand”) as an alternative to “infrastructural,” to avoid the latter’s connotations of foundational support. From this, we derive the terms “infrastices” and “infrastitiality.”

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- 3 Apple's iPhone, iPad, and MacBook Air products show an exemplary refinement of this logic of form, featuring near seamless surface enclosures and highly concealed and controlled infrastitital elements.
 - 4 The high status of "objects" in western industrialized society is exemplified in the title and subject of the film documentary *Objectified*, by Gary Hustwit (2009).
 - 5 Many sustainable design scholars acknowledge the close ties between material form and environmental sustainability. Examples include Stuart Brand, *How Buildings Learn: What Happens After They're Built* (New York: Penguin, 1994); Jonathan Chapman, *Emotionally Durable Design: Objects, Experiences, and Empathy* (London: Earthscan, 2005); and Stuart Walker, *Sustainable by Design: Explorations in Theory and Practice* (London: Earthscan, 2006). Many anthropologists acknowledge the close ties between perception and environmental sustainability. Examples here include Tim Ingold, *The Perception of the Environment* (London: Routledge, 2000) and Kay Milton, *Loving Nature: Towards an Ecology of Emotion* (London: Routledge, 2002).
 - 6 Many scholars concerned with environmental sustainability emphasize an interdependent view of the world. See, for example, James E. Lovelock, *Gaia: A New Look at Life on Earth* (Oxford: Oxford University Press, 1979); David W. Orr, *Ecological Literacy: Education and the Transition to a Postmodern World* (Albany, NY: State University of New York Press, 1992); and John Thackara, *In the Bubble: Designing in a Complex World* (Cambridge, MA: MIT Press, 2005).
 - 7 Such inquisitiveness is evident in the amount of everyday human ingenuity dedicated to the deconstruction, renovation, and redesigning of existing products, buildings, and spaces.
 - 8 This curiosity is evident in various "leisure" practices, from the general (e.g., local walking and wider journeying) to the specific (e.g., trainspotting or parkour).

an *object*. As infrastices become a hidden interiority, the surface of the object is necessarily punctured by other material components—*interfaces*—that allow the object to be used and connected to other objects. The aim of mainstream design is to enact this logic of form and to refine it as far as possible, through a deft creative shaping,³ whereby surfaces become the primary substrate of everyday human perception and objects achieve the highest economic, political, and cultural status.⁴

As accepted and pervasive as this logic might be, it entails a significant problem for environmental perception. In constituting the world as a set of apparently independent and discrete objects, the interdependent and entangled nature of the world becomes more difficult to perceive. Flows of materials, which are of critical environmental significance, are infrastitally hidden and accorded low perceptual value. The implication is that local activities should occur within bounded envelopes, largely in ignorance of the physical continuities that surround and sustain everyday life. This perceived discontinuity should be a cause of concern within the context of present-day design, which should responsively acknowledge the close ties between perception, material form, and environmental sustainability,⁵ and the value of a view of the world that recognizes the interdependence of its constituents.⁶

We should also question whether this conventional logic of form is actually desirable or attainable. Life, in all its forms, is difficult to contain. When presented with a preformed, enclosing surface, humans in their inquisitiveness often try to break through, to understand the constitution of the surface itself, and to creatively engage with the entanglements contained within.⁷ Presented with a divided landscape, with designated spaces for different forms of habitation and activity, human beings are inclined to wander, following an insatiable curiosity with regard to the world around them.⁸

Many materials are no less energetic than living organisms, and no more compliant with containment. In buildings, fluid leaks often occur, and through them residents gain quotidian knowledge of the routes and flows of daily resource use. Some resource conduits resist being framed as "infra," because of their sheer scale, and the potential economic costs of enclosing them within surfaces (e.g., high-voltage power networks, whose extended megastructures sprawl across stratifications of space).

