Working by Not Quite Working: Resistance as a Technique for Alternative and Oppositional Designs

James Pierce
December 2015
CMU-HCII-15-109

Human-Computer Interaction Institute
School of Computer Science
Carnegie Mellon University
Pittsburgh, PA 15213 USA

jjpierce@cs.cmu.edu
http://jamesjpierce.com

Committee
Eric Paulos (Chair), Carnegie Mellon University
Jodi Forlizzi, Carnegie Mellon University
Chris Harrison, Carnegie Mellon University
Phoebe Sengers, Cornell University

Submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

Keywords

Design, Human-Computer Interaction, Interaction Design, Research through Design, Design Research, Design Techniques, Design Resistance, Critical Design, Speculative Design, Adversarial Design, Design Fiction, Reflective Design

Abstract

Since the early 2000s, within the fields of Design and Human-Computer Interaction (HCI) an emerging body of unconventional design work has exemplified and articulated alternative and oppositional functions of design. Examples of such functions include provocatively speculating about alternative futures (speculation), questioning the status quo (critique), and debating political issues (agonism). Prominent examples of alternative and oppositional design have originated within HCI. Others have been heavily discussed, adapted, and critiqued within HCI. Alternative and oppositional designs have been presented under various names: critical design, design fiction, adversarial design, reflective design, ludic design, speculative design... At this moment the list continues to grow while examples of such work proliferate. This work collectively demonstrates the potential for design to engage concerns and goals that pivot around themes of generating radical alternatives and creating productive political, cultural, and social opposition. This thesis argues that there is a body of unconventional design work that becomes cohesive and legible when held together by themes of oppositionality and alternatives, and operating throughout these designs is a technique which I term design resistance.

This thesis presents two primary contributions. The first contribution is to isolate and elaborate resistance as a design technique at work across a range of alternative and oppositional designs. I articulate how design resistance works by analyzing a series of design exemplars drawn from HCI and adjacent areas of Design. The second contribution is to extend and refine the overarching technique of design resistance through two design case studies. These design case studies serve the dual function of offering additional insight into design resistance grounded in my own design practice while concretely demonstrating new knowledge relevant to specific domains and concerns within HCI, including sustainable energy consumption and critiques of digital consumer technologies.

Together these contributions provide new knowledge for (1) understanding the rise of alternative and oppositional designs, the concerns they are working to engage, and the research gaps they are working to fill, and (2) how to practice alternative and oppositional forms of design using techniques of design resistance.

Acknowledgments

This thesis is dedicated to my parents for their constant support, even when I had only the faintest idea as to where I was heading. I'm glad they can now finally order me those return address labels for "Dr. James Pierce."

I've been very fortunate to have many wonderful mentors, colleagues, and friends who have provided me with guidance, support, and good times throughout my graduate student career. Which means many thanks are in order. First up, I want to thank my advisor, Eric Paulos. Of all the many wonderful forms of support that Eric has provided me over the years, above all I would have to say I appreciate his enthusiasm for pursuing unconventional, often risky, and at times even absurd research and design directions. Thank you Eric for encouraging and supporting me along the less conventional routes.

The remaining members of my thesis committee have also played important roles for which I am grateful. Throughout my entire time at CMU, Jodi Forlizzi has been a constant source of encouragement and inspiration. I have been incredibly fortunate to learn design research from one its most esteemed practitioners. For bringing his engineering perspective to bear on my work, and for offering me unique insight into the thoughts of a brilliant young researcher, I thank Chris Harrison. Finally, I am indebted to Phoebe Sengers for her generous mentorship and rewarding collaborations over the years. Among Phoebe's many talents, I am perhaps most grateful for her uncanny ability to immediately find the holes in an argument and articulate them in the clearest terms possible.

My career as an HCI and design researcher properly began at Indiana University under the guidance of a remarkable group of researchers and educators. Eli Blevis, Jeffery Bardzell, Shaowen Bardzell, Erik Stolterman, Marty Siegel, and Youn-kyung Lim have each contributed in crucial ways to my development. I am especially indebted to Eli Blevis for his mentorship, his intellectual generosity, and for many late night discussions drinking beers and sipping espressos. Special thanks is owed to Eli for teaching me how to write a design research paper within the unique disciplinary configurations of HCI. I must also thank Shunying Blevis for all of the delicious homemade dumplings and fresh-baked bread. For helping me cultivate a critical sensibility, I am deeply grateful to Jeff Bardzell. It was during Jeff's Interaction Criticism course that I first learned what it meant to do critical work within a culture of design and technology. The encouragement and training I received while working with Jeff and Shaowen Bardzell profoundly impacted my academic career,

Table of Contents

Chapter 1

Introduction

Since the early 2000s there has been a rise of alternative and oppositional design work within the fields of Design and Human-Computer Interaction (HCI). This work has exemplified newly articulated functions of design, including provocatively speculating about alternative futures, questioning the status quo, and debating political issues. Alternative and oppositional design work has been presented by designers, artists, and scholars under various names: critical design,[1] design fiction,[2] adversarial design,[3] reflective design,[4] ludic design,[5] speculative design,[6]... At this moment the list continues to grow while examples of such work proliferate. This design work has demonstrated the potential of unconventional functions of design that pivot around the themes of generating alternatives and creating political, cultural, and social opposition. While alternative and oppositional designs have exhibited distinctly artistic and critical orientations, they have resisted the exclusive label of either Art or Critique. Instead alternative and oppositional designs often maintain a primary affiliation with the traditions of Design. Alternative and oppositional design work has also resisted a single all-encompassing term or definition in favor of a lengthy and evolving list of labels and banners. Given the contingent and exploratory nature of this work, perhaps the resistance toward institutionalization is all for the better. Resisting codification certainly aligns with the ethos of much of this design work. Yet pragmatically a term is needed here for referencing the range of conceptual framings and specific examples that form the subject and context of this dissertation.

The variegated works that I am labeling with the phrase alternative and oppositional designs

---

[1] Critical design was introduced in Dunne, *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design* (originally published as Dunne's PhD dissertation, "Hertzian Tales: An Investigation into the Critical and Aesthetic Potential of the Electronic Product as a Post-Optimal Object") and subsequently elaborated upon in Dunne and Raby, *Design Noir: The Secret Life of Electronic Objects*.

[2] See, for example, Bleecker, "Design Fiction: A Short Essay on Design, Science, Fact and Fiction."

[3] See DiSalvo, *Adversarial Design*.

[4] See Sengers et al., "Reflective Design."

[5] See Gaver et al., "The Drift Table: Designing for Ludic Engagement."

[6] See, for example, Auger, "Why Robot?: Speculative Design, The Domestication of Technology and the Considered Future;" Lukens and DiSalvo, "Speculative Design and Technological Fluency;" and Dunne and Raby, *Speculative Everything: Design, Fiction, and Social Dreaming*.

exhibit several thematic features. One is a commitment to the generation of design alternatives. A commitment to design alternatives is also a tendency toward design divergence. Divergence productively contrasts with convergence, that other necessary force in any design process. A second feature is the challenging of conventions and an oftentimes overtly oppositional stance. Alternative and oppositional designs range from the mildly alternative to the radically oppositional. Alternative and oppositional designs thus suggest an encompassing spectrum—but one that is nonetheless an alternative to if not in direct opposition toward conventional design practices and outcomes.

A third feature of this unconventional design work is that it tends to operate within academia and adjacent artistic and intellectual contexts. The rise of alternative and oppositional designs follows in the wake of an expansion of design beyond a narrow set of professions into the comparatively nascent fields of design research, design studies, research through design, and Design as a discipline. Following this introduction, chapter 2 situates the rise of alternative and oppositional designs as a response to sentiments of discontent voiced within the traditions of Design (design is harmful in its excess and design is not critical enough), Art (art is not real enough), and humanities-based Critique (critique is too critical: it is not affirmative enough). Situating alternative and opposition design in relation to the traditions of Art and humanities-based Critique is a useful device for understanding why they have arisen and what gaps they are working to fill.

A fourth feature is an expansion of traditional notions of use, user, usefulness, usability, and stakeholder. Agonistic debate, complicated pleasure, and ludic engagement are a few of the alternative and oppositional design functions that prior work has articulated and exemplified.[7] The users of such functions might include an exhibition goer, a publication reader, a workshop attendee, a research study participant, or an academic researcher. Oftentimes multiple user groups are making use of an alternative and oppositional design. The overdetermination of an "end user" can be advantageous for designs whose very functionality depends on resisting reducing to a conventional design. Alternative and oppositional designs also expand the traditional notion of the ultimately desired end product of design. As design research artifacts, the outcomes of alternative and oppositional design might consist of images or prototypes of technologies that have not been fully actualized. Moreover the design intention may be to never actualize them. Within the very nascent traditions of speculative design and design fiction, oftentimes it is impossible to actualize the designs because they rely upon technologies or

---

[7] On agonism, see DiSalvo, *Adversarial Design*. On complicated pleasure, see Dunne and Raby, *Design Noir*, 63. Dunne and Raby attribute this phrase to Martin Amis. On ludic engagement, see Gaver et al., "The Drift Table: Designing for Ludic Engagement."

contexts that have not yet arrived. All of this resists what is conventionally understood in the design disciplines as an end use of an end product by an end user.

Thesis and Contributions

This thesis argues that there is a body of unconventional designs that become legible when held together by themes of oppositionality and alternatives, and operating throughout these designs is a basic technique that I refer to as design resistance. This thesis presents two primary contributions. The first contribution this thesis makes is to isolate design resistance as a technique at work across a range of alternative and oppositional designs. Specifically I articulate how design resistance works in an often counterintuitive and sometimes intentionally frustrating manner as a working by not quite working. Conventionally good designs just plain work. They are nonresistantly embodied and embedded within everyday life and ordinary routines. Resistant designs work with but also against conventional use and what I refer to as the conventional trajectory of design. Resistant designs offer embodied and embedded use, but at the same time they offer some degree of resistance towards this use. Resistant designs offer resistance towards use in order to function alternatively and oppositionally. The affective and intellectual tensions that resistance creates in use—actual or imagined, and always to some extent both—affords a range of alternative and oppositional functions: critique, speculation, agonism, reflection, etc.

The second contribution of this thesis is to extend and refine the technique of design resistance through two design case studies. Chapter 4 explores new possibilities in designing digital limitations. Digital limitations is presented as a design space that is highly motivated in theoretical and critical writings yet is under-explored in design. Digital limitations is here explored through the design of counterfunctional devices. Counterfunctional devices are technologies that counter ordinary and expected functionality in order to create new functionality: counterfunctionality. An array of counterfunctional camera variants are presented to exemplify digital limitations as a design space and articulate techniques and tactics for designing digital limitations. Chapter 5 explores new ways of materializing electrical energy in provocative and engaging ways. While the design cases are both grounded in and embody critiques of dominant research and design approaches, the design cases presented here exhibit relatively mild oppositional stances. Materializing energy is presented as an alternative design approach for sustainable design and HCI. While the design cases in chapter 5 offer resistance, their resistance is primarily intended to provoke and inspire designers and researchers in ways that can be translated and transitioned into less resistant, more conventional technologies.

Uses and Audiences of These Contributions

This thesis has been written primarily for an audience of design- and critically-oriented researchers and practitioners working within or adjacent to the fields of Design and HCI. Yet any researcher interested in incorporating design into their practice may find use of this thesis. The two primary contributions of this thesis serve several functions for the HCI community specifically. First, this thesis offer tools for design researchers and critics to help explain and position alternative and oppositional design work, especially to broader HCI and design audiences. The concepts and interpreted examples have been designed as tools for the designer to reflect upon, explain, and position their work. For the HCI audience with limited design expertise, this thesis contributes to the project of helping demystify the techniques and functions at work in alternative and oppositional designs.[8]

Second, this thesis contributes to and helps give definition to a more general project of the development and refinement of techniques for alternative and oppositional designs. For the designer and researcher with interest and expertise in doing alternative and oppositional design, resistance is offered as a technique to be developed and refined, extended into other domains and concerns, and realized in the form of new design works. For the designer and researcher with less expertise or interest in alternative and oppositional design, this work helps to explain design processes and techniques that can then be applied and extended to any HCI project that involves designing digital technologies, including those of a more conventional orientation.

Finally, while it is not a central concern of this thesis, the contributions presented here may aid in the project of critiquing and identifying limits to alternative and oppositional designs. While the focus of this work is on affirming alternative and oppositional design work, this thesis is also actively working to surface and invite critique. Critique does, after all, require subjects or examples. As philosopher and political theorist Jane Bennet puts it, "we need both critique and positive formulations of alternatives, alternatives that will themselves become the objects of later critique and reform."[9] This is a call that alternative and oppositional designs are well positioned to respond to.

---

[8] For the non-design expert, the concepts and case studies help to render alternative and oppositional design work more legible and accessible. However it must be clarified that the approach taken here is not to translate alternative and oppositional design work into the most easily digested form for the general HCI audience. One of the arguments that this thesis will slowly unfold is that some of the most valuable aspects of alternative and oppositional designs are those that resistantly evade clear verbal articulation and instrumental goals.

[9] Bennet, *Vibrant Matter: A Political Ecology of Things*, xv.

The Subtle Shift from Design Methods to Design Techniques

Methods have been a mainstay of Design since the Design Methods Movement and the formalization of Design Research in the 1960s. This thesis is making a methodological contribution which is to articulate how resistance operates and in turn how it can continue to be developed, refined, and applied. From this point on, however, I will use the term technique rather than method. Dictionaries similarly describe methods and techniques as ways of accomplishing or achieving something.[10] The term method and its historical uses in Design and HCI largely emphasize systematic and established procedures. The Design Methods Movement grew out of a desire to "scientize design" by establishing systematic and highly prescriptive methods.[11] Methods sound scientific. Science has, after all, been branded with a method rather than a technique.

Technique, on the other hand, is often associated with artistic and craft practices. Technique connotes practical skill and ability as well as performance and execution. Technique also serves as a broad definition of technology.[12] Technologies are selected and used, but they are also modified and combined with other technologies to suit the task at hand. Techniques are tools, and tools require skilled use. There are many different ways to skillfully use a tool. The possible uses of a tool include those that have yet to be demonstrated or articulated. Technique not only acknowledges this fact but also celebrates and invites adaptation and even unconventional use.

The subject of this thesis, design resistance, demands a shift from design methods to design techniques. Design methods too often exhibit an apply-use-repeat logic in which the goal is to instrumentally produce reliably expected design outcomes. Under this logic, the purpose of a well-designed design method to allow practicing designers to systematically produce better conventional products. In this sense design methods are themselves conventional designs emerging from a conventional design trajectory. Yet resistant designs resist the logic of the conventional design trajectory (section 3.1). An instrumental apply-use-repeat logic runs counter to how and why alternative and oppositional designs resistantly operate. Alternative and oppositional designs resist clear utilitarian functionality, and the techniques at work in

---

[10] The OED offers the following definitions. Method: "More generally: a way of doing anything, esp. according to a defined and regular plan; a mode of procedure in any activity, business, etc." Technique: "The formal or practical aspect of any art, occupation, or field; manner of execution or performance with regard to this. Also more generally: way of doing something."

[11] Key publications marking the Design Methods movement are Christopher Jones' *Design Methods: Seeds of Human Futures* and Herbert Simon's *The Sciences of the Artificial*.

[12] See, for example, Mitcham, "Types of Technology," 230-231.

resistant designs similarly resist codification or straightforward application. They resist being packaged up as step-by-step recipes. The subtle shift to technique offers an alternative to the apply-use-repeat logic of method. In this sense, technique is a resistant method: It works to guide and inspire new designs, and it does this by not quite working like a conventional apply-use-repeat design method.

Design and Philosophy as Integrated Practice

The general approach I take throughout this dissertation involves doing design and doing philosophy as a sort of integrated practice. In the case studies presented in chapters 4 and 5, the designerly side of this practice tends to dominate. In these chapters many readers will recognize the work as belonging to an emerging tradition of research through design.[13] In chapter 3 philosophical inquiry leads the way. My approach for analyzing alternative and oppositional designs and isolating their techniques of design resistance is rooted in epistemological traditions of the humanities and the arts, rather than the scientific and engineering disciplines that undergird certain areas of design research such as the design methods tradition.[14] My use of

---

[13] Research through design was introduced by Christopher Frayling in a 1993 in "Research in Art and Design," a publication of the Royal College of Art where Frayling was teaching at the time. Frayling's idea was that design can lead research rather than serving another established research tradition. Frayling describes such a design-led research practice as one in which " the end product is an artefact – where the thinking is, so to speak, embodied in the artefact, where the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual or iconic or imagistic communication" (5). This idea was picked up in HCI by John Zimmerman, Jodi Forlizzi and Shelley Evenson at Carnegie Mellon's Human-Computer Interaction Institute and School of Design. In "Research through Design as a Method for Interaction Design Research," Zimmerman et al. build on Frayling's work as well as Nigel Cross' claim that "design knowledge resides in products themselves." (Cross, "Design Research: A Disciplined Conversation," 6.) The key idea in Zimmerman, Forlizzi, and Evenson's paper is that research through design is an inquiry process that produces knowledge through the practice or activity of designing. The concept was revisited and revised a few years later by Zimmerman and Forlizzi along with Erik Stolterman in "An Analysis and Critique of Research Through Design: Towards a Formalization of a Research Approach." Zimmerman, Stolterman and Forlizzi write: "Since [research through design] is an inquiry process revolving around the making of a product, service, environment, or system, the knowledge gained can be implicit; residing almost entirely within the resulting artifact" (10). The concept and practice of research through design has continued to develop since. Bill Gaver recently cautioned against the urge to formalize research through design: "the design research community should be wary of impulses towards convergence and standardisation, and instead take pride in its aptitude for exploring and speculating, particularising and diversifying, and - especially - its ability to manifest the results in the form of new, conceptually rich artefacts" (Gaver, "What Should We Expect from Research Through Design?," 937). Koskinen, Zimmerman, Binder, Redström, and Wensveen have proposed constructive design research as an alternative to the notion of research through design: "we prefer to talk about 'constructive design research' [rather than 'research through design'], which refers to design research in which construction—be it product, system, space, or media— takes center place and becomes the key means in constructing knowledge" (Koskinen et al., *Design Research Through Practice: From the Lab, Field, and Showroom*, 5).

[14] A key publication that helped establish a design methods tradition seeking to emulate the rigor of the sciences was Herbert Simon's *Sciences of the Artificial* (1969). For Simon the ultimate goal of applying systematic and scientific thinking to design was the development of a "a science of design," "a body of intellectually tough, analytic, partly formalizable, partly empirical, teachable doctrine about the design process" (14). In *Sciences of the*

philosophy is influenced by prior works of philosophically-inflected design research, which some have framed as design philosophy.[15]

Throughout this dissertation but particularly in chapter 3 (Design Techniques of Resistance), I draw heavily on certain areas of philosophical thought concerned with materiality, technology, art, and design. I adapt certain philosophical concepts along with the modes of thinking used to generate them. Yet to the extent that what I am doing may be considered philosophy, it is designerly rather than philosophical concerns and sensibilities that ultimately guide the inquiry. It is not basic philosophical questions concerning knowledge or existence, for example, that motivate my inquiry. Rather it is a basic question of design technique: *How are alternative and oppositional designs operating?* Technique, even when approached theoretically, is at its core a practical matter.

While it is fair to say that the manner in which I formulate and engage with the question of technique is quite theoretical, the role here of theory is to generate concepts that may be of use to designers, critics, and, by extension, all of the other users who interact with and experience alternative and oppositional designs. It matters less whether the concepts of design resistance that I present in chapter 3 are true or valid (particularly as judged from the perspective of the philosophical traditions that helped to generate them) than the degree to which the concepts hold *generative potential* for the practices of design, production, use, critique, and appreciation. My value proposition is that approaching the matter of design technique philosophically, but fused with and directed toward designerly practices, can yield insights that serve to inform and inspire practices of designing, using, and judging the sorts of works that I am calling alternative and oppositional designs. More simply: *Philosophy can be very useful for alternative and oppositional design.*

Determining how well I deliver on this promise requires engaging with the concepts introduced in chapter 3 and then extended through the design cases presented in chapters 4 and 5. But even

---

Artificial, Simon proposed a "curriculum in design", which would allow design to "take its place by the side of natural science in the whole engineering curriculum"(134). Simon's vision of a science of a design lies within an entirely different disciplinary tradition from the arts-inflected origins of formal design education exemplified by the 1920s Bauhaus and 1960s Ulm schools of design.