A logic of form based on the division of surfaces and infrastices is therefore not necessarily consistent with the dynamic qualities of life; it appears more to restrict than to enrich the fulfilment of both human desires and the inclinations of materials. However, to question this logic of form is challenging because it is interlinked with established ideologies in aesthetics, ergonomics,

safety, commerce, and regulation. To move forward, we thus launch a philosophical critique, centered on the matter of most concern: that of the *object*.

Design: Obstacle for/to the Removal of Obstacles

The title of this section is taken from an essay by philosopher Vilém Flusser that follows strikingly similar lines to aspects of our argument and has notable things to say concerning the problematic nature of objects:

An 'object' is what gets in the way, a problem thrown into your path like a projectile (coming as it does from the Latin *obiectum*, Greek *problema*). The world is objective, substantial, problematic as long as it obstructs. An 'object of use' is an object which one uses and needs to get other objects out of the way. This definition contains within it a contradiction: an obstacle for/to the removal of obstacles?⁹

Flusser argues (as do we) that, cast in the form of objects, material culture creates a problem of obstruction: More specifically, it impedes the tracing of relations along the paths of our activity in the world. Flusser then suggests possible ways of dealing with objects and the obstructions they place in our way:

I come across obstacles in my path...; I overturn some of these obstacles... in order to continue, and the objects thus overturned prove to be obstacles in themselves. The more I continue the more I am obstructed by objects of use (more in the form of cars and administrative machinery than in the form of hailstones and man-eating tigers)... The more I continue, the more objective, substantial and problematic culture becomes.¹⁰

This passage highlights how the very things we use to achieve our breakthroughs, and thus to advance, become objects of obstruction in themselves. As we proceed, these obstacles multiply. This indeed calls to mind the condition of modern society in which environmental problems are typically addressed by way of further technologization and objectification, leading to obstructions on an even larger scale, along with such negative environmental effects as waste, pollution, and climatic destabilization (which are in turn addressed through further technologization and objectification, creating a vicious circle). The passage also sums up the effects of producing environmental information interfaces—a point to which we shall return. Given the bleakness of the situation, Flusser offers a way out:

In an attempt to break out of this vicious circle, I project designs myself: I myself throw objects of use into the path of other people. What form must I give these projected

9 Flusser, *The Shape of Things*, 58.

10 Ibid.

designs so that those coming after me can use them to continue and at the same time avoid being obstructed as much as possible? This is both a political and an aesthetic question and forms the central concern when it comes to *creating* things. ...

... Objects of use are therefore mediations (media) between myself and other people, not just objects. They are not just objective but inter-subjective as well, not just problematic but dialogic as well. The question about creating things can also be formulated in this way: Can I give form to my projected designs in such a way that the communicative, the inter-subjective, the dialogic are more strongly emphasized than the objective, the substantial and the problematic?¹¹

Here, Flusser suggests a human role that is *active* and *involved*—as in his insistence that “*I project designs myself: I myself throw*”—in the generation of a material world based on relations and reciprocity, epitomized in the qualities of *mediation*, *dialogue*, and *communication*. In finding an alternative to the conventional logic of form, it should be possible to reimagine design as a practice that seeks to facilitate mediation and dialogue between people and their surroundings through enriched involvement with materials.

Flusser concludes his essay by relating the problematic nature of objects to grander issues. He asserts that an object-oriented culture tends toward an inward focus on objects themselves and a reduction in dialogical relations, resulting in restrictions on social freedoms and an increase in material waste and entropy. His conclusion situates the nature of material form as an issue of central importance to mainstream social and environmental concerns.

Disciplinary Obstacles

To develop our argument in more detail, we review how the conventional logic of form produces objects in the disciplines of product, architectural, and urban design. We also explore how these disciplines have tried to address questions of environmental relations, and consider instances in which these disciplines have produced forms that contest the conventional division between infrastructures and surfaces.