[15] The journal *Design Philosophy Papers* perhaps most clearly gives definition to design philosophy as a field of study. Other scholarly works of philosophically-inflected design research include Winograd and Flores, *Computers and Cognition: A New Foundation for Design*; Redström, "Form-Acts: A critique of conceptual cores;" Redström, "On Technology as a Material in Design;" Hallnäs and Redström, "From use to presence: on the expressions and aesthetics of everyday computational things;" Mazé and Redström, "Form and the Computational Object;" Pierce and Paulos, "A Phenomenology of Human-Electricity Relations," Verbeek, *What Things Do: Philosophical Reflection on Technology, Agency, and Design*; Flusser, *Shape of Things: A Philosophy of Design*; Willis, "Ontological Designing;"and Fry, *Design Philosophy: An Introduction to Defuturing*.

prior to this there is intuitively a sense that philosophical thought is well suited to the task of grasping alternate and oppositional design work which is so clearly in resonance with the traditions of art and humanities-based critique. Indeed, design practices that are self-described in terms of critique, speculation, and reflection already appear deeply invested in thinking and questioning both as designerly processes and functions of design outcomes.

Working with and against the Pull of the Digital

Most of the examples in this thesis emphasize digital and interactive technologies. Why does digital technology appear to feature so prominently in the works of designers, artists, and scholars that engage with alternative and oppositional designs? In setting the stage for his scholarly discussions of adversarial design, Carl DiSalvo offers three reasons for focusing on computational examples.[16] First, there is an affinity between design and new technologies. Second, computation is a lively contemporary technology. As DiSalvo reminds us, the mechanical automated machine was the dominant technology at the beginning of the twentieth century, during which time the Constructivists and those at the Bauhaus prefigured what we know today as contemporary design.[17] Today computation is the dominant technology. Third, DiSalvo argues along with others that computation deserves a close reading so as to develop a medium particularity in scholarly accounts of design.[18] Anthony Dunne and Fiona Raby similarly motivate their project of developing a critical design practice and perspective by drawing attention to under-explored design possibilities in the electronic medium. In particular, Dunne and Raby express their dissatisfaction with the lack of a poetic dimension in electronic technologies. Bill Gaver et al. similarly challenge the utilitarian focus of many computational technologies and instead propose that designers explore ludic possibilities of computational technology.[19]

Drawing together these explanations and justifications for the emphasis on digital technology, I want to assert another reason motivating the emphasis on digital and interactive technologies throughout many alternative and oppositions designs: The pull of digital potential and possibility is compelling. Whether a critical opponent of technology or an enthusiastic technocrat, it seems as though we are all attracted to shiny new technological gadgets. This is less a celebratory or cynical statement than a factual one marking the contemporary historical and cultural

---

[16] DiSalvo, *Adversarial Design*, 21.

[17] DiSalvo, *Adversarial Design*, 22.

[18] DiSalvo, *Adversarial Design*, 21-23.

[19] See Gaver et al., "The Drift Table."

climate surrounding the rise of alternative and oppositional designs. *A major pull of digital technology for alternative and oppositional designers are the possibilities of diverting the pull of digital technology in new directions and competing on the same digital grounds as dominant design and technology.*

Chapter 2

Alternative and Oppositional Designs

This chapter reviews a collection of unconventional design work in order to form a base of approaches, concepts, and examples for articulating design techniques of resistance. The themes of alternatives and oppositionality will be used to hold together this body of unconventional design work. While an historical and critical review of the rise of alternative and oppositional designs is outside the scope of this dissertation, these unconventional forms and functions of design may be instructively read as a response to sentiments of discontent expressed within the comparatively well-established traditions of Design, Art, and humanities-based Critique. Contextualizing alternative and oppositional designs as a response to these sentiments of discontent is a useful starting point for understanding the unique contributions they offer and the gaps between the traditions of Design, Art, and Critique that alternative and oppositional designs are working to fill.

The rise of alternative and oppositional designs is clearly represented by a growing list of terms: critical design, speculative design, design fiction, adversarial design, contestational design, reflective design, design for debate, ludic design, and more. These terms have been introduced in scholarly writings and design manifestos since the early 2000s as means of curating examples, isolating thematics and tactics, and branding and promoting the work of practitioners and institutions. This variegated and evolving set of terms and labels have thus far resisted collapsing into any one among them or rallying around a new, all-inclusive name.[1] It is worth giving pause to this observation to ask if this resistance toward institutionalization and codification is in fact a positive characteristic of what I am here calling alternative and oppositional designs. If so, the next question to ask is what are the problematics of my own naming.[2]

But setting aside for now the benefits of contingent names and transitory labels, the term alternative and oppositional designs has several crucial functions to serve here in the context of

---

[1] At this moment, however, strong contenders for such a label are critical design, speculative design, and their conjunction, critical and speculative design (SCD).

[2] There is a related concern with methodological over-formalization to attend to as well. For example, Gaver cautions the design research community in HCI to "be wary of impulses towards convergence and standardisation, and instead take pride in its aptitude for exploring and speculating, particularising and diversifying, and - especially - its ability to manifest the results in the form of new, conceptually rich artefacts." Gaver, "What Should We Expect From Research Through Design?," 937.

this dissertation. First, a foundation of thematically cohesive yet diverse examples provides a basis for a variety of theoretical, critical, and methodological projects. The specific project of this dissertation is to articulate technique at work across a diverse range of unconventional design examples. The general structure of this project is to focus on the basic question of how certain designs are operating while suspending immediate concern with why, or toward what ends, they are operating so. In other words: *focus initially on technique rather than function*. A solid foundation of examples whose various functions have been previously argued and generalized serves to both justify and facilitate this project.

This dissertation has converged upon design resistance as a technique operating throughout a body of evolving design work characterized by themes of alternatives and oppositionality. Another way of describing this body of work is that it collectively offers alternative and oppositional *functions*. Based on prior work, these alternative and oppositional functions have been succinctly captured with keywords including critique, speculation, agonism, reflection, and ludic engagement. A second pragmatic need then arises. A name is needed to avoid the unwieldy deployment of a continually evolving list: critical design, speculative design, design fiction, adversarial design, reflective design, interrogative design, design for debate…

Originally conceived as a device for bootstrapping the project of articulating design techniques of resistance, the term alternative and oppositional designs—the bootstraps themselves—may have use that extends beyond this dissertation. On the other hand, the very techniques of design resistance employed by alternative and oppositional designs suggest that the power of these designs lies partly in their ability to evade institutionalization and codification.[3]

This chapter begins by contextualizing the rise of alternative and oppositional designs within sentiments of discontent voiced within the traditions of Design, Art, and humanities-based Critique. Prominent areas of alternative and oppositional design work are then reviewed. This is followed by a brief discussion of nascent criticisms of the works reviewed, particularly critical and speculative design. A focused discussion of the rise of alternative and oppositional designs within HCI follows, demonstrating the uptake of design work originating outside of HCI along with the development of novel alternative and oppositional design approaches, methods and techniques, and original design works within HCI.

---

[3] The mildly unwieldy term alternative and oppositional designs may offer its own moderate resistance toward uptake. Here I have deliberately avoided introducing an acronym such as A&O, and instead resorted to the cumbersome approach of spelling it out each and every time. I have also rarely deviated from the using the plural form as a singular term. Writing out alternative and oppositional designs—plural—emphasizes that the term coalesces not only a range of examples, but a range of already established terms for naming sets of examples: critical design, speculative design, adversarial design, reflective design, etc.

2.1 Discontents with Design, Art, and Critique

Designers are often celebrated as agents of positive change. Yet even among its practitioners and proponents, a sentiment is often voiced that design has reached a point of excess: too often design is not merely superfluous, it is harmful. As design theorists Nelson and Stolterman succinctly observe, "Design has done great service for humanity, as well as great harm."[4] While this harm is often acknowledged, the acknowledgment is also typically an afterthought. A notable exception is the recently initiated online curation experiment and companion publication Design and Violence.[5] Antonelli et al. foreground the harmful side of design that is too often neglected: "Design has a history of violence. It can be an act of creative destruction and a double-edged sword, surprising us with consequences intended or unintended. Yet professional discourse has been dominated by voices that only trumpet design's commercial and aesthetic successes."[6] These words echo a sentiment that can be traced back at least to Victor Papanek's famously polemic declaration in 1974 that "There are few professions more harmful than industrial design, but only a very few of them."[7]

A few prominent themes of critique carrying this sentiment stand out in design discourse. One is environmental critique. Many have drawn attention to design's role in both wittingly and unwittingly committing violence toward people, environments, and our shared collective future.[8] A second prominent theme is marxist and feminist oriented critiques of design and consumer culture. Design studies scholar Judy Attfield, for example, argues "Feminist practice in design, history and critique offers a point at which a criterion can be constructed which doesn't refer everything back to market forces or abstract aesthetics."[9] Embodying marxist critiques of capitalism, designer and design critic John Thackara has asserted that "because product design is thoroughly integrated in capitalist production, it is bereft of any independent critical tradition on which to base an alternative."[10]

---

[4] Nelson and Stolterman, *The Design Way: Intentional Change in an Unpredictable World* , 302.

[5] For the online project curated by Paola Antonelli, Jamer Hunt, Kate Carmody, and Michelle Miller Fischer, see "Design and Violence." For the print publication, see Antonelli et al, *Design and Violence*.

[6] Antonelli et al., "Design and Violence."

[7] Papanek, *Design for the Real World*, 9-10.

[8] For example, see Papanek, *The Green Imperative: Natural Design for the Real World*; Fry, *Design Futuring: Sustainability, Ethics and New Practice*; Fry, *A New Design Philosophy: An Introduction to Defuturing*; McDonough and Braungart, *Cradle to Cradle: Remaking the Way We Make Things*; Manzini and Vezzoli, "A Strategic Design Approach to Sustainable Product Service Systems."

[9] Attfield, "FORM/female FOLLOWS FUNCTION/male: Feminist Critiques of Design," in Clark and Brody, *Design Studies: A Reader*, 52.

[10] Thackara, "Beyond the Object in Design," in *Design After Modernism*, 21.

The sentiments that design is harmful in its excess and is not critical enough can be found among a diversity of alternative and oppositional designs. Alternative and oppositional designs offer a response to discontents with design and, more importantly, they demonstrate practical routes forward that involve designing, producing, and presenting things that are other than or in addition to verbal criticism or commentary.

The rise of alternative and oppositional designs connects with sentiments of discontents voiced within two other areas of practice and scholarship adjacent to design: the arts and humanities. Paralleling discontents within design, two sentiments of discontent have been prominently voiced within the arts and humanities, namely that humanities-based critique is too critical and not affirmative enough, and that conventional art practices are not social enough, collaborative enough, or real enough.

Critique has long been a mainstay of the humanities. But critique has a tendency, an obligation even, to turn inward on itself. A concern with critique, voiced by some of its own practitioners, is that critique tends to become mired in its own argumentation, too often failing to rise out to affirm or create something positive. The frustration is that critique too easily turns into endless critiques and a perpetual series of philosophical one-ups.[11] Political theorist and philosopher Jane Bennet captures this sentiment while suggesting a way forward, asserting that "ethical political action on the part of humans seems to require not only a vigilant critique of existing institutions but also positive, even utopian alternatives. ... we need both critique and positive formulations of alternatives, alternatives that will themselves become the objects of later critique and reform."[12] The production of such alternatives is a crucial way of understanding the work that alternative and oppositional designs are doing—or at least experimenting with and aspiring to do.

Within the traditions of Art similar concerns have recently surfaced over the role that art works and artists can play in affirming positive change. This sentiment is most apparent in the recent movements of relational art[13] and social practice[14] rising to prominence in the 1990s.[15] These

---

[11] See, for example, Latour, "Has Critique Run Out of Steam."

[12] Bennet, *Vibrant Matter*, xv.

[13] For one of the first detailed accounts, see Bourriaud, *Relational Aesthetics*.

[14] For a curation of social practice art works, see the edited volume by Thompson, *Living as Form: Socially Engaged Art from 1991-2011*. For a critical, theoretical, and historical review, see Bishop, *Artificial Hells: Participatory Art and the Politics of Spectatorship*. For a critical response to an earlier essay by Bishop, see artist Liam Gillick's "Contingent Factors: A Response to Claire Bishop's 'Antagonism and Relational Aesthetics.'"

two related movements in the Arts represent a shift toward more social and participatory works which often challenge, from within or from without, the traditional sites of art galleries and art markets. The underlying sentiment motivating this social, collaborative, and relational turn in art practice and discourse is encapsulated in a quote attributed to artist Dan Graham which sets the scene of Claire Bishop's historical examination and critique of participatory art: "All artists are alike. They dream of doing something that's more social, more collaborative, and more real than art."[16]

While relational and participatory art is celebrated by many practitioners, theorists, and critics as more social, collaborative, and real than traditional forms and modes of art, Bishop critically observes how art that aspires to be other than art nonetheless ultimately maintains itself as Art: "The point of comparison and reference for participatory projects always returns to contemporary art, despite the fact that they are perceived to be worthwhile precisely because they are non-artistic. The aspiration is always to move beyond art, but never to the point of comparison with comparable projects in the social domain.[17] Alternative and oppositional designs suggest a way of sidestepping this problem: start and end with Design, rather than Art.

Design appears uniquely capable of practically and materially responding to concerns that critique is not affirmative enough and art is not real or social enough. Design is more affirmative and positive than critique because design proposes, plans, and often directly leads to the production of real, social, and material everyday things. At the same time, the traditions of art and critique offer techniques and perspectives to aid the traditions of Design in addressing concerns that it is too affirmative and at times unwittingly harmful. This suggests another sentiment explaining the rise of alternative and oppositional design: *There is a need and desire for design that is more artistic, more critical, and more philosophical*. Alternative and oppositional designs appear to be working to fill this need for design that is more like art, critique, theory, and philosophy.

2.2 Alternative and Oppositional Designs

This section reviews key terms, writings, and design examples that exhibit alternative and oppositional orientations. The term alternative and oppositional designs isolates two broad

---

[15] These movements also happen to coincide with, although perhaps slightly predate, the rise of alternative and oppositional designs.

[16] Bishop, *Artificial Hells*, 1.

[17] Bishop, *Artificial Hells*, 19.

themes running throughout the works and writings reviewed here. The first is a commitment to design alternatives. A commitment to alternatives is simultaneously a tendency toward design divergence and the exploration of possibilities. The works reviewed here collectively exemplify the notion of designs that keep designing.[18] Presenting design alternatives is a way to defer a definitive final product, solution, or use. Design alternatives and divergence may thus be offered as a unique sort of design outcome, where there is something of an unfinished quality and intention evident in the "final" outcome. The second theme running throughout these designs is an oppositional stance toward conventions, hegemony, and the status quo. The theme of oppositionality emphasizes overt questioning, contestation, critique, and dissent. The oppositional orientation of the works reviewed here—which is more readily apparent in some than others—exemplify the notion of designing against design. The themes of design alternatives and oppositionality will be more fully elaborated at the conclusion of this section.

The alternative and oppositional design works that will be reviewed below fall within a period from the late-1990's to present day. While what follows is not an historical review, it is worth noting that the works that will be discussed clearly take inspiration from avant-garde and conceptual art and design practices dating back at least 100 years.[19] This review begins with the introduction of critical design in the late 1990s.

Critical Design (Dunne and Raby)

Among the terms reviewed here, critical design has perhaps been the most widely popularized, discussed, and critiqued. The term critical design was introduced by Anthony Dunne in

[18] My use of this phrase does not necessarily rely upon the attribution of agency to the non-human outcomes of design. I thus mean this phrase differently, but not necessarily in conflict with, Anne Marie Willis' understanding of "ontological designing," the notion that "we design our world, while our world acts back on us and designs us." Willis, "Ontological Designing," 70. Similarly my use of the phrase "designs that keeps designing" differs here from Fry's three-part definition of design as consisting of "the designed object," "the design agency," and the "design in process, which is the on-going designing that is the agency of the designed object as it functions or dysfunctions." Fry, *Design Philosophy*, 6.

[19] A variety of art and design works stand out as clear precursors to the work reviewed here. Notable examples aligned with the tradition of product design include the Italian Radical Design Movement of the 1960s (also known as anti-design), the Dutch conceptual design company Droog (established in 1993), Ron Arad's conceptual furniture design such as the Rover Chair (1981), the pop-art inspired postmodern furniture of the Memphis design group of the 1980s, and Krystof Wodiczko's interrogative design practice. Similar movements and figures within graphic design and architecture include the works of critical graphic designer Jan Van Toorn and the conceptual and experimental architectural designs of Archigram, Superstudio, and Peter Eisenman. Dating back even further, the origins of contemporary alternative and oppositional designs exhibit clear affinities with avant-garde artistic practices, notably Italian Futurism, Dada, the Situationist International, and conceptual art's beginnings with Duchamp's readymades. Alternative and oppositional designs thus exhibits historical origins overlapping with the rise of social practice and participatory art in the 1990s. For a history of the rise of participatory art, see Bishop, *Artificial Hells*.

Hertzian Tales (1997)[20] and subsequently by Dunne and Raby in *Design Noir* (2002).[21] The term has since attained a high level of visibility within critically-oriented design research and HCI. Perhaps the most prominent feature of critical design as described by Dunne and Raby is that it emphasizes designing things that facilitate questioning and challenging the status quo. In *Design Noir*, Dunne and Raby describe critical design as "design that asks carefully crafted questions and makes us think."[22] The emphasis on questioning and thinking aligns critical design with artistic and intellectual traditions.

A second key feature of Dunne and Raby's critical design is that it is explicitly set in opposition to industry, the market, and conventional instrumentally focused design practice. Critical design thus asserts a critique of design itself. Dunne and Raby sharply contrast critical design with "affirmative design" which "reinforces the status quo:"

> Design can be described as falling into two very broad categories: affirmative design and critical design. The former reinforces how things are now, it conforms to cultural, social, technical and economic design. Most design falls into this category. The latter rejects how things are now as being the only possibility, it provides a critique of the prevailing situation through designs that embody alternative social, cultural, technical or economic values."[23]

A third feature of critical design is it that it critically eschews straightforward instrumentalism and utility. Instead Dunne and Raby's writings tend to revel in an appreciation of the experiential and aesthetic value of provocation. While Dunne and Raby repeatedly assert that critical design is not art, examples of critical design have clear affinities with artistic traditions.[24] For example, art is also well known for asking "carefully crafted questions" and for the ways in which it "makes us think"[25]—whereas conventional design practice is not.

---

[20] Dunne, "Hertzian Tales: An Investigation into the Critical and Aesthetic Potential of the Electronic Product as a Post-Optimal Object." Dunne's PhD dissertation was republished in 2008 as *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*.

[21] Dunne and Raby, *Design Noir: The Secret Life of Electronic Objects*. This critical text is unfortunately out of print. Yet in a curious turn of events, Dunne and Raby's *Design Noir* makes an electronic appearance in the critical art/design project Amazon Noir. Through the design and application of "sophisticated robot-perversion-technology," the Amazon Noir project successfully "stole [over 3000] copyrighted books from Amazon." The text, minus the images, of *Design Noir* was one of successfully stolen and distributed books, and is currently available to download at: http://www.paolocirio.net/work/amazon-noir/amazon-noir-books/AMAZON-NOIR--Design_Noir_The_Secret_Life_of_Electronic_Objects--By--A_Dunne_F_Raby_et_al_--3764365668.pdf. See, Paolo Ceriu and Alessiandro Luduovicio, "AMAZON NOIR ~ The Big Book Crime."

[22] Dunne and Raby, *Design Noir*, 58.

[23] Dunne and Raby, *Design Noir*, 58.

[24] See, Dunne and Raby, "Critical Design FAQ," question 10, "But isn't it art?"

[25] Dunne and Raby, *Design Noir*.

Dunne and Raby present many examples to illustrate critical design. These examples are drawn from a range of sources, including fine art, conceptual design, fringe culture, and Dunne and Raby's own critical design practice. Examples presented in *Hertzian Tales* include Dr. Jack Kevorkian's controversial homemade suicide machines, artist/designer Kryzystof Wodiscko's homeless vehicle project that draw attention to problems of homelessness, and Dunne's own Faraday Chair, a coffin-like chamber that protects the user from electro-magnetic radiation.[26] A similar approach of presenting a range of art and design examples is taken in *Design Noir*. An example is Ippei Matumoto's *Life Counter*, a digital device that first prompts you to enter a value for how long you expect or would like to live.[27] Once entered, the device's four displays continually count down in years, days, hours, or seconds. Examples from Dunne and Raby's own design practice include the *Nipple Chair* which gently vibrates when it detects an electro-magnetic field,[28] and the *GPS Table* which features a central digital displays that reveals the numerical GPS coordinates of the table at any given moment. Dunne and Raby marshal these examples and others to demonstrate possibilities for design to offer an experiential aesthetics of estrangement, discomfort, and disturbance.

Dunne and Raby, The Nipple Chair (left) and GPS Table (right), 2001, from the series The Placebo Project.