Product Design

In product design, our concern is with everyday mass-produced articles that draw on materials and energy in their manufacture and use—for example, telephones, hairdryers, computers, washing machines, and cars. In mainstream product design, such objects

11 Ibid., 58-59.

Figure 1

An example of an energy consumption interface, as an integrated part of a consumer product: *Toyota Prius* car.
Photograph: © King Huang.



follow the conventional logic of form and thus incorporate little incentive for users to interact with the energetic and material circulations that sustain their production and utility.

Governments and manufacturers do of course recognize that environmental awareness is an important issue, and they try to address it through product and point-of-sale interaction. An established practice is to append environmental information to the product in the form of a label. So-called “eco-labels” focus on communicating a quantitative estimate of “environmental impacts” for everyday products, such as washing machines, refrigerator-freezers, and vacuum cleaners. Since their origin in the 1970s, their use has become widespread at an international level.¹²

However, the resort to eco-labels only reinforces our argument, offering further confirmation that modern products and their material forms are not *in themselves* effective in deepening users’ perception of environmental relations. To compensate for this lack of effectiveness, manufacturers have more recently introduced environmental information interfaces into the make-up of products, usually in the form of energy consumption monitors (see Figure 1). This more recent development demonstrates that material forms are perfectly capable of offering valid sites for tracking environmental effects. So far, however, these effects have been represented only by way of the compilation of datasets drawn from detached, instrumental measurement and relayed back in the forms of maps, tables, graphs, and images. Such data displays presuppose a world of objective properties that are given quite independently of the direct sensory engagements through which people perceive and come to know their surroundings. Thus, this kind of monitoring of environmental effects, as Flusser foretold, only furthers the project of objectification and makes the enrichment of users’ perception of environmental relations more difficult, not less.

12 Cecilia Bratt, Sophie Hallstedt, K.-H. Robèrt, Göran Broman, and Jonas Oldmark, “Assessment of Eco-Labeling Criteria Development from a Strategic Sustainability Perspective,” *Journal of Cleaner Production* 19 (2011): 1631-38.

Figure 2

Gustafsson and Gyllenswärd's *Power-Aware Cord*: a power cord which lights up in response to the electricity consumed by its connected appliances.

Photograph: © Carl Dahlstedt.



Recent work in tangible interaction design has sought to address the perceptual limitations of graphic displays. Prototypes such as the “Power-Aware Cord” (see Figure 2), designed by Anton Gustafsson and Magnus Gyllenswärd,¹³ show how attention can be drawn directly to the actual flows of materials and energy on which products depend for their operation. Such design innovations open up interesting possibilities and indicate the broad scope for creative ideas centered on direct perception. However, they currently remain conceptualized in relation to a material culture of objects in which the division between infrastices and surfaces obstinately persists.

Architectural Design

Most everyday architectures feature the same distinction between surface elements that are intended to be perceptible and infrastitial elements meant to be hidden. Surfaces include those on both the exterior (e.g., façades and roofing) and the interior (e.g., floors, walls, and ceilings), as well as interface elements associated with basic supplies of water, energy, and telecommunications (e.g., control panels, taps and sockets). Infrastitial elements include foundations; cavities and spaces for ventilation; and conduits for waste, water, energy, and telecommunications signals. Although some infrastitial elements are frequently featured as materials of interest to specific groups of people (known in Britain as “DIY enthusiasts”), for the most part they are designed primarily for the attention of specialist technical and skilled workers (known, by contrast, as “tradespeople”). Within this context, infrastitial elements typically recede into the background of everyday material culture. Again, the result is a generic material form that complies with mainstream aesthetic values but is not directly intended to help residents follow energetic and material circulations.

13 Anton Gustafsson and Magnus Gyllenswärd, “The Power-Aware Cord: Energy Awareness Through Ambient Information Display,” paper presented at the Conference on Human Factors in Computing Systems (HCI), Portland, OR, April 2–7, 2005.

Figure 3

Richard Rogers's 1986 *Lloyd's of London*, which reverses the traditional architectural order of surfaces and workings with a striking display of structures and services on the outside of the building, thus creating an uncluttered interior invested with the qualities of surface. Photograph: © Peter McDermott.



These traditions in architecture were challenged with the advent of the late modern “high-tech” style, with the overt display of building services as its key aesthetic feature. At its most extreme, the relation between surfaces and technical workings was reversed in such a way as to place the technical workings “on top,” as “suprastics,” rather than beneath (see Figure 3). However, this style neither undoes nor moderates the division between the material elements, respectively, of surfaces and workings. The division remains; it is merely inverted. Moreover, the neutral, abstract, machine-like forms of the high-tech style have been widely criticized for their neglect of historical context and sense of place, and for their incongruity with everyday scales of human habitation. These criticisms have opened the way to a post-modern architectural style, along with a regression to the conventional logic of form.¹⁴

To make the energies and circulations of the infrastices more perceptible, contemporary architecture is devoting increasing attention to environmental information interfaces for settings, similar to those in the field of product design. These interfaces are typically energy monitoring units, located in commonly occupied domestic spaces and featuring graphic and numerical displays intended to be comprehensible to ordinary residents. As in product design, these devices are effective in foregrounding the environmental effects of architectural occupation, but in projecting these effects as compendia of abstract information, they are complicit in reproducing the very logic of form that impedes the direct perception of environmental relations.

Public Space Design

Public spaces in the modern town, city, and country also embody a division between surface and infrastice akin to those encountered in both product and architectural design. The shaped surfaces of landscape and the built environment—including fields and parkland, pavements and roads—are directly perceptible.

14 For a review of transitions through modern, late modern, and post-modern architectural styles, and the respective critiques of these styles, see Charles Jencks, *Architecture Today* (London: Academy Editions, 1988).

Hidden away from everyday perception are the ground substructures of soil, burrows, and roots; conduits for water, sewage, energy, and telecommunications; and interface elements, such as hydrants, maintenance holes, and telephone junction boxes.

More so than for product design and architecture, the infrastitial elements of public spaces are obscured as much by their *location* as by the opacity of their surfaces. They are often located in spaces far removed from those where people normally live, such as in remote highlands or designated industrial estates, or positioned peripheral to everyday view, as with the overhead positioning of power or telecommunication lines.¹⁵ These practices of making use of remote locations, and of designing infrastitial elements in accordance with an overtly technical aesthetic, render these elements tangential to the concerns of everyday life. As long as they continue to function, they remain part of an indifferently accepted perceptual background. Of more interest and relevance to everyday life are the surface qualities of landscape and built environment, which facilitate daily dwelling and journeying in and through areas of mainstream cultural interest. This conventional design of public space affords little opportunity to form an understanding of how, in material terms, people are inextricably linked to their surroundings through energetic and material circulations.

Applied to public space, our argument notably parallels that of the sociologist Elisabeth Heindenreich.¹⁶ Here, Heindenreich documents the historical process whereby what we are calling resource infrastices have shifted from a prior state of material tangibility—as with ancient aqueducts—to a contemporary state of being imperceptible to the senses: “[P]ipes and cables are hidden underground or in house walls to such an extent that no human eye can perceive them anymore.”¹⁷ She argues that this invisibility informs “a cultural perception which disconnects the consumption of natural resources from its natural context and environmental impact,”¹⁸ leading to a reduction of public environmental awareness and, consequently, having a detrimental effect on sustainable development. She concludes with a call to “make ‘visible’ the invisible processes of flow”¹⁹ that would convert resource infrastices into a tangible form of material culture and make it possible for environmental engagement to go beyond limited “abstract knowledge” and become a practice of “concrete experience and sensual perception.”²⁰

Beyond the social sciences, we find further support for the link between the imperceptibility of infrastices and the impoverishment of environmental relations. Communications and reliability scientists Karen Taylor and Andrew Widlea Koehler draw on their empirical studies to argue that design approaches—which reduce the sensorial and cultural presence of infrastitial systems in public spaces—have a negative effect on their socio-technical performance.²¹ Comparing the performances of levee systems in New

15 Conversely, infrastitial developments that threaten to invade people’s normal living spaces or spoil the view invariably give rise to vigorous protest.