In *Hertzian Tales* and *Design Noir*, the critique articulated by Dunne and Raby tends to revolve around a dissatisfaction with the limited aesthetic experiences offered by industrially produced electronic products. Thus while Dunne and Raby's writings both explicitly and implicitly align

---

[26] Dunne, *Hertzian Tales*, 63,

[27] Dunne and Raby, *Design Noir*, 63.

[28] Dunne and Raby, *Design Noir*, 78.

with the traditions of critical theory in the humanities, there does not appear to be a radical or clearly argued critique at the core of their work when read from the perspective of those humanities-based traditions of critical thought.

Critical Design and Critical Theory

For many academics, the term "critical" suggests humanities-based critical theory. Dunne and Raby's writings do suggest the influence of humanities-based critical theory, particularly the influences of Frankfurt School tradition. However Dunne and Raby tend to draw on critical theory in a piecemeal fashion as a source of inspiration, as artists oftentimes do.[29] As Jeff and Shaowen Bardzell write, "although Dunne and Raby in an interview distance critical design from the Frankfurt School … their formulation of critical design has unmistakable affinities with it."[30] While the influence of the Frankfurt school may be unmistakable to critical theorists, Dunne and Raby are unmistakably not critical theorists. What Bardzell and Bardzell highlight is that there is much to critique of Dunne and Raby's writings when read from the perspective of humanities-based critique.[31]

Following Dunne and Raby's articulation of critical design, others have articulated conceptualizations of critical design constructed upon a more explicit and rigorous scholarly foundation in critical theory. Bardzell and Bardzell's project of developing a design criticism of critical designs is one such project.[32] Sengers et al.'s presentation of reflective design and DiSalvo's articulation of adversarial design are two other important scholarly projects with an explicit and rigorous grounding in critical perspectives from the humanities.

Bardzell and Bardzell's writings along with the works reviewed below help reveal that the possibilities for critical design extend far beyond Dunne and Raby's focus on the commodification of aesthetic experience in *Hertzian Tales* and *Design Noir*. Dunne and Raby write that the purpose of critical design is "to stimulate discussion and debate amongst designers, industry and the public about the aesthetic quality of our electronically mediated existence."[33] While stimu-

---

[29] See Pierce et al., "Expanding and Refining Design and Criticality in HCI," 2085-2086.

[30] Bardzell and Bardzell, "What is Critical about Critical Design?," 3298; referencing an interview by Dunne and Raby, "Dreaming Objects."

[31] For example, of Dunne's *Hertzian Tales*, Bardzell and Bardzell write: "It is a soup of ideas: dozens of challenging designs, a dizzying array of Marxist, semiotic, and architectural theorists follow on each other fast and furious, with little explication or development. It places a considerable burden on the reader to infer how all of this adds up to a critical design practice." Bardzell and Bardzell, "What is Critical about Critical Design?," 3300.

[32] Bardzell and Bardzell, "What is Critical about Critical Design?,"

[33] Dunne and Raby, *Design Noir*, 58.

lating discussion and debate is a political function that, generally speaking, coincide with notions of design agonism and adversarial design discussed later in this chapter, the subject of Dunne and Raby's discussions and debates in *Design Noir* center specifically upon a critique of the lack of a poetic dimension in the electronic products offered by industry. While the commodification of aesthetic experience is a political issue to be certain, the works discussed below engage a wider range of political issues such as surveillance, privacy, pollution, incarceration, and global warming.[34]

Post-Critical Designs

Since Dunne and Raby introduced the term critical design it has be taken up by the design research community and its meanings and uses have expanded. For example, Mazé and Redström contextualize critical design practices within the traditions of (post-)critical architecture, anti-design, and contemporary conceptual design.[35] They describe conceptual and critical design as "a kind of 'criticism from within'" that inquires into "what design is about ... how the market operates, what is considered 'good design', and how the design and development of technology typically works."[36] Critiques of critical design (which will be reviewed later) coupled with expanded notions of critical design practice have led to discussions of a post-critical design.[37]

Speculative Design

Speculative design is another term closely associated with critical design. Recently it appears that many are using the term speculative design where they might previously have used the term critical design. While "critical" and "design" likely trigger juxtaposition, the terms design and speculation have a more natural affinity. Designers are known for giving form to divergent and even outlandish ideas. As early as 2000, Gaver and Martin noted the "role of speculative design" to "serve as landmarks opening a space of design possibilities for future information appliances."[38]

Recently the term speculative design has been asserted as a more formalized design practice,

---

[34] DiSalvo, *Adversarial Design*.

[35] Mazé and Redström, "Difficult forms."

[36] Mazé and Redström, "Difficult forms," abstract.

[37] See Koskinen et al., *Design Research Through Practice: From the Lab, Field, and Showroom*, 100-103. See also, "Feature Discussion Session 4: Is There a Post-Critical Design?"

[38] Gaver and Martin, "Alternatives," 216.

approach, and perspective. The term appears to be gaining traction. This is evidenced in part by criticism that explicitly names speculative design (discussed later). Another indication of this trend is that Dunne and Raby appear to be shifting away from "critical" in favor of "speculative" with the publication of their most recent book, *Speculative Everything*.[39]

James Auger is another practitioner who has asserted the speculative design label, which he uses to frame his design and artistic practice, as well as his largely practice-based PhD thesis work.[40] Similar to Dunne and Raby's use of the term critical design, Auger uses the term speculative design as a way to position his own design work and to also extend the approach to explain other design work. In doing so speculative design is offered as general approach for others to apply and adapt. For Auger, "speculative design opens a space for alternative perspectives, critical reflection and an examination of contemporary and near-future technological application."[41]

Others have similarly emphasized both the critical and imaginative sides of speculative design. Carl DiSalvo describes speculative design as "a practice of creating imaginative projections of alternate presents and possible futures using design representations and objects. At times critical and at other times whimsical, it is a distinctive, if loose, grouping of projects."[42] DiSalvo and Lukens take less direct approach to giving definition to speculative design.[43] They broadly describe speculative design as encompassing critical design, design fiction (covered in the following section), and certain conceptual approaches in architecture and graphic design.[44] DiSalvo and Lukens then give negative definition to speculative design be describing what it is not: scenario planning, concept cars or imagineering, design experiments, and art. [45]

---

[39] Dunne and Raby, *Speculative Everything: Design, Fiction, and Social Dreaming*. See also Dunne and Raby, "Critical Design FAQ:" "Critical Design uses speculative design proposals to challenge narrow assumptions, preconceptions and givens about the role products play in everyday life."

[40] See, Auger, "Speculative Design: Crafting the Speculation;" Auger, "Living with Robots: A Speculative Design pproach;" and Auger, Why Robot? Speculative Design, the Domestication of Technology and the Considered Future.

[41] Auger, "Why robot?," 6.

[42] DiSalvo, "Spectacles and Tropes: Speculative Design and Contemporary Food Cultures," 109.

[43] Lukens and DiSalvo, "Towards a Critical Technological Fluency: The Confluence of Speculative Design and Community Technology Programs," 76-77 and passim.

[44] In "Towards a Critical Technological Fluency," Lukens and DiSalvo write "The term speculative design does not refer to a specific movement or style. Rather, speculative design encompasses practices from across a range of disciplines, including visionary or futurist forms of architecture, design fiction, and—from within the field of interaction design—critical design or design for debate" (25).

[45] Lukens and DiSalvo, "Towards a Critical Technological Fluency," 26-27.

As Auger notes, the differences between speculative design, critical design, and related terms are often subtle and based on geographical and contextual usages.[46] In order to tease out some of these subtleties, I draw out three features of speculative design that may distinguish it from critical design as the term was originally introduced by Dunne and Raby.

Removing the Semantic Critical Edge with Speculation

The semantic turn from critical to speculative has the immediate effect of backgrounding overt criticality. Speculative is a term that easily encompasses a spectrum ranging from neutral alternatives to the sharply oppositional. Reiterating DiSalvo, speculative design creates "imaginative projections of alternate presents and possible futures... At times critical and at other times whimsical." [47] While the term speculative design is effectively able to encompass both the critical and the whimsical (and a speculative design work will often exhibits both), an overall effect of the turn to the term speculation may be that the work is more readily associated with provocative yet less politically potent and explicitly critical aims.

Losing the critical semantic edge may offer a number of benefits. Presenting a design as "critical" foregrounds the dimension of criticality.[48] It prompts the user/viewer to ask questions such as, what is this design critiquing? A design that is positioned as "speculative" instead emphasizes possibility as well as a certain level of noncommitment. To speculate is to propose or conjecture in the absence of firm commitment or evidence. Its Latin etymology is to observe from a vantage point. When presented with a speculative design, the user/viewer is less likely to ask what is being critiqued. Instead speculation is more so an invitation to imagine before engaging with critical questions and concerns. Thus one of the impetuses surrounding the shift from critical to speculative design may be that the term speculative is more amenable and less threatening to a broader audience. A general public tends to be less fluent and interested in the intellectual and artistic discourses of critique. Additionally, the provocative forms that a general public tends to be more interested in and accustomed to, such as science fiction cinema, typically invite imagination and speculation in entertaining and seductive ways. Auger explains his preference for the term speculative design over critical as precisely based on this goal of reaching a broad popular audience: "As one of the core motivations of this practice [often referred to as critical design] is to shift the discussion on technology beyond the fields of experts

---

[46] Auger, "Speculative Design," 1.

[47] DiSalvo, "Spectacles and Tropes: Speculative Design and Contemporary Food Cultures," 1, emphasis added.

[48] As Auger writes, the term critical design (along with discursive design, covered later) reveals "the intentions of the object as an instigator of debate or philosophical analysis. These terms act to dislocate the object from everyday life, exposing their fictional or academic status." Auger, "Speculative Design," 2.

to a broad popular audience, the choice of 'speculative' is preferable as it suggests a direct correlation between 'here and now' and existence of the design concept."[49]

Speculative Design's Future-Orientation

A second feature of speculative design is that it tends to be explicitly future-oriented. This orientation may range from the near to distant future. However speculative designs work to maintain some level of plausibility that prevents them from becoming total fantasy. As Lukens and DiSalvo write,

> A particular characteristic of speculative design is that it tends to be future-oriented. Being future-oriented should not be mistaken as being futuristic in a fantasy-like sense, suggesting that it is "unreal" and therefore dismissible. Rather, an emphasis on the future should be read as part of a broader exploration of the space of possibilities created by technology—a space that can be imagined only by the technologically fluent.[50]

Auger similarly asserts that speculative design is future-oriented, stating that "speculative design serves two distinct purposes: first, to enable us to think about the future; second, to critique current practice."[51]
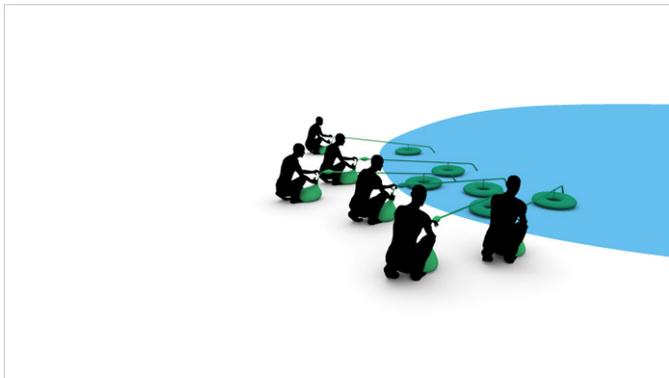
Dunne and Raby, *Designs for an Overpopulated Planet: Forgers,* 2009.

As an example, take Dunne and Raby's *Designs for an Overpopulated Planet*. The work is oriented toward a distant future scenario that may never actually arrive. Yet the scenario is also clearly oriented toward the impending predictions of global warming and other environmental catastrophes. One of the functions of *Designs for an Overpopulated Planet* is to bring a seemingly distant but possible future closer to the present day. This is accomplished with the

---

[49] Auger, "Speculative Design," 2.

[50] Lukens and DiSalvo, "Speculative Design and Technological Fluency," 27.

[51] Auger, "Speculative Design," 1.

construction of "artifacts from the future"[52] that, in this case, help individuals harvest food in a world of scarcity. It must further be noted that the audience for this design work are those currently living in conditions of relative environmental and political stability. *Designs for an Overpopulated Planet* appears to be designed primarily for those that are currently enjoying the luxuries of excess with a goal of prompting them to consider a future in which those luxuries are gone.[53] *Designs for an Overpopulated Planet* differs from Dunne and Raby's *Nipple Chair* and *GPS Table* discussed previously in that these latter works were actually embodied and embedded by users within their existing domestic and everyday lives. *Designs for an Overpopulated Planet* is presented as useful and usable as a set of embodied products only within a looming possible future.

To the extent that speculative designs are critical, their criticality tends to be directed toward exploring and communicating new possibilities. As Marina Schmidt and design research studio Metahaven (Daniel van der Velden and Vinca Kruk) write in *Uncorporate Identity*, "we believe that speculative design, operating beyond the notion of 'critical practice,' can serve as a tool of both analysis and creative action, outlining scenarios and potential approaches in what appears as an increasingly dicey world." [54]

Troika, Tool for Armchair Activists

---

[52] Dunne and Raby, *Speculative Everything*, 100.

[53] As will be discussed in section 2.3, Prado and Oliveira argue that "the vast majority of the body of work currently available in the field [of speculative and critical design] has concentrated its efforts on envisioning near futures that deal with issues that seem much more tangible to their own privileged crowd. Projects that clearly reflect the fear of losing first-world privileges — gastronomical, civil or cultural — in a bleak, dystopic future abound, while practitioners seem to be blissfully unaware (or unwilling to acknowledge, in some cases) of other realities." Prado and Oliveira, "Questioning the 'critical' in Speculative & Critical Design."

[54] Metahaven and Vishmidt, *Uncorporate Identity*, 11.

Not all speculative designs are oriented toward distant futures. DiSalvo and Lukens review works that they consider speculative design that appear to have been implemented and practically used. An example is *The Tool for Armchair Activists* by the collective Troika. This technology allows activists to affix a speaker to a lamppost in urban areas and remotely broadcast political messages. The device is particularly useful for areas that political protesters have been banned from entering, such as the 3-mile perimeter of the British Houses of Parliament.[55] While *The Tool for Armchair Activists* was actually built and used, Lukens and DiSalvo highlight its future-oriented function as a way to examine uses for telepresence and mobile media by protestors. [56]

Speculation, Emerging Technologies, and the Not-Yet Possible

A third feature of speculative design is that there tends to be an emphasis on emerging technologies and designing for scenarios that, while within the realm of possibility, may likely never actually arrive. For example, Veronica Ranner's *Biophillia: Organ Crafting* presents scenarios for artisanal production techniques for the still very nascent technologies of lab-grown meat. Thematically similar, James King's *Dressing the Meat of Tomorrow* explores aesthetic culinary forms for chefs to present lab-grown meats. Both projects design technologies for everyday users prior to but in anticipation of the arrival of the enabling technologies. They are thus able to serve as catalysts for discussion and debate prior to the maturation of these technologies and the various products, systems, and services that may be designed and constructed with and around them.

Other examples of speculative design and design fiction propose products that may actually be technically feasible but are so seemingly outlandish and complex that it appears highly unlikely they would ever actually be built—at least not at the moment. An example is James Auger and Jimmy Loizeau's *Flypaper Robotic Clock*, part of the *Carnivorous Domestic Robots* series.[57] *Flypaper Domestic Clock* is a prototype for an electronic 7-segment display clock that powers itself by harvesting flies and converting them to electrical power. The technical and economical feasibility of the clock is unclear, although Auger and Loizeau carefully contextualize its design within technical research developments in robotics and energy-harvesting. It is even less clear

---

[55] Lukens and DiSalvo, "Speculative Design and Technological Fluency," 31

[56] Lukens and DiSalvo, "Speculative Design and Technological Fluency, "28.

[57] See, Auger and Loizeau, "Carnivorous Domestic Entertainment Robots." This project is also featured in Beaver, Pennington, and Kerridge, *Material Beliefs* and in Dunne and Raby, *Speculative Everything*.

what level of demand might exist or be created for such a technology, and how it would fit within and alter domestic life. But these are precisely the sorts of questions that speculative design and design fiction hope to raise. Speculative designs tend to operate as images rather than embodied products. Because the technologies and contexts for speculative design proposals have not yet arrived, and may never arrive, they must make use of highly representational forms including photography, models, diagrams and drawings, videos, and text rather than functional embodied and embedded products and systems.

However not all of the works described as speculative designs are unbuildable. For example, Sputniko's *Menstruation Machine* is a proposal for a device that replicates the pain and bleeding that occurs during a female's menstruation cycle. While it presents some formidable engineering challenges, *Menstruation Machine* appears feasible to prototype with existing technologies.

Design Fiction

Closely associated with speculative design, design fiction is another term to recently emerge that is gaining popularity within the same communities interested in critical and speculative design.[58] Similar to speculative design, design fictions tend to be less explicitly critical (perhaps even less critical than speculative designs[59]), they tend to be future-oriented, and they tend to emphasize emerging technologies and the not-yet technically possible. However design fictions emphasize two additional features that are less salient among discussions of speculative design. First, design fiction tends to associate with the literary and cinematic genres of fiction, especially science fiction. Second, design fiction emphasizes narrative, diegesis, the suspension of disbelief, and related concepts from film and literary theory. These additional features give the impression that design fiction is a narrower genre than speculative design.[60] Both points will be briefly elaborated upon momentarily.

---

[58] As Dunne and Raby write, "Speculative design overlaps with several other merging design approaches but design fiction is probably the closest, and the terms are often used interchangeably." Dunne and Raby, *Speculative Everything*, 100.

[59] As Dunne and Raby write in *Speculative Everything*, "Another difference that separates design fictions from the kind of fictional design we are interested in is that they are rarely critical of technological progress and border on celebration rather than questioning" (100).

[60] In *Speculative Everything* Dunne and Raby write "As it is popularly understand, design fiction is a narrower genre [than speculative design" (100). In "Speculative Design" Auger argues that the "fiction" qualifier cues the user to a nonreal status of the design work: "[T]he physical object presented as a 'design fiction' may be identical to a 'speculative design' object or a 'design probe,' and so on; however, the use of the modifier gives the cultural object a substantially different value. For example, the word 'fiction' before design immediately informs the viewer that the object is not real" (1).

Near Future Laboratory, TBD Catalog. http://nearfuturelaboratory.myshopify.com/products/tbd-catalog

The term design fiction appears to have been coined by Near Future Laboratory co-founder Julian Bleecker in a presentation given in 2008 and later elaborated upon in a widely cited self-published online essay.[61] Noted science fiction writer Bruce Sterling later developed the concept in an article for the ACM interactions and elsewhere.[62] Bleecker describes his introduction of the term design fiction as a response to a presentation of an early paper draft by Paul Dourish and Genevieve Bell entitled "Resistance is Futile: Reading Science Fiction Alongside Ubiquitous Computing," which was eventually published in 2014.[63] Bleecker describes design fiction as a "conflation of design, science fact, and science fiction."[64] Design fiction is "a way of materializing ideas and speculations without the pragmatic curtailing that often happens when dead weights are fastened to the imagination."[65]

---

[61] Bleecker, "Design Fiction: A Short Essay on Design, Science, Fact and Fiction." While Bleecker has popularized the term design fiction, science fiction writer Bruce Sterling has used the term in the 2005 book publication of *Shaping Things*: "I've been writing 'design fiction' for years now. Design fiction reads a great deal like science fiction; in fact, it would never occur to a normal reader to separate the two. The core distinction is that design fiction makes more sense on the page than science fiction does. Science fiction wants to invoke the grandeur and credibility of science for its own hand-waving hocus-pocus, but but design fiction can be more practical, more hand-on. It scarifies some sense of the miraculous, but it moves much closer to the glowing heat of technosocial conflicts" (30). I located this passage based on a tip from Josh Tanenbaum, "What is Design Fiction?"

[62] See, Sterling, "Design Fiction;" Sterling, "Patently Untrue: Fleshy Defibrillators and Synchronised Baseball Are Changing the Future;" and Bosch, "Sci-Fi Writer Bruce Sterling Explains the Intriguing New Concept of Design Fiction."

[63] Bleecker, "Design Fiction" 12, referencing Dourish and Bell. See Dourish and Bell, ""Resistance is Futile": Reading Science Fiction Alongside Ubiquitous Computing."

[64] Bleecker, "Design Fiction," 6.

[65] Bleecker, "Design Fiction," 6.

An example of design fiction is the print publication *TBD Catalog*, produced by Bleeker and collaborators at the Near Future Laboratory. The fictional products offered in the catalog are oftentimes humorous, such as "Oglie: The Social Network for Your Pet," "Anti-Drone Services in the Future," "Data Enlargement Services," and "3D Food Printer Accessories." The brilliance of these proposals is that they are at once outlandish yet plausible, particularly when read alongside the Skymall product catalog which is widely known for its oftentimes gimmicky and ridiculous products.