16 Elisabeth Heindenreich, “Spaces of Flow as Technical and Cultural Mediators Between Society and Nature,” *Environment, Development and Sustainability* 11 (2009): 1145-54.

17 *Ibid.*, 1149.

18 *Ibid.*, 1147.

19 *Ibid.*, 1154.

20 *Ibid.*

21 Karen Taylor and Andrew Widlea Koehler, “In Defence of Ugliness: The Role of Technical Presence in Critical Infrastructure System Endurance,” (paper presented at the International Symposium on Technology and Society, Las Vegas, NV, May 31–June 2, 2007).

Orleans, LA, and the Netherlands, they show that the Netherland levee systems, which have a significant sensorial and social presence, also enjoy a high technical performance record, whereas the levee systems of New Orleans, with a much lower sensorial and social presence, spectacularly failed during the 2005 hurricane Katrina disaster. Taylor and Widlea Koehler observe that the public visibility of the Netherland levees, along with their associated education programs, tourist information, and folklore, ensures that the value of these systems is amply acknowledged despite their apparent ugliness; thus, they attract great public respect and economic investment and are maintained to the highest standards. By contrast, the New Orleans levee systems meld imperceptibly into the surrounding parkland to an extent that they are barely noticed. As a result, they attract no particular attention, and because of the resulting public disregard, the level of economic investment and standards of maintenance are much lower than in the Netherlands. Taylor and Widlea Koehler conclude with a point that resonates with our argument: “[T]he aesthetic form of a critical infrastructure contributes to the ultimate effectiveness of the system.”²²

From Opacity to Textility

So what might it mean to re-imagine material culture in a way that dispenses with a division between surface and infrastices? It would, in effect, be to undo the conventional logic of form that conceals energetic and material circulations beneath what Mae-Wan Ho has called the “opaque, flat, frozen surface of literalness.”²³ This surface conspires to deceive the unsuspecting observer into taking the outward envelopes of things for reality. But what if the surface were not opaque? What if it were woven from the lively movements of materials themselves as they mix and flow in the generation of things? And what, then, if the environment were not the networked assembly of discrete objects that we usually take it to be, but rather an entangled mesh of materials in energetic movement, out of which the forms of things are continually emerging? Objects mark fixed points, projected “ends,” or moments of termination. Material movements, however, rather than going from point to point, run forever *in between*,²⁴ finding their way around or breaking through the objects that, as Flusser observed, have become obstacles to their continuation.

With this perspective, we can think of the inhabited world not as a layout of interconnected *objects* but as a tapestry of interwoven *lines*.²⁵ And, we can think of environmental relations as ever-unfolding along these lines. What they weave is not an opaque surface but a permeable membrane. This membrane does not divide outside from inside, the manifest from the concealed, or superficiality from depth. “What is really at stake,” remarks Susanne Kuechler, “is a new kind of surface ontology which replaces the opposition of inside and outside, invisible and visible,

22 Ibid.

23 Mae-Wan Ho, “The Role of Action in Evolution: Evolution by Process and the Ecological Approach to Perception,” *Cultural Dynamics* 4, no. 3 (1991): 348.

24 Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (London: Continuum, 2004), 323.

25 Tim Ingold, *Lines: A Brief History* (Abingdon, UK: Routledge, 2007).

immaterial and material, with a complementary relation that thrives on transformation rather than distinction.”²⁶ Thus, instead of the division between surface and depth, or between the superficial and the infrastitial, the surfaces of things are at one with their workings. These surfaces are no longer superficial, nor are the workings infrastitial; rather both surfaces and workings are *interstitial*, “in the midst of things.” *Through environmentally engaged practice, surfaces are woven into the interstices of the world.* Compared with the traditional emphasis on the capacity of surface forms (e.g., façades or casings) to obscure what lies beneath or within, our approach suggests an emphasis on the weave of surfaces, or what could be called their *textility*.²⁷