Design Fiction and Literary/Cinematic Fiction

A distinction between speculative design and design fiction is that the latter foregrounds the association with the literary and cinematic genres of fiction, especially science fiction. Science fiction is a key reference point both for Bleecker's and Sterling's discussions of design fiction, as well as Dourish and Bell's work that served as inspiration. Bleecker writes, "Design fiction does all of the unique things that science-fiction can do as a reflective, written story telling practice."[66] For Sterling, "Science fiction 'design' ... demands some whiz-bang, whereas industrial design requires safety, utility, serviceability, cost constraints, appearance, and shelf appeal."[67] For Dunne and Raby, design fiction "has grown out of the technology industry, and as the 'fiction' part of the label references science fiction rather than general fiction, it places a strong emphasis on technological futures [because of which] design fiction is increasingly being understood as a genre of future vision video (sometimes photos but rarely stand-alone objects)."[68]

Design Fiction and Diegetic Prototypes

A second distinction between speculative design and design fiction is that the latter term emphasizes a compelling narrative and corresponding concepts from film and literary theory, most notably the concept of diegetic prototypes. Bruce Sterling has more recently offered a definition of design fiction as "the deliberate use of diegetic prototypes to suspend disbelief about change."[69] As Sterling explains, "'Diegitic' [is a concept] from film and theatre studies. A movie has a story, but it also has all the commentary, scene-setting, props, sets and gizmos to support that story. Design fiction doesn't tell stories— instead, it designs prototypes that imply

---

[66] Bleecker, "Design Fiction," 8.

[67] Sterling, "Design Fiction," 21.

[68] Dunne and Raby, *Speculative Everything*, 100.

[69] Sterling, "Patently untrue: fleshy defibrillators and synchronised baseball are changing the future."

a changed world."[70] Bleecker, referencing David Kirby's conceptual articulation of the diegetic prototype, writes "the diegetic prototype refers to the way that a science fiction film provides an opportunity for a technical consultant to speculate within the fictional reality of the film, considering their work as more than a props maker or effects artist creating appearances."[71] A key example that Kirby presents is the popular film *Minority Report*. Kirby describes how the film's special effects consultant John Underkoffler "treats his diegetic prototypes as if he were designing not only physical prototypes but also real objects that become part of 'everyday life' in the diegesis."[72] The gestural interfaces in *Minority Report*, brought to life on the big screen of cinema, have since become a mainstream cultural reference. As Kirby writes, the gestural interfaces of *Minority Report* "quickly entered into the technological imaginative vernacular and has since become a focal point for discussions about interactive technologies." [73]Although he doesn't use the term diegetic prototype, Dunne similarly notes how designs can function as props: "By abandoning the technical realism of the prototype and the visual realism of the traditional industrial design model, conceptual models in combination with other media, can refer to broader contexts of use and inhabitation. For instance, by using conceptual models as film props the viewer can be drawn into the conceptual space of the object in use rather than an appreciation of the thing in itself."[74]

While Dunne, Raby, and Auger state their preference for the term speculative design over design fiction, their writings also clearly articulate cinematic fiction as a source of inspiration and point of reference.[75] Both speculative design and design fiction evince an aspiration to be as popularly engaging as works of cinematic and literary fiction. While the genre of fiction foregrounds narrative over props, design fiction and speculative design tend to foreground the props while implying the narrative. A new genre of design that lies somewhere between product design and cinema is a seductive prospect that appears to be driving a great deal of experimental design work collected under the terms design fiction and speculative design.

---

[70] Sterling, "Patently untrue."

[71] Bleecker, "Design Fiction," 39,

[72] Kirby, "The Future is Now: Diegetic Prototypes and the Role of Popular Films in Generating Real-world Technological Development," 50.

[73] Kirby, "The Future is Now," 52.

[74] Dunne, *Hertzian Tales*, 92.

[75] See Dunne and Raby, *Speculative Everything*, 74-75, 89-90, 129-132, and passim; and Auger, "Speculative Design," 1-5 and passim.

Design Agonism, Adversarial Design, Contestational Design, and Design for Debate

As DiSalvo writes, "Since the late 1990s, there has been a proliferation of projects that examine and experiment with the capability and role of design (broadly construed) in increasing societal awareness, and motivating and enabling political action."[76] The terms design agonism, adversarial design, contestational design, and design for debate each calls attention to political functions of design. Each of these terms isolates political potentials for design to provoke and engage people in discussion and debate around issues. Dunne has introduced the term "design for debate" to highlight how design can create things that facilitate public discussion about the possible developments of science and technology research before this knowledge is translated into commercial product offerings.[77] In his PhD thesis work, Tad Hirsch describes contestational design as "a unique form of design activity whose aim is promote particular agendas in contested political arenas."[78] Binder et al. note the potentials for "controversial design things" to serve democratic functions.[79] Binder et al. note that Chantal Mouffe's concept of "agonism" is a possible frame of reference for designing things that promote democratic debate.

The most thorough treatment of design agonism to date is by Carl DiSalvo in the book *Adversarial Design*. Carl DiSalvo adopts a scholarly approach in his articulation of adversarial design, one that is markedly different from the inspirational manifesto-like writings of Dunne and Raby in *Design Noir*. DiSalvo grounds his work in Mouffe's political theory of agonism which asserts that "a commitment to contestation and dissensus [are] integral, productive, and meaningful aspects of democratic society."[80] DiSalvo describes adversarial design as "both a way of doing the work of agonism through designed things and a way of interpreting designed things in terms of their agonistic qualities;"[81] "To claim that adversarial design does the work of agonism means that designed objects can function to prompt recognition of political issues and relations, express dissensus, and enable contestational claims and arguments."[82]

---

[76] DiSalvo, "Design and the Construction of Publics," 48.

[77] Dunne, "Design for Debate."

[78] Hirsch, "Contestational Design." An example is TXTmob, "an SMS-broadcast system that I developed with an ad-hoc coalition of activists to support mass mobilizations during the 2004 Democratic and Republican" (abstract, see pages 34-66).

[79] Binder et al, *Design Things*, 187.

[80] DiSalvo, *Adversarial Design*, 12,

[81] DiSalvo, *Adversarial Design*, 12.

[82] DiSalvo, *Adversarial Design*, 12-13. DiSalvo's way of defining adversarial design with an emphasis on interpretation differs from Dunne and Raby, who tend to pitch critical design as a practice.

DiSalvo's project demonstrates how designed artifacts are capable of doing political work that pivots around contestation and debate. In contrast to speculative design proposals, many of the examples DiSalvo discusses are technically operational in a way that allows them to be used in an embodied manner within everyday practical contexts. One example used to articulate adversarial design is Mark Shepard's *CCD-Me-Not Umbrella*, a prototype for a product that allows users to disrupt and "flirt with" pervasive satellite image surveillance technologies. [83]Another example is Natalie Jeremijenko's *Feral Robotic Dogs* that were ostensibly deployed to sniff out volatile organic compounds (VOCs) in San Diego landfills. Both projects are noteworthy in their demonstrated potential to publicly engage citizens in contentious issues (surveillance and pollution). In contrast to many examples aligned with the speculative design or design fiction label, both of these projects make use of more developed technologies such as hobbyist remote control vehicles and CCD (charge-coupled device) photographic surveillance and counter-surveillance using infrared LEDs (light-emitting diodes). These examples of adversarial design exhibit a high degree of perceived technical functionality and autonomy that affords them the potentials for embodied and embedded use in everyday contexts.[84]

Tactical Media

The term tactical media has been used by scholars and artists to describe interventionist media art projects that offer political and cultural critiques of contemporary society, oftentimes by cleverly manipulating mainstream media. Geert Lovink has described tactical media as "discourse plus art equals spectacle."[85] In the book *Tactical Media*, Rita Raley emphasizes how tactical media function to "critique the dominant political and economic order" by engaging in a "micropolitics of disruption, intervention, and education."[86]

An example presented by Raley is Michael Mandiberg's *Oil Standard*, a Firefox browser extension that converts U.S. dollar sign values into the equivalent value in barrels of crude oil (market price).[87] The function of the extension is not so much to help users convert between

---

[83] See Shepard, "Sentient City Survival Kit."

[84] However, particularly in the case of Robotic Feral Dogs it is not clear to what extent these devices technically function to "'sniff out the contaminants on the [polluted] site and ... communicate the site conditions to interested community members." ("Feral Robotics Dogs"). A common technique used by tactical media artists and activities, discussed later in the section, is to manipulate the media to report events and technologies that may not have actually occurred or been created. See, for example, Raley, *Tactical Media*.

[85] Lovink, "Dark Fiber: Tracking Critical Internet Culture", 256.

[86] Raley, *Tactical Media*, 1.

[87] Raley, *Tactical Media*, 2.

dollars and oil prices, but rather to foreground oil politics.[88]

As Carl DiSalvo notes, tactical media exhibit an overtly activist political stance that contrasts with Dunne and Raby's discussions and examples of critical design.[89] While tactical media is an artistic practice that is clearly also engaged in the practice of designing and producing things,[90] its functions differ from many examples of critical design and speculative design. Tactical media, along with adversarial design, tend toward explicit political and cultural opposition that often involves intervening within the public sphere through mainstream media dissemination. While tactical media projects may present design alternatives, these alternatives overtly function to critique and disrupt the dominant political, cultural, and economic order. Tactical media are not so much neutral alternative possibilities or speculations as they are explicitly oppositional alternatives with clear targets.

Reflective Design

Phoebe Sengers and colleagues present reflective design as an approach for HCI grounded in thinking from humanities-based critical theory. Sengers et al. define critical reflection as "bringing unconscious aspects of experience to conscious awareness, thereby making them available for conscious choice."[91] This operational definition of critical reflection is a distillation of the Western tradition of critical thought post-Enlightenment as exemplified in, for example, Marxism, feminism, and psychoanalysis.[92] Sengers et al. offer a number of strategies and principles for reflective design. However there are two overarching functions that are important here as they together highlight functions that are less clearly asserted within the perspective reviewed thus far.

First, reflective designs and reflective designing function as ways to rethink "dominant metaphors."[93] Building on Phil Agre's concept of critical technical practice,[94] Sengers et al. argue that

---

[88] In discussing adversarial design, Carl DiSalvo also uses Oil Standard to exemplify how design can function to "reveal hegemony." See DiSalvo, *Adversarial Design*, 48-51.

[89] DiSalvo, *Adversarial Design*, 18.

[90] DiSalvo, *Adversarial Design*, 18.

[91] Senger et al., "Reflective Design," 50.

[92] Senger et al., "Reflective Design," 50.

[93] Sengers et al. are explicitly referencing Phil Agre's work when they describe inverting dominant metaphors. See Agre, Computation and Human Experience. Sengers et al. offer a useful summary of Agre's critical technical practice. "Briefly, CTP consists of the following moves: identifying the core metaphors of the field, noticing what, when working within those metaphors, remains marginalized, inverting the dominant metaphors to bring that margin to the center, and embodying the alternative as a new technology. Agre sees CTP as a way to solve recurring

"critical reflection on the limitations of the field's methods and metaphors can help us to see the world in a new way, identifying and weighing new technical possibilities."[95] The function of rethinking dominant metaphors is primarily useful for reflective practitioners, notably researchers working within HCI and design. In other words, reflective designs are tools that are useful for the field to critically reflect on their own practices and outcomes, and to specifically question and rethink the dominant metaphors unconsciously embodied and perpetuated.

Second, reflective design functions to engage users who are not themselves reflective HCI or design researchers in the same sorts of critically reflective practices.[96] An example presented by Sengers et al. is the *Virtual Intimate Object (VIO)*, which was designed to support intimacy among couples in long-distance relationships. The *VIO* allows a user to send their partner a simple one-bit message to convey intimacy. Interviews with actual users of systems suggested that it had successfully provoked critical reflection. For example, one user accused the researchers of "creating computer dependency and spreading and marketing it to the general public."[97]

Returning to the first function of reflective design, the *VIO* also functions as an example for HCI and design researchers to critically reflect on their own practices and values, specifically the dominant metaphors in the field. The *VIO* is presented as a tool to critically reflect on assumptions concerning scale and effectiveness when it comes to designing something as complex as intimacy. As Sengers et al. write, "[In HCI] communication devices are often expected or designed to scale in the manner of Metcalfe's Law: the more of them, the more valuable they are. What happens, however, when we build a communication device that doesn't scale? How could we even evaluate a system that claimed to transmit something as complicated to measure as intimacy?"[98]

Sengers et al.'s discussion of reflective design highlights two alternative and oppositional functions that are less pronounced in discussions of other areas previously reviewed here such as

---

technical impasses by enabling reflection on, and potentially alteration to, the core metaphors that structure a technical field" (52). For a more nuanced discussion of critical technical practice in computational design, see Sengers, Anti-Boxology: Agent Design in Cultural Context, 17-18 and passim.

[94] See Agre, *Computation and Human Experience*.

[95] Senger et al., "Reflective Design," 50.

[96] Sengers et al. write "reflective design is a set of design principles and strategies that guide designers in rethinking dominant metaphors and values and engaging users in this same critical practice." Sengers et al, "Reflective Design," 57.

[97] Senger et al., "Reflective Design," 55.

[98] Senger et al., "Reflective Design," 54.

critical design and speculative design. The first is the function of critical reflection as clearly grounded in the traditions of critical theory. The second is the double function of designing things to critically reflect on design practice, and designing things that engage non-expert users in similar critical reflections. These double functions are important because they emphasize the potential interplay of uses between two separate audiences: an audience of expert research or practitioners on the one hand, and an audience of everyday users or a general public on the other.

Discursive Design

While not as prominent as the aforementioned areas, discursive design is yet another term that has been used to describe alternative and oppositional functions of design. Tharp and Tharp describe discursive design as the "the creation of utilitarian objects/services/interactions whose primary purpose is to communicate ideas—artifacts embedded with discourse." [99] While Tharp and Tharp present discursive design as an umbrella term that encompasses critical design and possibly the other terms and examples already reviewed here, in this context the notion of discursive design is useful for highlighting yet another cut throughout the works that I am referencing with the term alternative and oppositional designs. [100]

Discursive design dovetails with a variety of writings that understand artifacts as capable of embodying or constituting knowledge, argument, or critique. A number of scholarly works have verbally articulated how works of art and design can function as alternatives to privileged verbal forms of discourse. The key idea behind research through design is that design artifacts can embody, constitute, or construct forms of design knowledge. [101] In the article "New Methodologies in Art and Design Research: The Object as Discourse," Seago and Dunne build on Fraylings notion of research through design as research in which "the end product is an artifacts" and "where the thinking is, so to speak, embodied in the artifacts." [102] Seago and Dunne offer examples of practice-based research that involves "a critique of existing approaches to production/consumption communicated through highly considered artifacts." Similarly emphasizing

---

[99] Tharp and Tharp, "Discursive Design Basics: Mode and Audience," 406-407.

[100] As an umbrella term for the alternative and oppositional designs reviewed here, the term discursive design has its problems. As I note later in Chapter 3, the total reduction of alternative and oppositional designs to verbal discourse or argumentation would be unfortunate as it ignores the non-verbal or less-verbal functions of designed things.

[101] On research through design and the production of design knowledge, see, for example, Zimmerman, Stolterman, and Forlizzi, "An Analysis and Critique of Research Through Design: Towards a Formalization of a Research Approach," 310 and passim; and Frayling, "Research in Art and Design," 15 and passim; and

[102] Frayling, "Research in Art and Design," 15.

the discursive role of less-textual productions, Rita Raley writes about tactical media works as "hybrid (we might even say 'new') forms of academic criticism." [103]

Alternative and Oppositional Functions of Design

The works covered in this section offer a range of alternative and oppositional design practices, perspectives, approaches, and outcomes. They also offer a concise set of keyworded alternative functions of design: critique, speculation, fictionalization, agonism, contestation, debate, discourse, political disruption.

The term alternative and oppositional designs isolates two broad themes evident across the works reviewed here. The first is a commitment to the production of design alternatives. These designs are committed to the generation of alternatives to conventional design as usual. They are "alternatives" in the form of "conceptual design proposals" that "embody values apart from those traditionally associated with functionality and usefulness."[104] They are critical designs that "embody alternative social, cultural, technical or economic values."[105] They offer "alternative visions to those put forward by industry" and "an alternative to how things are."[106] They are speculative designs that open "a space for alternative perspectives."[107] They offer "imaginative projections of alternate presents and possible futures using design representations and objects.[108]" They are design fictions for "working through turbulent alternatives" and "walking down strategic alternatives."[109]   They are reflective designs that "reflect alternative possibilities."[110] They "help us to see the world in a new way, identifying and weighing new technical possibilities."[111] They are adversarial designs that "offer alternatives to dominant practices and agendas."[112] Alternative designs offer divergence. They offer other possibilities. Alternative designs can operate as designs that keep designing, meaning they work to defer arriving at a possibly premature, inappropriate, or even harmful design product or solution.

---

[103] Raley, *Tactical Media*, 5.

[104] Gaver and Martin, "Alternatives: Exploring Information Appliances through Conceptual Design Proposals", 209.

[105] Dunne and Raby, *Design Noir*, 58.

[106] Dunne and Raby, *Speculative Everything*, 35.

[107] Auger, "Why Robot?," 6.

[108] DiSalvo, "Spectacles and Tropes: Speculative Design and Contemporary Food Cultures," 109.

[109] Near Future Laboratory, "Near Future Laboratory | Clarify Today, Design Tomorrow."

[110] Sengers et al., "Reflective Design", 49.

[111] Sengers et al., "Reflective Design," 50.

[112] DiSalvo, *Adversarial Design*, 115.

The second theme running throughout the unconventional designs reviewed here is oppositionality. These designs are committed to oppositional stances toward convention, hegemony, and the status quo. They are critical designs that provide "a critique of the prevailing situation."[113] They are reflective designs that help us critically reflect "on the limitations of the field's methods and metaphors"[114] They are speculative designs that function "to critique current practice."[115] They facilitate "critical reflection and an examination of contemporary and near-future technological application."[116]They are design fictions that are "contesting the status quo."[117] They are adversarial and agonistic designs that "function to prompt recognition of political issues and relations, express dissensus, and enable contestational claims and arguments."[118] They are discursive designs that "raise awareness and perhaps understanding of substantive and often debatable issues of psychological, sociological, and ideological consequence."[119] They are tactical media disruptions that "critique the dominant political and economic order" by engaging in a "micropolitics of disruption, intervention, and education."[120] They are "hybrid (we might even say 'new') forms of academic criticism."[121] Oppositional designs can operate as designing against design, meaning they work to critique, disrupt, and subvert the practices and outcomes of design—possibly even their own.

The themes of design alternatives and design oppositionality are not only useful for characterizing unconventional design work but further identify a rough spectrum through which design can operate. Collectively, alternative and oppositional designs range from the more neutrally alternative to the radically oppositional. For example, many works labeled as speculative design appear to exhibit a stronger commitment to design alternatives than to oppositionality. On the other hand, many works of adversarial design appear to exhibit a stronger commitment to oppositionality than the exploration of alternatives. While the either/or distinction is useful up until a point for understanding the functions of particular design works, design alternatives and design opposition typically work together. The generation of design alternatives can be a means

---

[113] Dunne and Raby, *Design Noir*, 58.

[114] Sengers et al., "Reflective Design," 50.

[115] Auger, "Speculative Design," 1.

[116] Auger, "Why Robot?," 6.

[117] Near Future Laboratory, "Near Future Laboratory | Clarify Today, Design Tomorrow."

[118] DiSalvo, *Adversarial Design*, 12-13.

[119] Tharp and Tharp, "Discursive Design Basics," 407.

[120] Railey, *Tactical Media*, 1.

[121] Raley, *Tactical Media*, 5.

to direct opposition, and design opposition can be a means to the generation of alternatives.

While this section has painted a largely positive picture of alternative and oppositional designs, there are reasons to critique a commitment to design alternatives and resist embracing oppositional designs as the heroic vanguard of social, cultural, and political resistance. The next section turns to consider some recent strands of critique of critical design and speculative design, many of which extend to other alternative and oppositional designs discussed here.

2.3 Critiques of Alternative and Oppositional Designs

As is often the pattern, an initial flurry of excitement gives way to a discernible momentum, a threshold at which some critical observers begin to interrogate the assumptions that enthusiastic practitioners have uncritically embodied.[122] Recently the works and practitioners associated with the terms critical design and speculative design have become the targets of sharp criticism. Speculative and Critical Design (SCD) has emerged as a named target of many of these critiques.[123] In these writings, SCD is used as a reference for works and practitioners of critical design and speculative design discussed above. In subsequent discussion I will preserve this referent. However it must be noted that these critiques, generally speaking, pertain to what I am terming alternative and oppositional designs.

The overarching critique of SCD can be summed up as an observation of SCD's failure, neglect, or inability to critique itself or to make itself accountable to its most oppositional critics. Five strands of critiques weave their way through these collective writings. The first is SCD's focus on problems of privilege. Pedro Oliviera and Luiza Prado observe that the "the vast majority of the body of work currently available in the field [of SCD] has concentrated its efforts on envisioning near futures that deal 'with issues that seem much more tangible to their own

---

[122] This is what has happened with the rise of relational art, participatory art, and social practice art. See Claire Bishop's critique of these movements in her book *Artificial Hells*.

[123] The majority of these writings have appeared as non-archival online publications, reflecting the nascency of these critiques and debates. Key writings that critique speculative and critical design include Oliveira, "Cheat Sheet for a Non (or Less) Colonialist Speculative Design;" Prado and Oliveira, "Questioning the 'critical' in Speculative & Critical Design: A rant on the blind privilege that permeates most Speculative Design projects;" DiSalvo,"Feature Discussion Session 4: Is there a Post-Critical Design?;" Thackara, J. "Republic of Salivation (Michael Burton and Michiko Nitta)," (along with lively debate the ensued in the online comments); Tonkinwise, "How We Intend to Future: Review of Anthony Dunne and Fiona Raby, Speculative Everything: Design, Fiction, and Social Dreaming;" Kiem, "When the Most Radical Thing you Can Do is Just Stop;" and Kiem, "Is a Decolonial SCD Possible?: Comments and questions in reply to Luiza Prado and Pedro Oliveira."

privileged crowd.'"[124] Speculative and critical design projects that "clearly reflect the fear of losing first-world privileges — gastronomical, civil or cultural — in a bleak, dystopic future abound, while practitioners seem to be blissfully unaware (or unwilling to acknowledge, in some cases) of other realities."[125] Oliveira and Prado continue,

> Those sleek, shiny gadgets and sentient objects and robots SCD designers are keen to portray come only to the aid of white, middle class, cisgendered heterosexual citizens. But no SCD dystopian scenario takes into account that this pervasive "technological menace" will most probably be manufactured in China, Indonesia or Bangladesh (as suggested by Ahmed Ansari in the comments section in the original post). And we cannot help but reinforce that SCD is a practice whose origins and current developments, so far, happen within colonialist countries.[126]

A key point of reference for Oliveira and Prado's observations are critical traditions within the humanities. The feminist, postcolonial, and queer theoretical lenses invented and championed by the humanities function to isolate and reveal the sorts of problems that Oliveira and Prado highlight. Recognizing the critical theoretical lenses that Oliveira and Prado bring to bear suggests that SCD practitioners whose expertise lies primarily in design and form-giving may be unequipped with the critical tools to help them surface or engage with these critiques. Specialized design critics, or else SCD practitioners with expertise in humanities-based critical methodologies and perspectives, may serve a much-needed role.[127]

The second strand of critique is a pretense of engaging a broader and less exclusive public while in actuality remaining an elitist practice. Continuing the dialogue initiated by Oliveira and Prado, Matthew Kiem writes,

> As we and many others have observed, this pretense to be 'fostering debate and discussion' has always been an idealised but delayed object of SCD, a way of justifying the production of nice looking images and gestural chatter, but never something that was taken seriously. SCD has always been grounded in liberal pluralist understanding of the political, in which the production of discourse was prioritised as a sufficient in itself, to the exclusion of decision, disagreement, and position taking.[128]

---

[124] Prado and Oliveira, "Questioning the 'critical' in Speculative & Critical Design: A rant on the blind privilege that permeates most Speculative Design projects," paragraph four.

[125] Prado and Oliveira, "Questioning the 'critical' in Speculative & Critical Design: A rant on the blind privilege that permeates most Speculative Design projects," paragraph four.

[126] Prado and Oliveira, "Questioning the 'critical' in Speculative & Critical Design: A rant on the blind privilege that permeates most Speculative Design projects," paragraph seven.

[127] For example of humanities-based criticism of SCD, see Bardzell, Bardzell, and Hansen, "Immodest Proposals: Research through Design and Knowledge."

[128] Kiem, "Is a Decolonial SCD Possibe?: Comments and questions in reply to Luiza Prado and Pedro Oliveira," paragraph six.

This second critique can be reframed as skepticism of SCD's speculative justification of its own as-yet unrealized potential to engage a broader public or those in key positions of power and influence. Doing so suggests a more lenient disposition, given the relative nascency of the speculative-critical design enterprise.

Third is a critique of recuperation: SCD at times claim to be anti-market, but in actuality its seductive forms only serve to feed into the market mentality it ostensibly confronts and resists. As Cameron Tonkinwise writes,

> Given who [Dunne and Raby] are in the field of design and design research at the moment, this book is not so "idiosyncratic," but instead a speculative recuperation of critique, a significant investment in returning criticism of market-based futures back into a source of just more market-based futures. Worse, it would seem that what is dominating one of the few spaces we have to try to renegotiate the irresistible futures bequeathed to us by non-inclusive modernist impositions, is yet another style-obsessed modernist imposition.

The concept of recuperation, introduced by Guy Debord and the Situationist International, is a phenomena in which capitalism absorbs and commodifies radical forms of cultural and political resistance. The claim that SCD is in fact a speculative recuperation of critique sits comfortably alongside critiques of relational aesthetics and social practice art.[129]

A fourth critique that has been directed at SCD is of a commitment to noncommitment and the dulling of any particular critical-oppositional edge. As Cameron Tonkinwise has argued, "It would not fit the [Dunne and Raby Critical and Speculative Design] brand—very uncool to actually commit to a particular future, and to argue forcefully for its wider desirability—but that is what we need of design right now. Not speculations that just fuel the market-as-usual, but decisive intents to constitute different futures, especially ones that seem currently impossible."[130] Tonkinwise's words suggest that a commitment to noncommitment entails a dulling of any particular critical-oppositional edge. An agonistic commitment to pluralistic contestation indeed appears as a foundation of democratic society.[131] But a pluralistic commitment to noncommitment can also work to diffuse directed dissent, as these critiques reviewed here suggest. A commitment to alternatives above any particular alternative may ultimately create politically neutralizing effects.

---

[129] See, for example, Bishop, *Artificial Hells*.

[130] Tonkinwise, "How We Intend to Future: Review of Anthony Dunne and Fiona Raby, Speculative Everything: Design, Fiction, and Social Dreaming," 187.

[131] See DiSalvo, *Adversarial Design*, referencing Chantal Mouffe's writings on agonism. See, for example, Mouffe, "Deliberative Democracy or Agonistic Pluralism."

The refusal to commit to any particular future transitions into a fifth critique. Perhaps the most damning critique of SCD is that it lacks substantiveness and perpetuates the harmful excesses of design while at its core lacking any truly radical critique. The critiques of SCD cited above followed in the wake of a lively online debate that followed from a design review by John Thackara published in the Design and Violence project mentioned previously. Thackara presents a pointed critique of a speculative design project, *The Republic of Salivation*, which envisions a future where governments have instituted strict food-rationing policies.[132] Thackara writes,

> With their knowing references to "the scientific study of nutrigenomics," and an airy promise that "new organisms will be tasked with erasing Man's destructive effects," this kind of work masquerades as radical. But in its steadfast refusal even to think about the roots of our alienation from living systems—among them, food—it belongs squarely within the neo-liberal worldview that only Man is smart enough to correct the odd mistake that He may have made.
>
> If the artists were to focus more on observable nutrient and energy flows, and less on infantile science fictions, they would discover that the roots of our food crisis lie in a bad idea that can rather easily be fixed. The bad idea involved pumping nutrients out of distant ecosystems and feeding them to cities in a one-way process. This misstep dates back a long way, to the beginnings of agriculture, but its malignant effects have accelerated under thermo-industrial capitalism.[133]

Tonkinwise's review of Dunne and Raby's Speculative Everything echoes Thackara's sentiment that speculative design is distracting us from more pressing problems and solutions.

> This is why the basis of the speculations by [Dunne and Raby] always have technoscience at their center, rather than altered social relations. Putting the focus on problems that we all will apparently face is a good way of excusing the need to deal with, if not concealing altogether, that there are problems today that not all of "Us" face, that there are people who benefit – from what is available on the market, from technoscientific advances; and then there are people who most definitely do not get to enjoy those benefits – and who invariably also are made to bear the costs of those "advances."[134]

A point of comparison here is with other radical traditions in design such as Victor Papanek's "design for the real world" or Tony Fry's "redirective practice."[135] In contrast to many examples of SCD, what is radical about the design approaches articulated by Papanek and Fry is to not only propose a particular future and material outcome, but to diligently work to actualize it.

---

[132] Thackara, "Republic of Salivation (Michael Burton and Michiko Nitta)."

[133] Thackara, "Republic of Salivation (Michael Burton and Michiko Nitta)," paragraphs 3 and 4.

[134] Tonkinwise, "How We Intend to Future," 183.

[135] See Papanek, *Design for the Real World* and Fry, *Design Futuring*.

I've highlighted several critiques of SCD, and I'll conclude by noting a several considerations moving forward. (And in taking this approach, I am afraid that I will be resorting to one of the very tactics for which SCD has been so forcefully criticized: failing to take an explicit critical stance and instead appealing to the value of noncommitment, deferral, and the production of divergent alternatives.)

First, SCD and alternative and oppositional designs more generally must engage with their critics, or they risk either collapsing under the weight of these critiques or perpetuating the problems that critics are pointing out. As Oliviera and Prado note, "A first step, perhaps, would be to acknowledge that these issues are at stake instead of just dismissing them as useless concerns."[136] Second, the momentum of a first step needs to be carried forward with additional steps. Third, once you go down the rabbit hole of critique it can be difficult to come back up. The tradition of critique is, of course, painfully aware of this fact. Viewed as an experiment in engaging and embodying critique through design, SCD should be applauded. But as both affirmative and critical outcomes, SCD must be continually interrogated. Reiterating once again the words of Jane Bennet, "we need both critique and positive formulations of alternatives, alternatives that will themselves become the objects of later critique and reform."[137] And indeed this is exactly what appears to be happening with SCD. An ever-present danger to keep watch for, as critical theory is keen to remind us, is that the voices and impacts of one group becomes dominant to a point at which others are muted, becoming hegemonic such that any alternative becomes difficult to see. Finally, the first point was that alternative and oppositional designs must generally engage with self-critique. The ultimate critique is that the entire speculative-critical design project is deeply flawed. If alternative and oppositional designers are not at least open to this possibility and willing to engage such criticisms, it is a best an irony that critics will be sure to point out.

2.4 Alternative and Oppositional Designs in HCI

Alternatives and to a lesser extent oppositionality have been cornerstones of Design in HCI since the design subfield began to take root within the field. In 1999, Bill Gaver, then at the RCA, published an article on cultural probes as a design method in the ACM interactions magazine with coauthors Anthony Dunne and Elena Pacenti.[138] In the article, Gaver and co-

---

[136] Prado and Oliveira, "Questioning the 'critical' in Speculative & Critical Design: A rant on the blind privilege that permeates most Speculative Design projects," paragraph 8.

[137] Bennet, *Vibrant Matter*, xv.

[138] Gaver, Dunne, and Pacenti, "Design: Cultural Probes."

authors explicitly note their use of Dada and Situationist techniques as inspiration for the method, which has since become something of a household name within design in HCI. In 2000, right around the time that *Design Noir* was published,[139] Gaver and Martin published a paper at the ACM CHI conference titled "Alternatives: Exploring Information Appliances Through Conceptual Design Proposals."[140] Another key paper published soon after, again at CHI, was Gaver, Beaver, and Bedford's "Ambiguity as a Resource for Design."[141] In 2004, Gaver and colleagues published the CHI Case Study report "The Drift Table: Designing for Ludic Engagement."[142] This publication introduced ludic design which would become a major theme of the work of Bill Gaver, Andrew Boucher, and colleagues. Around this same time, alternative design work in HCI and Ubiquitous Computing (Ubicomp) were emerging elsewhere. In 2001, Lars Hallnäs and Johan Redström published Slow Technology: Designing for Reflection.[143] A few years later, Kees Overbeeke, Tom Djajadininigrat, Stephen Wensveen, and colleagues published several design papers focusing on the aesthetics of interactive products in which they argue for a shift in emphasis from utility to emotional resonance.[144] Meanwhile the design of urban computing systems was introduced within HCI by Eric Paulos and colleagues.[145]

Dimensions of oppositionality and criticality began to be asserted most clearly in HCI beginning with work by Phoebe Sengers and coauthors. Two papers by Sengers et al, "Reflective Design"[146] and "Staying Open to Interpretation,"[147] begin to explicitly develop design-oriented HCI agendas that explicitly draw on critical traditions in the humanities. Design criticism in HCI based on critical theory from the humanities has more recently been championed in a

---

[139] Dunne and Raby, *Design Noir*.

[140] Gaver and Martin, "Alternatives: Exploring Information Appliances Through Conceptual Design Proposals."

[141] Gaver, Beaver, and Benford, "Ambiguity As a Resource for Design."

[142] Gaver et al., "The Drift Table: Designing for Ludic Engagement."

[143] Hallnäs and Redström, "Slow Technology: Designing for Reflection."

[144] See Overbeeke and Wensveen, "From Perception to Experience, from Affordances to Irresistibles;" Djajadiningrat et al, "Tangible Objects: redressing the balance between appearance and action;" and Wensveen, Djajadiningrat, and Overbeeke, "Interaction Frogger: A Design Framework to Couple Action and Function through Feedback and Feedforward."

[145] See Paulos and Goodman, "The Familiar Stranger: Anxiety, Comfort, and Play in Public Places;" and Paulos and Jenkins, "Urban Probes: Encountering Our Emerging Urban Atmospheres."

[146] Sengers, et al., "Reflective Design."

[147] Sengers and Gaver, "Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation."

number of publications by Jeffrey and Shaowen Bardzell and colleagues.[148]

A theme running throughout these works is a shift toward experience design and away from designing digital systems with a preoccupation for utility, usability, and efficiency. This shift in perspective within HCI is succinctly captured in the title of the 2003 edited anthology *Funology: From Usability to Enjoyment*.[149] In 2004, Forlizzi and Battarbee introduced an experience design framework for HCI.[150] The ad hoc design work happening in HCI was given a new naming with Zimmerman, Forlizzi, and Evanson's 2007 CHI paper "Research through Design as a Method for Interaction Design Research in HCI."[151] Around this same time, Susanne Boedker traced the "third-wave" shifts in HCI characterized by an expansion from workplace technologies to computing in personal, domestic, and cultural contexts.[152] Along with technological shifts in computing and context came a broadening of third-wave concerns including experience, emotion, reflexivity, and culture.[153] Harrison, Tatar, and Sengers elaborate this shift as a "Third Paradigm" or "Phenomenologically-Situated Paradigm" that "focuses on the experiential quality of interaction, primarily the situated nature of meaning and meaning creation."[154]

Since the introduction of research through design, reflective design, slow technology, experience design, and ludic design, the field of HCI has witnessed a rapid expansion of alternative, oppositional, and critically-oriented design work. Key areas of alternative and oppositional design in HCI are reviewed below.

Critical and Speculative Design Proposals in HCI

Visual and textual proposals are sometimes used in HCI to communicate technologies that do not yet exist. One use of such proposals has been to engage with findings from qualitative fieldwork. Wyche, Taylor, and Kaye present provocative design proposals "as ways to further

[148]See, for example, Bardzell and Bardzell, "What is "Critical" About Critical Design?;" Bardzell, Bardzell, and Stolterman, "Reading Critical Designs: Supporting Reasoned Interpretations of Critical Design;" and Bardzell, Bardzell, and Hansen, "Immodest Proposals: Research Through Design and Knowledge."

[149] Blythe et al., *Funology: From Usability to Enjoyment*.

[150] Forlizzi and Battarbee, "Understanding Experience in Interactive Systems." See also, Forlizzi, Designing for Experience: An Approach to Human-Centered Design.

[151] Zimmerman, Forlizzi, and Evenson, "Research through Design as a Method for Interaction Design Research in HCI," 493.

[152] Bødker, "When Second Wave HCI Meets Third Wave Challenges."

[153] Bødker, "When Second Wave HCI Meets Third Wave Challenges."

[154] Harrison, Tatar, and Sengers, "The three paradigms of HCI," abstract.

engage with and elaborate on" findings from their fieldwork studying unplanned home activities.[155] Swan and Taylor use design proposals in a similar way to articulate alternative photo display concepts emerging from their field research.[156]

Design proposals have also been used explicitly as outcomes of a design process rather than as the outcomes of fieldwork. An example is Aipperspach, Hooker, and Woodruff's *Heterogeneous Home* proposals which have been presented both in a self-published design booklet[157] and a 2008 Ubicomp paper.[158] Both works consist of design proposals that combine image and text alongside textual commentary that describes and explains the proposals. In the case of the Ubicomp paper, the proposals are presented as "a view of ubiquitous computing, in which home environments and technological artifacts are designed to promote variation and differentiation of space and experience."[159] Another example is Boucher, Cameron, and Jarvis' use of design proposals to illustrate alternative technologies for community energy management and engagement.[160] The proposals can be traced to later prototypes and products implemented by the Interaction Research Studio.[161] Similarly, Ben Hooker's *The Weekend*, a large electrical sign that lights up on Friday at the end of the workday, demonstrates an implementation of a proposal found within the *Heterogeneous Home* proposals. However design proposals can be presented as final rather than preliminary outcomes of the design process. An example is the visual-textual proposals presented in Gaver and Martin's "Alternatives: Exploring Information Appliances Through Conceptual Design Proposals."[162]

Design Fiction in HCI

The design fiction label and approach popularized by Bruce Sterling and Julian Bleecker has recently been gaining popularity within HCI. An example is Blythe et al.'s use of design fiction in conjunction with a qualitative study of thriving elderly persons living in retirement commu-

---

[155] Taylor, Wyche, and Kay, "Pottering by Design," 371.

[156] Swan and Taylor, "Photo Displays in the Home."

[157] Aipperspach, Hooker, and Woodruff, "The Heterogeneous Home."

[158] Aipperspach, Hooker, and Woodruff, "The Heterogeneous Home."

[159] Aipperspach, Hooker, and Woodruff, "The Heterogeneous Home," 230.

[160] Boucher, Cameron, and Jarvis. "Power to the People: Dynamic Energy Management Through Communal Cooperation."

[161] See Gaver, et al., "Indoor Weather Stations: Investigating a Ludic Approach to Environmental HCI Through Batch Prototyping" and Gaver et al, "Energy Babble: Mixing Environmentally-Oriented Internet Content to Engage Community Groups."

[162] Gaver and Martin, "Alternatives: Exploring Information Appliances Through Conceptual Design Proposals."

nities.[163] Blythe et al. present "design fictions in the form of advertisements for products and services that do not exist."[164] One of their design fictions is Social Watch, a smart watch app for connecting elderly people around similar interests. Their design fictions deliberately played into the rhetoric of "solutionism,"[165] or technology as a silver bullet. However, the exaggerated solutions are intended to be used as provocations or questions: "the team were creating fictions rather than proposals and the focus was on questions rather than solutions."[166] In earlier work, Blythe proposes "research through design fiction" as a method where the design fictions "take the form of 'imaginary abstracts' which summarize findings of papers that have not been written about prototypes that do not exist."[167] An extension of this method is proposed by Linehan et al. in the form of alternate endings to CHI papers.[168] Elements of design fiction can also be noted in Blythe's use of pastiche as a technique for HCI and Ubicomp.[169]

The expansion of design fiction in HCI can be traced back to a cover story for ACM interactions written by noted science fiction writer Bruce Sterling.[170] Another group to heavily employ design fiction is Wakkary, Tanenbaum, Tanenbaum, Hauser, and Desjardin, whose work includes using design fiction for sustainable design,[171] steampunk as design fiction,[172] and design fiction as a strategy for producing physical artifacts.[173] Other uses of design fiction in HCI include Markussen and Knutz's discussion of the poetics of design fiction,[174] Prost et al's use of participatory design fiction for sustainable domestic energy consumption,[175] Heibeck et al's use of design fiction for immersive media,[176] Reeves' review of the uses of envisioning in ubiquitous

---

[163] Blythe et al, "Solutionism, the Game: Design Fictions for Positive Aging."

[164] Blythe et al., "Solutionism, the Game: Design Fictions for Positive Aging," 3849.

[165] Blythe references Morozov's notion of solutionism as the contemporary societal faith in technology to solve problems. See Morozov, *To Save Everything, Click Here: The Folly of Technological Solutionism*.

[166] Blythe et al., "Solutionism, the Game: Design Fictions for Positive Aging," 3855.

[167] Blythe, "Research Through Design Fiction: Narrative in Real and Imaginary Abstracts," 703.

[168] Linehan et al., "Alternate Endings: Using Fiction to Explore Design Futures."