Starting from this idea of the textility of interstitial surfaces, woven from the flowlines and circulatory pathways of matter and energy, we propose the following ways of considering human, material, and environmental relations. First, we can consider how an embodied awareness of environmental relations might be enhanced by conjoining lines of human–artifact movement and practice with flows of energy use. This approach is exemplified in Mads Vedel Jensen’s analysis of a brewery process operator in which he shows how, in skilled practice, the choreography of bodily movement is rhythmically attuned to the circulations of a liquid medium through a system of pipes, valves, and taps.²⁸ For the practitioner, this system figures not as an object assembly but as a mesh of paths, movements, and flows. Adopting this approach, we might consider redesigning cooking activities and artifacts so that the bodily gestures and skills of making food are responsive to its draws on and flows of energy, or redesigning the transitory paths of public space so that pedestrian and vehicular movements are in line with the material trajectories of electricity and water.

Second, by making lines of matter and energy flow directly perceptible, in a weave of interstitial relations linking proximal and distal environments, the material qualities of the weave, rather than its outward appearance, would become the focus of aesthetic attention. The consideration of matter and energy as lines in this textilic way is a salient theme in the work of some contemporary craft scholar–practitioners. For example, Maggie Orth’s pioneering work in the field of “electronic textiles” demonstrates how electronics and conductive fibers can be woven and sewn to create highly sensorial and interactive fabrics (see Figure 4).²⁹

Third, we could consider how a focus on textiles might lead us to rethink the fundamental concepts of architecture. The idea that buildings are woven rather than made is not, of course, a new one. It was classically explored in the nineteenth century by Gottfried Semper, who argued that the very origin of building “coincides with the beginning of textiles.”³⁰ More recently, this theme has been further developed in the work of architectural

26 Susanne Kuechler, “Technological Materiality: Beyond the Dualist Paradigm,” *Theory, Culture and Society* 25, no. 1 (2008): 116.

27 Tim Ingold, “The Textility of Making,” *Cambridge Journal of Economics* 34, no. 1 (2010): 91–102.

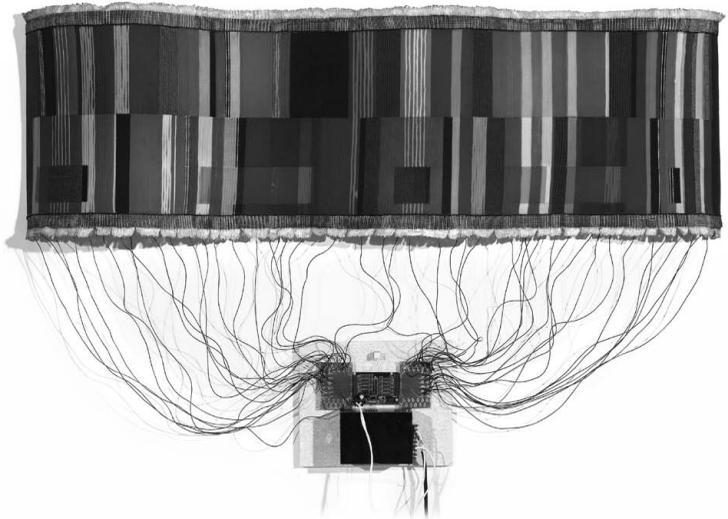
28 Mads Vedel Jensen, “An Anthropological Move Towards Tangible Interaction Design,” (paper presented at the Nordic Design Research Conference, Copenhagen, May 29–31, 2005).

29 “Maggie Orth, PhD, “Art, Technology, Design,” <http://www.maggiearth.com/> (accessed November 30, 2012).

30 Gottfried Semper, “Style in the Technical and Tectonic Arts or Practical Aesthetics,” in *The Four Elements of Architecture and Other Writings*, trans. Harry Francis Mallgrave and Wolfgang Herrmann (Cambridge: Cambridge University Press, 1989): 254. Semper’s essay was originally published in 1860.