[169] See Blythe, "Pastiche Scenarios" and Blythe, "The Hitchhiker's Guide to Ubicomp: Using Techniques from Literary and Critical Theory to Reframe Scientific Agendas."

[170] Sterling, "Design Fiction."

[171] Wakkary et al., "A Sustainable Design Fiction: Green Practices" and Hauer, Desjardins, Wakkary, "Sfuture: Envisioning a Sustainable University Campus in 2065."

[172] Tanenbaum, Tanenbaum, and Wakkary. "Steampunk As Design Fiction."

[173] Tanenbaum, Tanenbaum, and Wakkary, "Design Fictions."

[174] Markussen and Knutz, "The Poetics of Design Fiction."

[175] Prost, Mattheiss, and Tscheligi, "From Awareness to Empowerment: Using Design Fiction to Explore Paths Towards a Sustainable Energy Future."

[176] Heibeck, Hope, and Legault, "Sensory Fiction: A Design Fiction of Emotional Computation."

computing,[177] Lindley and Potts' reflections on design fiction prototyping with video,[178] and Lawson et al.'s speculative design proposals for quantified cats and dogs. [179]

Alternative and Oppositional Prototypes and Products in HCI

The production and deployment of "working" or "functional" prototypes and products is a common practice in design within HCI. The exact meaning of terms such as working prototype are often vague, but intuitively there is a sense that such artifacts move well beyond textual descriptions, visual depictions, and physical models.[180] Along a trajectory from early concept to finished product, operational prototypes and products occupy a space closer toward the completed end of this spectrum. In chapter 3, I elaborate distinctions between design proposals, prototypes, and products and then show how alternative and oppositional designs resist a conventional trajectory leading toward a useful, everyday product.

Interaction Research Studio, The Drift Table.

Within the HCI research community many design prototypes and products fit comfortable along what in chapter 3 I refer to as the conventional trajectory of design. However there is also a great deal of unconventional design prototypes and products created within the HCI research community that offer resistance along the conventional trajectory of design in order to offer alternative and oppositional functions. A classic example is the CHI case study publication of the *Drift Table*, an electronic coffee table with a portal that displays a slow-moving landscape

---

[177] Reeves, "Envisioning Ubiquitous Computing."

[178] Lindley and Potts, "A Machine Learning: An Example of HCI Prototyping with Design Fiction."

[179] Lawson et al., "Problematising Upstream Technology through Speculative Design: The Case of Quantified Cats and Dogs."

[180] In sections 3.1 and 3.3, the distinction between proposals and prototypes will be more clearly articulated.

controlled by the weight distribution of objects placed on the table's surface.[181] At the time of the publication in 2002, the field of HCI was still preoccupied with designing technologies for utility and efficiency. Gaver et el. present the *Drift Table* as an exemplar of designing for "ludic engagement" as an alternative to utilitarian design:

> We believe that it is important to develop domestic technologies that reflect ludic as well as utilitarian values. ... From a cultural perspective, supporting ludic pursuits may counterbalance tendencies for domestic technologies to portray the home as little more than a site for work, consumption, and relaxation.[182]

The case study report of the Drift Table documents the design process beginning with formative design work and culminating in a working prototype that is deployed in participants' homes as part of a field study. The ludic design approach exemplified by the *Drift Table* case study has been extended to a number of other projects such as the recent *Indoor Weather Stations*[183] and *Energy Babble*[184] projects.

A recent example of alternative design work in HCI employing highly functional prototypes deployed in situ is work by Will Odom and colleagues designing slow technologies. Building on Hallnäs and Redström's slow technology paper,[185] Odom and colleagues have designed, implemented, and deployed working prototypes in several field studies.[186] These includes a longitudinal field study of *Photobox*, a device that prints a handful of randomly selected photos from the owner's online photo collection at random intervals each month.[187] The alternative and oppositional orientation of the design work is apparent in the naming of the device as a "slow technology." Elaborating on their intentions of investigating slowness, Odom et al. write, "We want to investigate how technologies might be designed to slow the consumption of digital photos and support experiences of reflection and revisitation of the past."[188] On a broader level, Photobox was designed to build upon and expand prior design-oriented HCI research, including the previously described ludic design work by Gaver et al., "articulating how embracing values alternative to the more dominant focus of efficiency and usability can critically nurture

---

[181] Gaver et al., "The Drift Table."

[182] Gaver et al, "The Drift Table", 886, with reference to Gaver, "Designing for Homo Ludens."

[183] Gaver et al., "Indoor Weather Stations: Investigating a Ludic Approach to Environmental HCI Through Batch Prototyping."

[184] Gaver et al., "Energy Babble: Mixing Environmentally-Oriented Internet Content to Engage Community Groups."

[185] Hallnäs and Johan Redström, "Slow Technology."

[186] See Odom et al., "Technology Heirlooms?: Considerations for Passing Down and Inheriting Digital Materials;" Odom et al., "Photobox: On the Design of a Slow Technology;" and Odom et al, "Designing for Slowness, Anticipation and Re-Visitation: A Long Term Field Study of the Photobox."

[187] Odom et al, "Designing for slowness, anticipation and re-visitation," 1962.

[188] Odom et al, "Designing for slowness, anticipation and re-visitation," 1963.

and expand future research in the HCI."[189]

Photobox. See William Odom, Mark Selby, Abigail Sellen, David Kirk, Richard Banks, and Tim Regan, "Photobox: On the Design of a Slow Technology."

Other examples of alternative and oppositional design prototypes and products in HCI include Redström and Bucklund et al.'s explorations of "energy as a material in design,"[190] Wakkary et al's design of "unaware objects" for implicit and unknowing encounters,[191] Leahu and Sengers' design of affective interactive systems that demonstrate how feminist concepts of performativity[192] "can be applied to HCI phenomena and approaches to generate new understandings as well as technical and design alternatives,"[193] and Devendorf and Ryokai's design of fabrication tools drawing on art practice "to support critical and reflective modes of making."[194]

Critical Design in HCI

The term critical design along with Dunne and Raby's writings and works have been referenced in HCI since the earliest alternative- and critically-oriented design publications in HCI, including Gaver and Martin's "Alternatives: Exploring Information Appliances through Conceptual Design Proposals," Hallnäs and Redström's "Slow technology," Djajadiningrat et

---

[189] Odom et al., "Designing for slowness, anticipation and re-visitation," 1969.

[190] Another is example is work coming out of Umeå University and the Interactive Institute in Sweden investigating "energy as a material in design." See Backlund et al.,"Static! The Aesthetics of Energy in Everyday Things." This work later developed into the Switch! and Visual Voltage exhibitions. Examples include the Power-Aware Cord and the Energy Curtain. See Mazé and Redström, "Switch! Energy Ecologies in Everyday Life;" Gustafsson and Gyllenswärd, "The Power-Aware Cord: Energy Awareness through Ambient Information Display;" Ernevi et al, "The Energy Curtain: Energy Awareness;" and Redström, Johan, "Form-Acts: A Critique of Conceptual Cores."

[191] Hauser, Wakkary, and Neustaedter, "Intersecting with Unaware Objects."

[192] Leahu and Sengers, "Freaky: Collaborative Enactments of Emotion."

[193] Leahu and Sengers, "Freaky: Performing Hybrid Human-Machine Emotion," 616.

[194] Devendorf and Ryokai, "Being the Machine," 2478.

al.'s "Tangible Products: redressing the balance between appearance and action," and Sengers et al.'s "Reflective Design."

Recent trends suggest that critical design is continuing to gain purchase within the field.[195] Several paper sessions titled "Critical Design" have occurred at the CHI and DIS conferences. These include papers explicitly associating with the critical design label, such as Feinberg et al.'s provocative designs reworking metadata and Wilde et al.'s use of knitting and textile design to explore notions of ability and disability through embodied interactions.[196] These sessions have included works that are not explicitly described by the authors as critical design. Such publications include Odom et al.'s presentation of *Photobox*[197] and my own design work with Eric Paulos on counterfunctional devices (which are the focus of Chapter 4).[198]

Perhaps the most prolific and conceptually developed use of the term critical design in HCI is in work of Jeffrey Bardzell, Shaowen Bardzell, and their collaborators.[199] Bardzell and Bardzell's project is to develop a design criticism of critical design. As discussed by Pierce et al., the Bardzells' work emerged from an interest in Dunne and Raby's approach as a methodology for doing cultural criticism in design, together with concerns that their work was lacking methodological and conceptual articulation necessary for it to be accessible to the HCI audience.[200]

Most recently I, together with several colleagues, have reviewed the critical design discourse in HCI, drawing out several strands of critique along while proposing various routes forward for critically-oriented design and design criticism in HCI.[201] One observation we make is that the term critical design is currently being used as a catchall term for emerging design practice in HCI that extends well beyond either Dunne and Raby's original use of the term or the Bardzells' project of developing a critical design criticism in HCI. We argue that the term critical design is problematic when used as a catchall term:

> Despite its allure, the term 'critical design' is too specific to serve as a label for the emergence of design prac-

---

[195] See Pierce and Sengers et al., "Expanding and Refining Design and Criticality in HCI."

[196] See Feinberg, Carter, and Bullar, "A Story Without End: Writing the Residual into Descriptive Infrastructure;" and Wilde, "PKI: Crafting Critical Design."

[197] Odom et al., "Designing for slowness, anticipation and re-visitation."

[198] Pierce and Paulos, "Counterfunctional Things: Exploring Possibilities in Designing Digital Limitations."

[199] See, for example, Bardzell and Bardzell, "What Is 'Critical' About Critical Design?" and Bardzell et al., "Critical Design and Critical Theory: The Challenge of Designing for Provocation."

[200] See Pierce and Sengers et al., "Expanding and Refining Design and Criticality in HCI," 2084.

[201] See Pierce and Sengers et al., "Expanding and Refining Design and Criticality in HCI," 2087-2091.

tices that exhibit a 'critical voice' in some form." Going forward, we proposed three routes. First, we can find an alternative label to describe this overall movement. Second, we could simply recognize critically-oriented design practices as first and foremost Design. And third, and this the option we leaned towards, we can "simultaneously recognize these emerging approaches and practices as Design, while developing a more varied, evolving, and provisional set of labels to describe, develop and advocate for them."[202]

In this dissertation, I have attempted to somehow do all three, including offering alternative and oppositional design as an alternative catchall term that avoids some of the problems we identified. In this dissertation I also attempt to develop techniques, concepts, and tools useful toward a design criticism that is "provisional, open, incomplete, and even a bit messy (like design!)."[203]

2.5 The Question of Alternative and Oppositional Technique

This chapter has presented an evolving cluster of design practices, approaches, and outcomes that intuitively exhibit an affinity for one another. The affinity is unconventional—so unconventional that the very functions of these designs have required explanation and justification. In this chapter I have reviewed several prominent strand of unconventional design: critical design, speculative design, design fiction, adversarial design, design agonism, design for debate, contestational design, reflective design, discursive design, and tactical media.

Here I have introduced the conjunctive singular term alternative and oppositional designs as a device for coalescing this range of divergent and critically-oriented design works and writings. Some of these works are explicitly oppositional. Other works take a more neutral political and critical stance, instead concerning themselves foremost with the exploration of possibilities. Alternative and oppositional represents a spectrum ranging from the mildly alternative to the radically oppositional.

The forms and formats reviewed in this section vary, and include scholarly writings, manifestos, and design examples (predominantly accessed through visual and verbal media). However it must be noted that discursive writings on design, as distinct from works or examples of design, exert a strong influence on this review.[204] In particular, discursive writings on design have

---

[202] See Pierce and Sengers et al., "Expanding and Refining Design and Criticality in HCI," 2084.

[203] See Pierce and Sengers et al., "Expanding and Refining Design and Criticality in HCI," 2089.

[204] A tension between an academic preference for words and a designerly preference for things is often felt and voiced within the overlapping communities. As Auger notes in "Speculative Design," "for those within the design or research community [the] semantic details [with terms such as speculative design and critical design] are less

tended to delimit the space of examples I have drawn upon. All of the specific examples I reference or discuss in this section have been previously presented as examples of a more general design approach or perspective, such as critical design, speculative design, or adversarial design. A limitation of my selection of examples is that it constrains the discussions to a previously presented and perhaps overused set of examples. Alternative articulations may require other or additional examples.

The major upshot of delimiting the space of examples to those subsumed under already named approaches, however, is that it facilitates my project of demonstrating that resistance is a design technique at work across many alternative and oppositional designs. The term alternative and oppositional designs coalesces terms that in turn coalesce specific works. The linkages between specific design examples and keyworded alternative and oppositional functions (critique, speculation, agonism, etc.) is crucial for the project of articulating resistance as a design technique that affords alternative and oppositional design functions. There is no need to do the additional work of demonstrating a certain critical, speculative, or adversarial function when others have already done so.

Articulating Resistance as Technique at Work in Alternative and Oppositional Designs

The alternative and oppositional designs that have been reviewed here are being held together by deliberately unconventional functions: alternative and oppositional functions. They are held together by *whys*: for critique, for speculation, for agonism, and for reflection, as well as other alternative or oppositional ends. The gap that this chapter reveals is the question of what techniques underlie these alternative and oppositional functions. To be sure, prior alternative and oppositional designs have already articulated design techniques, tactics, strategies, and methods. Yet they have done so in relation to specific social, cultural, and political programs or functions. Moreover there is often little overlap among the design work used to exemplify these functions. Having established a diverse body of alternative and oppositional designs, the question emerges: What shared techniques underlie alternative and oppositional designs— techniques that are not already shared with conventional design work?

---

problematic as familiarity with the discourse makes the terminology less important, but for those unfamiliar with these practices, semantics fundamentally affect how the work is experienced and assessed" (2). As Auger suggests, the nuances of terminology and labels may be of little concern to those practitioners that are designing and making alternative and oppositional things. A sentiment often voiced within various communities of design practice is that the preoccupation with names and labels is an academic conceit, and naming perhaps matters more to academics that write about design than it does to practitioners who do design.

Chapter 3

Design Techniques of Resistance

Having established a base of alternative and oppositional design functions, this chapter articulates and exemplifies resistance as a design technique. Design resistance, I will argue, is a technique at work in many alternative and oppositional designs. The goal of this chapter is to reveal how alternative and oppositional designs work and to do so such that the articulated techniques can be extended, refined, and applied, as well as analyzed and critiqued. As discussed in chapter 1, my approach for articulating design techniques of resistance involves doing philosophy and design as a sort of integrated practice.

Section Overviews

Section 3.1, *Resisting the Conventional Trajectory of Design*, lays the foundations for resistance by setting up a contrast between a conventional design trajectory, on the one hand, and alternative and oppositional design trajectories on the other. Instead of defining alternative and oppositional design trajectories directly, my strategy is to bring them into relief by contrasting them with an idealized construct: the conventional trajectory of design. The conventional trajectory of design is leading toward a product that just plain works. In contradistinction, resistant design trajectories are generating designs that work by not quite working, often without quite actually being used. This vagueness will all be explained. But throughout this chapter I will try to maintain in my verbal articulation something of the vagueness and ambiguity upon which design resistance so often seems to thrive.

Design resistance is formally introduced beginning in Section 3.2. Design resistance is a technique at work in many alternative and oppositional designs. Design resistance operates within two perspectives. From the perspective of embodied and embedded use there is *resistance in use*. From the perspective of design, which is to say any perspective that creatively imagines the actualization of new embodied and embedded uses, there is *resistance along the conventional trajectory of design*. Whereas conventional designs just plain work, nonresistantly, design resistance "works by not quite working." This is a way of saying that resistant designs may appear strange, difficult, or even to some extent useless (they do not quite work). But resistant designs do have functions (they *work*, by not quite working). Moreover, these functions must be grasped as unique from "art" or "criticism," at least as those notions have traditionally been understood. Many scholars and designers have already very clearly argued and demonstrated

some of these functions. These alternative and oppositional functions were summarized in section 2.4: critique, speculation, agonism, reflection, etc. Design resistance operates from two perspectives.

In section 3.3., *Varying Resistance: Proposals, Prototypes, and Products*, concepts of design resistance presented in section 3.2 are developed using examples draw from the literature review of alternative and oppositional designs in chapter 2. This section varies the design of a specific object, a useless spoon that is used to introduce design resistance in section 3.2, in order to exemplify three variations on the design technique of resistance. The major outcome of this section is to articulate three important variations on the technique of resistance: resistant proposals, resistant prototypes, and resistant production. Examples of alternative and oppositional designs will be shown to variously make use of these techniques of design resistance.

Section 3.4, *Getting the Tension Right, but Not Quite Right: Composing Tensive Use*, draws the chapter to a close by discussing some general techniques for crafting compelling resistance. This section connects techniques of resistance with other concepts, tactics, and techniques that have been articulated in prior alternative and oppositional design writings. Also noted are the crucial considerations of audience, the forms and formats of a design (e.g., image, object, text, performance), and the modes in which these are experienced (e.g., actual use versus imagined use, firsthand use versus vicarious use).

3.1 Resisting the Conventional Trajectory of Design

In order to understand how and what design resistance resists, we need to begin with a foundation of how design is conventionally conceptualized, practiced, and experienced. As a design technique, design resistance resists conventional design. It resists nonresistant design. Yet design resistance is created by design, through design processes, with designed forms and outcomes. To understand design resistance we first need to understand nonresistance.

Defining design is tricky. Its etymology as a noun is connected with cunning and deception: intention, plan, intent, aim, scheme, plot, motif.[1] As a verb its meanings include to simulate, to draft, to sketch, to fashion, to have designs on something.[2] The meanings of the word design are broad and at times ambiguous. Design historian John Heskett writes: "Design is to design a

[1] See "About the Word Design," in Flusser, *Shape of Things: A Philosophy of Design*, 17 and passim.

[2] Flusser, *Shape of Things*, 17.

design to produce a design."[3] Underlying the apparent vagueness of this sentence is a precise identification of design as

1. A category ("Design is..."),
2. A verb or process ("to design"),
3. A plan or prefiguration ("a design to produce a design")
4. A final outcome or product (a produced design).[4]

"Design is to design a design to produce a design." This definition, if you will is attentive to design's concern with meaning and form. The definition captures the plurality suggested in design's etymology. It captures the activity that is felt when designing. The definition is not too rigid or precise. It anticipates a need for flexibility. And it captures the breadth and openness of design. Design often seems to be at risk of dissolving into everything. "Design is everywhere."[5] "Not everything is design. But design is about everything."[6] "Everything has to be designed and redesigned (including nature)."[7] "Design is universally everywhere...There is not a single thing around us that is not designed."[8]

Herbert Simon boldly declared that "everyone designs who devises courses of action aimed at changing existing situations into preferred ones."[9] For design theorists Nelson and Stolterman, "design is the ability to imagine that-which-does-not-yet-exist, to make it appear in concrete

---

[3] These words were originally published in Heskett, *Toothpicks and Logos*, which has been republished in the *Very Short Introduction* series as Heskett, *Design: A Very Short Introduction*. In *Design: A Very Short Introduction*, Heskett writes,

> Discussion of design is complicated by an initial problem presented by the word itself. 'Design' has so many levels of meaning that it is itself a source of confusion. It is rather like the word 'love,' the meaning of which radically shifts dependent upon who is using it, to whom it is applied, and in what context.

> Yet every use of the word is grammatically correct. The first is a noun indicating a general concept of a field as a whole, as in: 'Design is important to the national economy.' The second is a verb, indicating action or process: 'She is commissioned to design a new kitchen blender.' The third is also a noun, meaning a concept or proposal: 'The design was presented to the client for approval.' The final use is again a noun, indicating a finished product of some kind, the concept made actual: 'The new VW Beetle revises a classic design.' (3-4.)

[4] See previous note. Heskett, *Design: A Very Short Introduction*, 3-4.

[5] Clark and Brody, *Design studies: A Reader*, 1.

[6] Beirut, *Seventy-Nine Short Essays on Design*, 13.

[7] Latour, "A cautious prometheus? A few steps toward a philosophy of design (with special attention to Peter Sloterdijk)," 2.

[8] Fry, *Design Philosophy: An Introduction to Defuturing*, 5.

[9] Simon. *Sciences of the Artificial*, 111.

form as a new, purposeful addition to the real world."[10] For the polemic designer Victor Papanek, "The planning and patterning of any act towards a desired, foreseeable end constitutes the design process."[11] For design studies scholar Richard Buchanan, "design is the human power of conceiving, planning, and making products that serve human beings in the accomplishment of any individual or collective purpose."[12] Within adjacent fields, Design is becoming increasingly relevant. For Drucker et al. writing within the humanities, "design is a creative practice harnessing cultural, economic, and technological constraints in order to bring systems and objects into the world."[13]

From these discussions a few things are clear about design.[14] Design is a process and product. Design is both a verb and noun. As a product, it is both the plan or prefiguration of a product and the final, implemented, fully formed product. There is movement in design. For Simon, it is a movement from an existing condition to a preferred condition. For Nelson and Stolterman, design is moving from "that-which-does-not-yet-exist" toward "a new, purposeful addition to the real world."[15] For Drucker et al, it is a creative movement to "bring systems and objects into the world."[16] For Heskett, design is movement from "a design to produce a design" to a final produced design.[17] Design is a human process, an intentional process, and a creative process.[18] Design follows a trajectory that can be plotted from a beginning to an end: "existing conditions" to "preferred conditions";[19] "that-which-does-not-yet-exist" to "a new, purposeful addition to the real world;"[20] a "design to produce a design" culminating in a produced design.[21]

---

[10] Nelson and Stolterman, *The Design Way: Intentional Change in an Unpredictable World*, 10.

[11] Papanek, *Design for the Real World: Human Ecology and Social Change*, 17.

[12] Buchannon, "Design Research and the New Learning," 9.

[13] Drucker et al, *Digital_Humanities*, 13.

[14] A serious limitation here is that all of these well-cited definitions originating within the field of design are exclusively from white males. Writing in 1972, the definition attributed to Papanek in *Design for the Real World* above begins a few sentences earlier "All men are designers." As John Walker notes, "The problems inherent in this definition are obvious and multiple. Feminists will note the absence of women." Walker, "Defining the Object of Study," in Clark and Brody, *Design Studies: A Reader*, 45-46.

[15] Nelson and Stolterman, *The Design Way*, 10.

[16] Drucker et al, *Digital_Humanities*, 13.

[17] Heskett, *Design: A Very Short Introduction*, 3-4.

[18] For conceptualizations of design that emphasize nonhuman agency, see Fry, *A New Design Philosophy: An Introduction to Defuturing*; Willis, "Ontological Designing;" and Verbeek, *What Things Do: Philosophical Reflections on Technology, Agency, and Design*.

[19] Simon, *Sciences of the Artificial*, 111.

[20] Nelson and Stolterman, *The Design Way*, 10.

[21] Heskett, *Design: A Very Short Introduction*, 3-4.

Design follows a trajectory: Design is to design a design to produce a design to produce a design . . . to (possibly) produce a final design.

The Conventional Trajectory of Design

Resistant designs align with conventional designs but they offer some resistance toward becoming conventional products of the design process. Typically design is moving along a trajectory that eventually terminates at some "final product." This trajectory is epitomized by commercial design practice that brings consumer products to market. Consumer products are emblematic of the notion that design and technology solve problems and fulfill human needs and desires. Consumer products are our shared embodied and embedded experience of this notion. Consumers demand products, while the design of consumer products creates demand for them.[22] The contemporary discourse and practice of design dating back to the Bauhaus and the emergence of industrial design is closely tied to instrumentality and commercial viability.

Design resistance employs processes, forms, and intents of conventional design practice yet at the same time it offers resistance toward instrumentality and commercial viability. To grasp the relationship between resistant designs and conventional designs, what is needed first is an understanding of how the "final outcomes" of design are typically conceptualized. The concept of a "final product" of a design process is more general than the consumer product or object. As Buchanan writes, "'products' represent the formal cause, in the sense of the formal outcome of the design process that serves human beings."[23] Consumer products are of course not the only pervasive and impactful final products of design. Others include public goods and services, the design of policies and organizations, and do-it-yourself or amateur designs. Yet consumer products figure powerfully in our collective imagination and everyday experience with things. Just look and feel around. Compared to a service or building, objects are supremely graspable. An object can be held in hand and seen within view. These resistant design examples I discuss

[22] See, for example, Ingram, Shove, and Watson, "Products and Practices: Selected Concepts from Science and Technology Studies and from Social Theories of Consumption and Practice" Ingram et al. write "For things to be consumed they need to have been designed: product launch into the marketplace is where models of new product development end, and the marketplace is where consumption begins. However, the reverse sequence is equally valid: consumption practices, and their component materials, symbols and procedures develop over time, generating new product opportunities to feed the practice [referencing Shove, Comfort, Cleanliness and Convenience: The Social Organisation of Normality; and Shove and Pantzer, Consumers, producers and practices: understanding the invention and reinvention of Nordic Walking] These perceived opportunities stimulate design activity: the identification of design opportunity increasingly defines the start of design process, rather than the definition of a 'problem'. Joining these two sequences together produces a representation of designing and consuming that resonates with some models of design process, showing how consumer practices stimulate design, and new products stimulate new practices." (5)

[23] Buchanan, "Design Research and the New Learning," 9.

take consumer products as a key point of reference and comparison.

Designs do not always actually reach the terminal point of something like a consumer product. Some products are designed in a commercial setting with the full realization that they will never be brought to market. Concept cars and corporate futuring are examples of commercial design practices that entail divergent speculation. The very notion of a product as a terminal point can also be misleading. Consumer products are continually being redesigned. The iPhone is an exemplary final product. It is ubiquitous, transformative, and utterly useful, desirable, and engaging. Yet anyone is capable of seeing the iPhone 6 as a prototype for the iPhone 7, and so on. The iPhone is a final product but it can also be seen as the beginning or middling of an ongoing design trajectory of iPhones, smart phones, mobile devices, ubiquitous computing technologies, and beyond. Everything holds the potential to be redesigned, even "final" mass-produced, mass-distributed products.

In practice this terminal point of the design trajectory is more like a vanishing point. Moreover it is a vanishing point that is continually on the move. During the activity, process or event of design, the final product or outcome is a vague and moving target. But it is tending toward becoming less vague and more stable throughout the process. While Simon offers a goal-oriented model of design as devising "courses of action aimed at changing existing conditions situations into preferred ones," Nelson and Stolterman emphasize the intentional, unfolding, processual character of design. "[I]ntention is not the target, nor the purpose, nor an end state, but is principally the process of giving direction. … [I]ntention is best understood, not as a vision, but as the aiming and subsequent emergence of a desired outcome… Unlike a vision, the outcome is not there when the process begins."[24] "The designer's role is to midwife that desider-ata, which could not have been imagined fully from the beginning by either the client or designer and to provide end results in the form of an expected unexpected outcome."[25]

When design is aiming toward a final product, that final product is not yet known. But design is a process orienting toward making a product or condition more clear, more stable, more definitive. Whether conceived as a terminal point or vanishing point, design follows a trajectory involving progressive refinements and actualizations of things and their potentials for use. Creative divergences such as suspending criticism in brainstorming sessions are a necessary part of the process. They productively reorient the process towards a revised target—the expected unexpected outcome, as Nelson and Stolterman describe it. But these divergences are folded

---

[24] Nelson and Stolterman, *The Design Way*, 143-144, original emphasis.

[25] Nelson and Stolterman, *The Design Way*, 48, original emphasis.

back into the ultimately converging trajectory. A design is always becoming, but it is becoming a definitive something. That something is becoming separated from the design process as a product emerges and gains autonomy in the colloquial "real world" of everyday activity— a world whose reality is distinguished by its otherness with the reality of the event of designing.

Löwgren and Stolterman sum things up: While the whole design process is not "continuous convergence from the broad initial situation to the narrow final solution," "the design process always ends in a convergence phase with the focus on one specific solution," usually with "an artifact, a system, or a specification."[26]

The Terminal Point for Commercial Design Practice

In a commercial context the professional design team typically does not produce the final product that is distributed, sold, bought, and used by customers or end-users. The professional designer's job typically ends with the "design to produce a design."[27] The deliverables the design team produces are designs to produce a possible, eventual final manufactured product—a graphic, a package, an interactive technology, a software tool, a structure, a service, a brand identity, etc. The production and distribution of the final manufactured product is the job of others. Often this requires additional design work (engineering design, advertising design, packaging design, instructional design, etc.).

Prior to industrialization, the craft tradition made a much less pronounced distinction between design and production. Craft practitioners were skilled in both design and production. Potters designed and produced pottery. Furniture makers designed and constructed furniture. Things changed with industrialization. Industrial processes formed a new separation between design and production. A professional and technical distinction was clearly made between "a design to produce a design" and a "produced design." The important point here, again, is that the job of the conventionally conceived practicing designer often does not involve final production or implementation of whatever is being designed, be it an object, service, structure, graphic, packaging, or brand identity. In a commercial design context, typically engineers, assemblers, and other specialized professionals will take over the bulk of the final production work. Devel-

---

[26] Löwgren and Stolterman, *Thoughtful Interaction Design*, 29.

[27] Heskett, *Design: A Very Short Introduction*, 3-4. Heskett's technique of defining design with the sentence "Design is to design a design to produce a design" can be read as radically simplified version of an earlier definition he proposed, "industrial design is a process of creation, invention and definition separated from the means of production, involving an eventual synthesis of contributory and often conflicting factors into a concept of three-dimensional form, and its material reality, capable of multiple reproduction by mechanical means." Heskett, *Industrial Design*, quoted in Buchanan, "Design Research and the New Learning," 8-9.

opment, production, and distribution are (design) processes or activities typically separated from the practices professional designers.

Yet in design research and artistic design practice, the craft tradition is much more prevalent. Design research practitioners are typically responsible for the production and distribution of their final designs. The catch is that the products they produce and the means of distributing these products are often quite different from those involved in the production and distribution of a commercial product. For example, the final product of a design research project may be a publication or exhibition that includes conceptual proposals for products that not only do not actually exist but will likely never be built. The publication or exhibition also serves as a mode of distribution for this unconventional product of design. And in practice, publication and exhibition often blend together in the form of exhibition publications (e.g., an exhibition monograph or website) and publication presentations (e.g., an academic conference presentation or invited lecture). The purpose of this publication-product or exhibition-product is often framed as some sort of tool or product to be used by other designers making more conventional products. But it need not be. Sometimes the publication-product or exhibition-product explicitly resists this function and instead offers alternative and oppositional uses for non-expert designers: agonism, critique, speculation, reflection, and other alternatives.

As covered in Chapter 3, those professional designers working in industry, government, non-governmental or non-profit sectors do not have a monopoly on the label designer. Academics and artists can also be design practitioners, even if they work at a remove from commerce and industry.

Proposals, Prototypes, Products

The conventional trajectory of design is neatly plotted along the reference points of design proposals, prototypes, and final products. Design is to design designs (proposals) to design designs (prototypes) to eventually produce designs (products). The language of proposals, prototypes and products can be found throughout various design fields, but it is especially pronounced in the fields of interaction design and product design. However, there is little explicit agreement or formalized use of the terms, which can vary substantially from design subfield to subfield.[28]

---

[28] My preference for the term "product" partly reflects the product design and interaction design focus of my own work and the examples I draw upon. In product design and interaction design use of the terms prototypes and products is commonplace.

The reference points of proposal, prototype, and product will reoccur throughout this chapter. Their uses and meanings will gradually develop and shift as well. One reason for this is because I will be working to show how resistant designs work to problematize and elide the very distinctions that proposals/prototypes/products plot along the conventional trajectory of design. Proposals, prototypes and products too simply plot a conventional trajectory of design. But oversimplification has its uses. These uses include making clear beginnings for later complicating, collapsing, blending, expanding, and refining.

What is a product? A product is distinguished from proposals and prototypes. A product has left the design process while proposals and prototypes are still very much within it. A product is something that has gained autonomy outside of the design process. A product being used is indirectly experienced as no longer being designed. More specifically, a product is used in a way that is tending toward embodied, embedded, everyday, nonresistant uses. Once again, this conceptualization of a product takes the consumer product as a key point of reference.

What are proposals and prototypes? What important distinctions are these terms making? The conventional practicing designer does not produce final manufactured products. Designers create plans or specifications to produce final products. "Designs to produce designs," as Heskett puts it. Proposals and prototypes are one way of distinguishing work that happens within the design process leading toward a final product. Distinctions between less and more finalized design work are made in a variety of ways in the different specializations of design: concepts versus prototypes, early design concepts versus developed design concepts, low-fidelity versus high-fidelity prototypes, 2D versus 3D prototypes, visual prototype versus physical prototype, wireframes versus mockups, sketches versus layouts, layouts versus comps, form prototype versus interactive prototype, non-functional prototype versus functional prototype. But it is important to note that such distinctions are found across all established design practices. Bill Buxton distills these sorts of distinctions into sketches versus prototypes, neatly depicted in a table reproduced below.[29]

---

[29] Buxton, "What Sketches Are (and Are Not)."

Sketch	Prototype
Suggest	Describe
Explore	Refine
Question	Answer
Propose	Test
Provoke	Resolve
Tentative, non Committal	Specific Depiction

Sketch versus Prototype. Adapted from Buxton, "What Sketches Are (and Are Not)."

What I'm calling a proposal, Buxton might refer to generally as a sketch. A limitation of the term sketch is that it is too bound up with the specific form of a quickly hand-drawn image. Proposals as I use the term here can be highly polished and even non-visual.[30] The key distinction that proposals and prototypes are making is the crossing of thresholds moving things closer toward a final product.

Closeness to a Final Product: Proposing Beginnings, Prototyping Middlings, Producing Endings

Proposing, prototyping, producing. Beginning, middling, ending. A product is an ending, emerging from a prototyping which is a middling, emerging from a proposing which is a beginning. A design proposal is a proposal to develop a concept further through prototyping. But a design process is filled with subprocesses. Designing any thing is full of many beginnings, middlings, and endings. Design beginnings and middlings are relative. They are relative to one another, and they are relative to an implicit design trajectory.

But the conventional final product of a conventional design process is relatively well-defined: You can actually use it. It actually works. If it is a consumer product, you can purchase it. Actual use is embodied and embedded within a context of practical use. A proposal is proposing an actual use. A prototype is crossing a threshold into actual use, into embodied use, toward embedded use. It is approaching actual everyday, nonresistant, just plain working. The distinction between a proposal and a prototype is that a prototype clearly crosses some threshold of actual use. Within certain fields of design, key thresholds of actual use stand out. In product

---

[30] An alternative term for a design proposal is a design concept or conceptual proposal. However these terms can be especially misleading in an academic context. "Conceptual" suggests a false opposition with material or actual, when in fact design concepts have actual, material forms: sketches, text, verbal descriptions, performances, etc. For this reason I have chose the term proposal rather than concept.

design there is a discernible threshold between visual proposals and physical prototypes. But it depends on the anticipated final product, or the form of the "expected unexpected outcome."[31] The product designer expects a product design, the interaction designer expects an interactive design, the architect expects an architectural design, and so on.

Resistant Design: Creating Alternative and Oppositional Design Trajectories

The alternative and oppositional designs that form the core focus of this dissertation resist movement along a conventional trajectory of design. They resist becoming the conventional final products of the design process—either as "designs to produce a design" or produced designs. Yet they implicitly reference and position themselves relative to conventional design trajectories and products. This resistance is not a refusal to become a conventional product. Neither is resistance a guarantee that a design is prevented from becoming a conventional product. For once something exits or escapes the design process, what it becomes is no longer completely in the designer's hands.

Resistant designs can look and feel like conventional design proposals, prototypes, or products. They can also exhibit hybrid or multiple forms incorporating elements of conventional proposals, prototypes, and products. Some resistant designs look and feel like finished products while others are cruder. Sometimes they appear as polished proposals, other times as sketchy and abstract proposals.

Like industry concept cars and corporate futuring, the alternative and oppositional designs I will discuss resist becoming conventionally successful products. But unlike concept cars or corporate futuring they exhibit a distance from industry and resist being folded back into a conventional trajectory of design.[32] Because of this they can do work that conventional design and even radically experimental and visionary design cannot easily do when it is locked into a service relationship with industry. Resistant designs can interrogate and critique conventional design trajectories, while at the same time giving form to alternative and oppositional design trajectories.

Tensions between Opposition and Innovation, and Alternatives and Convention

Design resistance aligns with and references the conventional trajectory of design while at the

---

[31] Nelson and Stolterman, *The Design Way*, 48.

[32] For a clear examples of concept car style design that is completely aligned with the conventional trajectory of design, see the design concepts posted to Yanko Design: http://www.yankodesign.com/

same time it resists movement along the conventional trajectory of design and the actualization of a conventionally successful product. Prior to elaborating design resistance as a technique, it is worth noting the tensions design opposition and innovation, and design alternatives and convention.

The alternative and oppositional design trajectories are alternatives to the conventional design trajectory and the conventional, nonresistant products it is working to produce. But there is a peculiar tension between opposition and innovation, and between alternatives and convention. It is a tension where one side can give way—sometimes abruptly—to the other. Radically alternative and oppositional design possibilities can be experienced with a product as pervasive and commercially successful as Snapchat, a smartphone app that allows users to chat by sending images and text message that self-destruct after a few seconds. For example, Snapchat suggests a critique of the demands of social media technologies to require users to meticulously manage their online identities. The self-destructing feature of Snapchat instead allows users to free themselves of demands to send the most beautiful and interesting pictures at all times, along with the fears of negative repercussions, for example, associated with particularly intimate and revealing images.

However the immediate potentials for Snapchat to offer social, cultural, or political resistance through alternative possibilities now appears to have been thoroughly recuperated by Snapchat, recently estimated to be worth $19 billion. "A little friction is powerful," says Snapchat's confounder and CEO Evan Spiegel.[33] But initial resistance can quickly give way to nonresistant product success. "Everyone said, 'That is a terrible idea,' Spiegel remembers. "Not only is nobody going to use it, they said, but the only people who do, will use it for sexting."[34]

Contrarily, innovative potential can be experienced with something as weirdly resistant as Dunne, Raby, and Anastassiades's pixelating pornographic images "for people who enjoy porn but feel a bit guilty watching it" in their design work *S.O.C.D. (Sexually Obsessive Compulsive Disorder)*.[35] (One of many artistic image-deteriorating precursors to Snapchat?) Or Mark Shepard's counter surveillance *CCD-Me-Not Umbrella* "designed to let you flirt with object tracking algorithms used in advanced surveillance systems."[36] (A precursor of a product in the "near-future sentient city"?) Or Justin Blinder's *Vacated*, a project that "reverse engineers

---

[33] Colao, "Snapchat: The Biggest No-Revenue Mobile App Since Instagram."

[34] Colao, "Snapchat."

[35] Dunne and Raby, "Do you want to replace the existing normal? 2007/08."

[36] Shepard, "Sentient Cities Survival Kit."

Google Street View to highlight the changing landscape of various neighborhoods throughout Manhattan and Brooklyn."[37] In this case *Vacated* appears to be an immediate precursor of the Google Map's Time Machine feature. A few months after *Vacated* received widespread media coverage, Google released a Time Machine tool for their Street View Maps.[38] The resistant potential of a project by an artist-designer-programmer was apparently captured by a megacorporation and implemented within an application used nonresistantly by millions. Or, for the less enthused, this story is one of the successful recuperation, and intellectual and artistic theft, of a tactic for revealing gentrification, effectively stripping it from its radical political potential for agonism, debate, critique, or dissensus. A Time Machine feature, not a Revealing Gentrification feature, was added to Google Maps.

The takeaway from this discussion is that design resistance creates potential and possibility that can operate at a threshold between innovation and opposition, and between new alternatives and new conventions. Design resistance can only operate in relation to the conventional trajectory of design. I now turn to elaborate resistance as a technique for alternative and oppositional designs.

3.2 Introduction to Design Resistance

This section introduces design resistance as a technique that works both against and with the conventional design trajectory. Design resistance will not be defined in a straightforward manner but will instead be articulated through a series of concepts. Two openly useless examples will be used to introduce design resistance: a useless covered spoon and elongated fork designed by Katerina Kamprani. Later in this chapter, the concepts introduced in this section will be elaborated using exemplars drawn from the alternative and oppositional design literature reviewed in chapter 2.

Resistant designs, or designs that exhibit design resistance, will often elide distinctions among words, things, arguments, concepts, objects, the abstract, and the concrete. This is something to be on the watch for. In terms of composing written accounts of design resistance and presenting resistant designs, this suggests the possibility and even the need to experiment with alternative formats, voices, and stylistics of writing. To articulate design resistance, this chapter experiments with typographically foregrounding certain portions of text that emphasize exemplifica-

---

[37] Blinder, "Vacated."

[38] Blinder, "Vacated."

tion. Within dense conceptual discussions of design resistance, passages of text focused on design exemplification are typeset in sans serif. For the visually inclined or verbally averse, the sans serif text forms a less resistant route to grasping resistance as a design technique.

The sans serif text functions like an extended image caption. If you just want to get the gist of things, you can more quickly make your way through this section by focusing on the sans serif text.

The san serif text punctuates the flow of the chapter to emphasize portions of design exemplification. The alternate visual form of the sans serif text additionally suggests a moderate blurring of the distinction between words and things. Design typography offers one very practical route forward from deep philosophical problems concerning words and things. While the nuances of these philosophical problems lie outside the purview of design research and HCI, the basic question of the distinction between words and things touches upon what it is that design research and research through design produces. In the context of designs techniques resistance, the blending or blurring of words and things is a tactic that may be actively employed in alternative and oppositional designs.