Figure 4

An example of an electronic textile which weaves traditional textile fibres with electronic circuitry; Maggie Orth's 2009 *100 Electronic Art Years*. Photograph: © Maggie Orth.



historian Kenneth Frampton, in his *Studies in Tectonic Culture*.³¹ Frampton contends that building “is as tectonic and tactile in character as it is scenographic and visual.”³² The experience of architecture, then, is as much one of close-up, haptic engagement with the materials and forces that are bound together in the building, as it is the distanced contemplation of an enclosed and objectified form. Flusser, too, arrives at a rather similar conclusion, in an essay entitled “Shelters, Screens, and Tents.” Discussing what he calls the “screen wall,” exemplified in the nomadic tent, he describes it as a woven cloth that is “open to experiences (open to the wind, open to the spirit) and that stores this experience.”³³

These three considerations not only resonate with Flusser’s call for a material world of mediation, dialogue, and communication, with which we began, but also lend support to our suggestions for how matter and energy might be entwined in dialogue with material forms and human practices.

Conclusion: The Role of Design Anthropology in Understanding and Shaping the World

In this article, we have been critical of the way in which mainstream design intends to form the world, and of the limitations it places on the possibilities for people to enlarge the scope of their environmental relations. By this critique, however, we do not mean to devalue design. Rather, our intention is to call for a more reflexive design practice and for an expansion of the range of design with regard both to the ways it relates to non-design disciplines and to its role in society.

Traditionally, design has tended to adopt a technologically deterministic approach to environmental issues, focused on objects and their end results. This approach has its value and place but is limited in its understanding of human practices and ways of perceiving. To overcome this limitation, environmental design

31 Kenneth Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture* (Cambridge, MA: MIT Press, 1995).

32 *Ibid.*, 2.

33 Flusser, *The Shape of Things*, 57.

research has devoted increasing attention to experience, behavior, and culture.³⁴ Here, we emphasize the need to take an anthropological approach to the analysis of form and its relationship to environmental perception. Anthropology, like design, is an encompassing discipline, and much of its growth has occurred through enlightened engagement with fields of inquiry beyond its traditional disciplinary boundaries. Moreover, anthropology has expanded from its human-centered roots to embrace inquiries concerning materials, technology, and ecology. At the same time, design—traditionally rooted in the study of materials—has expanded to engage more deeply with cultural phenomena and ecological processes. Between these two disciplinary expansions lies a space in which a *design anthropology* could emerge that would combine the grounded insight of anthropological methodology and knowledge with the imaginative praxis of design skill and process.

Our call, then, is for a design practice that is *reflexive* toward its own disciplinary creations; *participatory* in its understanding of life; *knowledgeable* of the interrelationships between perception, culture, and materials; and *active* in creatively engaging with the continued enhancement of human life. The role of design in such practice is not merely to “add value” to products by enclosing them in outward forms that appeal to consumer sensibilities in a competitive market, but rather to address fundamental issues concerning the role of human practices in the constitution of environmental relations.

Expanding the knowledge, potential, and scope of design is bound to test the existing conventions and boundaries of design practice. The ideas expressed in this article, which outlines a radically alternative approach to understanding material forms, no doubt have highly problematic implications if applied in current commercial and regulatory contexts. Such problems are only to be expected; in our academic propositions concerning the future of design, we must view these contexts as they would be viewed in any critical social inquiry—as cultural phenomena that are themselves open to criticism, contest, and change. Yet such inquiry, we contend, should not only be a task for philosophical and social analysis, but also attract the creative attention of designers in a mutually shared trajectory of understanding and shaping the world.

Acknowledgements

This paper resulted from discussions in the interdisciplinary research program, *Designing Environments for Life (2009-2010)*, hosted by Scotland’s Institute for Advanced Studies (now Scottish Universities Insight Institute).

34 Kate T. Fletcher and Philip A. Goggin, “The Dominant Stances on Ecodesign: A Critique,” *Design Issues* 17, no. 3 (2001): 15-25.