The Structure of This Section

This section works through a series of concepts organized into brief subsections.

Each concept is exemplified using the examples of a useless spoon and fork.[39]

Katerina Kamprani, from the series *The Uncomfortable*, http://www.kkstudio.gr/projects/the-uncomfortable

Each set of concepts will be articulated in conjunction with the above examples. Together, the concepts and examples function as a definition of resistance in both senses of the word—as a

---

[39] See Kamprani, Katerina. "The Uncomfortable."

verbal description of the meaning of a word, and as the outline of an image or object. Designerly exemplification and verbal conceptual articulation work together to mutually give definition to resistance as a design technique.

A Note on the Unusual Uselessness of the Introductory Examples

The useless spoon and fork function here as examples of design resistance *independent of any clear alternative and oppositional function discussed in chapter 2.* This point is crucial. The useless spoon and fork are not exemplary with regards to the social, cultural, and political functions of alternative and oppositional designs, such as critique, speculation, and agonism. Indeed the examples I mobilize in this section seem as though they are designed to flaunt their uselessness. As examples of design resistance they are perhaps best grasped as designs that function as *intellectual decoration*. Here in this chapter, these useless spoons and forks are to be understood as presenting design resistance for no other reason than to do so in order to delight in it. But in doing so they cleanly illustrate techniques of design resistance. To call these examples intellectual decoration, then, is pejorative only in the sense that something that merely delights the intellect momentarily functions poorly in terms of critique, speculation, or some other alternative and oppositional function. For delight is a very conventional function of design.

In the following section the basic techniques of design resistance illustrated by the useless fork and spoon will be shown to operate within other exemplary alternative and oppositional designs. The techniques of the useless spoons and forks will be put in conversation with examples drawn from the alternative and oppositional design works reviewed in chapter 2.

Design Resistance: Resistance In Use and Resistance Along the Design Trajectory

Design resistance is the formal term given to the design technique that will be elaborated over the course of this chapter, unfolding into a multiplicity of concepts and tactics for alternatively and oppositionally designing. Naming resistance is a way of pointing to technique already at work in a variety of alternative and oppositional designs. There are two key points at which design resistance operates. The first is from the perspective of firsthand embodied and embedded use of a technology: *resistance in-use*. As will be explained, however, resistance in-use is often experience within the imagination as a virtual actual use. The second key point of resistance is from the perspective of design, production, and distribution: *resistance along the design trajectory*. Resistant designs resist becoming the final products of the conventional design trajectory which they may appear to moving along. A design that appears clearly and conventional useful and hence has commercial product potential is not exhibiting design resistance but rather the opposite: the potential for conventional design success.

Using a resistant design entails a process of working both against and with design resistance. It involves a process of appreciating design resistance. At least initially, resistant designs may be difficult to grasp. But slowly their resistance begins to resonate; or else they are eventually rejected, if not quickly dismissed out of hand. Resistant designs will be explained as working by not quite working. When working by not quite working utterly fails, it reduces to a merely not quite working. As with any design, it is crucial to consider the user and context. And as with many alternative and oppositional designs, this chapter is running the risk of targeting too specific and exclusive of an audience.[40]

Resistance In Use

Good design, we are told, is intuitive and easy to use. Good design is unobtrusive. It is mostly invisible. It simply works without requiring our attention. When good design does stand out and demand our recognition, its role should be to immediately delight. Judged according to these conventional criteria, resistant designs are quite poorly designed. To pass this litmus test for a conventionally good design is to also fail to qualify as design resistance.

Design resistance is unconventionally experienced in use as *a use that resists use*—a **working by not quite working**. Resistance as a design technique doubles as an affectively felt experience of use. *Friction* is a better term than resistance for isolating what is affectively felt in use. The word friction strips resistance of its political, social, and cultural connotations. It renders resistance material, haptic, purely technical. Ultimately this chapter is working toward showing how friction can be productive of politically, socially, and culturally alternative and oppositional functions. Toward this end the term resistance works well. This chapter will not only describe resistance as a design technique, it will make design friction felt.[41]

---

[40] *But that's useless. It doesn't actually work. What's the point?* Such statements stem from trying to grasp resistant designs as conventional designs. This is not surprising. Resistant designs work in relation to conventional design. They put themselves at risk of being misunderstood as poor attempts at a good conventional design. Resistant Design is not a commonly understood category like Design, Criticism, or Art. This is a situation that many examples of design resistance capitalize upon. This issue of misunderstanding resistant designs as poor conventional designs could be resolved by instead simply calling resistant designs Art. But to call anything Art immediately shifts the frame of understanding: *Ah! There's a reason it doesn't make any sense. It is Art.* While there is no fatal contradiction in a work being both design and art, alternative and oppositional designs employing design resistance are capable of doing work that can be difficult or impossible when treated as Art. For example, it is different to experience a prototype as a potential future everyday product than to experience it as Art.

[41] The format of a written publication is limited in its capacity to make certain things felt. A document can most directly access the modes of vision through text and image. But it has a much more limited capacity to directly engage other sense modalities.

Take a look, again, at the images above.

Working by Not Quite Working

The term *working by not quite* working tries impossibly to capture in words the actual experience of appreciating a resistant design. Design resistance can be affectively felt with resistantly designed things even prior to writing resistance out. The phrase "working by not quite working" is itself designed to have affective resonance prior to clear verbal understanding.

Take another look above: The useless spoon and fork work by not quite working. That statement may be vague, but it makes some sense. Does it not?

Underlying the affective resonance of this vague phrase is analytic precision. "Working" references alternative and oppositional functions, or any function that initially resists being clearly and conventionally useful. For example, the keyworded functions of critique, speculation, and agonism are all "workings." "Not quite working" refers to a not quite working like a conventionally designed product, especially the specific and generalized conventional products that resistant designs are referencing and associating with.

The useless spoon and fork are clearly not quite working like conventional spoons, forks, tableware, and domestic and consumer products in general. An articulation of their potential workings by not quite working will be held in suspense until later in this section. But for now, note that there is something compelling about these proudly useless designs. One thing is clear: They clearly work well as useless designs.

"Not quite" leaves quite a bit of wriggle room. Not quite working may range from the apparently useless to the mildly resistant. A benefit of the wriggle room is that it allows resistant designs to give way into less resistant, more conventional things. Some resistant designs appear as though they have been designed to maintain resistance indefinitely. Others appear as though designed to eventually transition into better, more useful conventional products. Others hover ambiguously in between.

Using without Quite Actually Using (Virtual Actual Use)

Working by not quite working entails an unconventional mode of use for a product: imagined use without quite actual use.

The useless spoon and fork are working by not quite working. But they are also not quite actually being used. They are not being held in hand, but rather they are imagined to be held in

hand. These particular designs operate virtually as images rather than actually as objects. It is clearly possible, yet also clearly improbable, that these products would ever arrive in your actual hands. It is improbably because they are so clearly useless.

Using without quite actually using is characterized by a predominance of *virtual rather than actual use*. The concept of *virtual actual use* of a designed thing, or use without quite actual use, is derived from a specific philosophical understanding of the virtual developed by Brian Massumi, and which is in no way related to the virtual as associated with the digital.[42] When a technology is virtually used it is not actually embodied firsthand within an everyday practical context. Rather it is imagined as so.

It is unconventional to purely imagine using a product that appears to be intended for actual use. Resistance becomes less resistant when you understand that *virtual actual use* is a real and intended mode of use. Recognizing virtual actual use is a crucial for fully appreciating design resistance. Design is conventionally judged and evaluated according to the extent to which it manifests as an actual technology that is actually used. In order to work resistant designs must

---

[42] With some mild misuse, I am using the term virtual as it has been developed by philosopher Brian Massumi building upon Gilles Deleuze's concept of the "virtual" and Alfred North Whitehead's concept of "pure potential." Massumi concisely describes the elusive concept of the virtual as "abstract event potential" (Massumi, *Semblance and Event: Activist Philosophy and the Occurent Arts*, 16). Yet the virtual is best grasped by way of an example. In *Parables for the Virtual: Moement, Affect, Sensation, Massumi* writes that "the virtual is best approached topologically:"

> Imagine a pliable coffee cup. Join the surfaces of the brim, enlarge the hole in the handle, and then stretch it so that all its sides are equally thick. You get a doughnut. You could then tie this doughnut into complex knots. All of the geometrical figures you can create in this way are versions of the same topological figure. Topological unity is, in and of itself, multiple. Of course, it is impossible actually to diagram every step in a topological transformation. Practically, only selected stills can be presented. Once again, the need arises to superpose the sequencing. It is only in that superposition that the unity of the figure can be grasped as such, in one stroke. It is virtual because you cannot effectively see it or exhaustively diagram it. It is an image because you can, for all of that, figure it, more or less vaguely, in the imagination. (134.)

This sort of imaginative topological transformation is what occurs with what I am calling virtual actual use of a designed thing, or use without quite actual. It is "not quite actual" because it has not been lived out and experienced in a sensorial, embodied manner. But it is actual in the sense of occurring within experience. Or as Massumi puts it in *Semblance and Event*, "not actually, if that means corresponding to a sense impression ... Actually: as in *in act*." (17.)

For Massumi, imagination is intimately connected with the virtual:

> Imagination is the mode of thought most precisely suited to the differentiating vagueness of the virtual. It alone manages to diagram without stilling. Imagination can also be called intuition: thinking feeling. Not feeling something. Feeling thought—as such, in its movement, as process, on arrival, as yet unthought-out and unenacted, postinstrumental and preoperative. Suspended. Looped out. Imagination is felt thought only-felt, felt as only thought can be: insensibly unstill. (Massumi, *Parables for the Virtual*, 134.)

Virtual actual use of a designed thing does not involve a reflective sequencing of steps, but rather manages "to diagram without stilling." Use without quite actual use is feeling the thinking of actual embodied use.

not quite work. And for this some notable degree of use without quite actual use that stems from a not quite working is required.

These forks and spoons will continue to resist as long as you assume their purpose is strictly to be actually held in hand and used like a fork and spoon. They make much more sense once you appreciate that they are designed to be used without actually being used. These things do not aspire to be actually used in hand as embodied products. Once you understand them to primarily be images that allow you to virtually actually use the products they depict, it makes more sense to say that they work by not quite working *without quite actually being used*.

Virtual actual use may occur (and to some extent, always does occur[43]) even when a thing is experienced firsthand.

Even if you do actually hold these useless spoons and forks in hand, you may still virtually use them, as images, by imagining their useless actual use as devices for eating. Because they have unique features that make them quite useless as forks and spoons, you are more likely to imagine their uselessness in hand rather than actually experience their useless by attempting to eat something with them.

Resistance You Feel You Are Supposed to Feel

When it is working smoothly, not quite working (resistance) is not experienced as a failure or shortcoming of the design. Rather it is felt that resistance is supposed to be felt.[44] Resistance is experienced as an integral or defining feature of the design. The resistance feels intentional and perhaps oddly appropriate.

Take another look above. The functions of the fork and spoon have become impaired. A crucial affordance of the spoon has been covered up while a crucial affordance of the fork has been stretched to the point where there is no longer a useful point.[45] Below, the other key affordance

---

[43] As Massumi explains in *Semblance and Event*, "The key is always to hold to the virtual as a coincident dimension of every event's occurrence. Again don't take this a dichotomy but as a creative differential, one essentially ingredient to every experience to the extent that every experience is an occasion of lived abstraction" (18). In other words, there is always use potential that is virtually experienced, to varying degrees. Design resistance, however, brings use potential or lack thereof (it is typically a strange use potential) to the perceptual foreground of experience.

[44] Massumi offers a more precise language for describing this experience: it is "thought-felt." A "thinking-feeling" is "a thinking at one with a feeling: a thinking– further fused with a feeling of what is … It's more an open-ended tending-to than a reflection-of or a reflecting-on" (Massumi, *Semblance and Event*, 50).

[45] Affordance is a well-known concept in design that describes the perception of a potential for action or interaction. For example, the sharp points of a fork afford piercing food so that it may be lifted from the plate to the mouth and then eaten. Psychologist James J. Gibson originally defined affordance as action potentials latent within the environment. See Gibson, *The Theory of Affordances*. Don Norman later developed the concept in the context of user-centered design to emphasis the perception of affordances by users of technologies. See Norman, *The*

of the spoon and fork has been loosened up to a state of uselessness.

Giuseppe Colarusso, from the series *Improbabilita'*, http://www.giuseppecolarusso.it/improbabilita_.html

But none of these features are shortcomings of the design. They are clearly both intentional and appropriate design decisions. Intentionality and appropriateness are not solely being communicated with a polished formal aesthetic. These things appear intentional and appropriate because they appear *sensibly nonsensical*.

Once you feel that you are supposed to feel resistance then you are in a much better position to appreciate a design's working by not quite working. If, on the other hand, you do not feel that you are supposed to feel resistance then you will likely dismiss the design as utterly useless. That is, assuming you stuck with the design long enough to arrive at that conclusion.

These useless forks and spoons are not subtle when it comes to asserting their uselessness. With these examples it is unlikely that anyone would dismiss them as a failed attempt at usefulness. One thing these examples have working for them is that they are supremely open about their uselessness.

Design of Everyday Things. For a clarification of affordance as "perceived affordance," see Norman, "Affordance, Conventions, and Design."

However subtle resistance is also a powerful technique of resistance. Yet a risk taken with subtly resistant designs is that they are easily dismissed outright as useless. A product that carefully stands at the cusp of usefulness and uselessness may tend to be associated with an aspiring conventional product and thus tend to be dismissed as a failed attempt at a better product.

Resisting the Conventional Trajectory of Design

This felt resistance is not a problem that will be corrected in later iterations. Nor is it primarily a means to an ultimately better final version of itself. Resistant designs are not conventional design proposals, prototypes, or products. Resistant designs are unconventional in their resistance toward becoming a conventional final product. They are unconventional design because they resist the conventional trajectory of design that they may appear to be moving along.

The useless fork and spoon are not designed to become better versions of themselves. They are not prototypes for better spoons or forks. Neither are they final designs for products that will actually be manufactured, distributed, acquired and used. Yet they do appear as a final designs or products of sorts: they appear as unconventional final products of design.

Nonresistant Counterparts

Working by not quite working requires some clearly working point of comparison: a nonresistant counterpart.[46]

The conventional counterparts are clear: spoons and forks. But also: silverware, tableware, kitchenware, household goods, conventional products, everyday things. This covered spoon and elongated fork resist becoming better forks and spoons, at least by the standards of success defined by their conventional counterparts.

Resistant Proposals, Prototypes, and Products

Resistant designs are not conventional design proposals, prototypes, or products. Resistance is an unconventional product of design. (Yet resistance is a very conventional sort of product of Art and Critique.) A hallmark of good design is that it does not resist but instead just works. Conventionally good design works so well that its working largely goes unnoticed. For the most

---

[46] Here we can begin to discern inherent criticality in design techniques of resistance. As Foucault writes, "By its function [critique] seems to be condemned to dispersion, dependency and pure heteronomy ... It only exists in relation to something other than itself."" Thus," As Judith Butler explains, "[Foucault] warns us at the outset that critique will not be one thing, and that we will not be able to define it apart from the various objects by which it itself is defined." Butler, "What is Critique? An Essay on Foucault's Virtue," referencing Foucault,

part, it goes unrecognized that working things have been designed.[47] In contrast, resistant designs can prompt questions such as, is this a design proposal for something that should not actually be prototyped? Is this a design prototype for something that should not actually be produced? Is this a designed product that in fact does not actually quite work? And yet resistant designs *resist reducing to statements* such as, you should not actually prototype me, you should not actually produce me, and you should not actually use me. Even if the design does literally make those statements, their non-verbals forms can cause us to resist taking those statements quite so literally. Because design potentials and possibilities of becoming something else, something better, something more useful, can still be felt. Resistant designs still exhibit design potentials and possibilities.

It seems improbable, although not impossible,[48] that these spoons and forks will actually be prototyped and produced. However, the designs hold the possibility of becoming something less resistant and instead something more conventionally useful, usable, and desirable. In this case it may just be the faintest feeling of new design possibilities. But it is there.

Special Spoons Kit, design by Ineke Hans. Available for € 9,95 from Royal VKB (http://royalvkb.com).

Compelling Resistance

Resistant designs resist the conventional trajectory of design and the terminal point it is tending toward: a conventionally useful, nonresistant final product. Yet for the right audience, well-designed resistant things are compelling.

Although clearly unconventional, these useless spoons and forks are clearly well designed. Even

---

[47] As Apple's Chief Design Officer Jonathan Ives puts it in the film *Objectified*: "A lot of what we [at Apple] seem to be doing in a product like [the iMac flat-panel display] is getting design out of the way. With that sort of reason, it feels almost inevitable, almost undesigned and it feels almost, like of course it is that way. Why would it be any other way?"

[48] Colarusso, Giuseppe. "Improbabilita'."

though they do not quite work. Even though they resist becoming better forks and spoons. They are good design despite appearing useless and pointless. Correction: They are good design because there *is* a point and a use, and those are pointlessness and uselessness.

Resisting Reducing to Art

Resistant designs may be proudly useless,[49] but they are still recognizable, legible, and usable as design.

If these useless spoons and forks are also art, they are certainly not Fine Art. If they are Art they are much closer to Applied Art. They are applications of century-old Dadaist and Surrealist techniques of suspending the everyday, of defamiliarization, of making strange, of locating the uncanny as already within the everyday. These useless spoons and forks are well-designed visual lessons in the artistic technique of suspending everyday potential.

Resistant designs risk or even sacrifice their status as Art in order to engage from the more ordinary, more humble, more familiar perspective of design and everyday life. Just not too ordinary, humble, or familiar. For then they would simply be conventional, nonresistant designed things.

Productive Resistance

Of what is resistance productive? Designs are always moving along a trajectory, working to become something better, more useful, more desirable, more final. Where are resistant designs going? What are resistant designs becoming? What is resistance working towards?

In this example there is a uselessness that is compelling, yet it appears to be going nowhere. It feels as if it is grinding the design process to a halt rather than keeping things going. It seems to have terminated with an end product that is only slightly unconventional: *Intellectual decoration*, of an everyday sort appropriate for printing on coffee mugs and T-shirts.

---

[49] The notion of a proudly useless artwork owes to Massumi. "The perceptual self-referentiality of abstract painting as a thinking-feeling of vision-as-it-happens makes it, in itself, proudly useless. So what kind of aesthetic politics can come out of it? Is there any way that it can come out of itself, in resonance with other relational dynamics?" Massumi, *Semblance and Event*, 71.

The Uncomfortable spoon coffee mug ($15) and T-shirt ($22), by Katerina Kamprani, available from https://society6.com/katerinakamprani

The useless spoon and fork do not seem to exhibit any political, social, or cultural resistance. They seems to have proudly stated *We are useless, and there is no point in making us more real.* They appears as an openly clever conceits. For the unenthused, they are cheap one-liners, ironic laughs that quickly expires. There is no radical potential on display. No potentials on hand for political, social, or cultural resistance. No potentials for innovation either. No potentials for novel application or extension.

Or are there?

Multiple Users, Forms, and Experiential Modes of Use

The productive potentials and possibilities of resistant designs are suspended and depending. Potentials for use depend on how the work resonates and connects with its user/viewer/reader/interactor/participant/audience/market. It depends on who the expanded user is. It depends on how the design is presented, positioned, explained, and articulated. It depends on the forms and formats of the design, and where the limits of the design are drawn and are perceived. It depends on the mode of experience in which the design is encountered and used. It depends on the extent to which the design is actually *embodied* and *embedded* or else virtually used within imagination. [50]

---

[50] What I am calling embodied use to refer to firsthand interactions with technology characterized by the merging of a body and material thing. Philosopher Don Ihde, building on Martin Heidegger's concept of technology being "ready-to-hand," describes this technology relation as a "partial symbiosis" of a person and a technology during which the technology in use is "embodied" and becomes "perceptually transparent" (Ihde, *Technology and the Lifeworld*, 86). Another way of approaching embodied use is through the concept of affordance (see note above). As Massumi writes, " Everyday experience foregrounds the object-oriented, action-reaction, instrumental pole. That pole comes across as stable because it offers our action perches—"affordances" in J.J. Gibson's vocabulary. We

The images appear differently when printed on a coffee mug than they appear when positioned within this dissertation. And an image of a useless spoon printed on a coffee mug is different when encountered at an online store than it is when encountered within this dissertation. An image of a useless spoon is different than an actually useless spoon in hand. An image of a useless fork has different uses for the reader of this dissertation than it does for someone who encounters it at a design exhibition than it does for someone who encounters it printed on a coffee mug for sale.

While for any design it is true that judging its quality and function must be done with respect to audience, form, and experiential mode of use, this point is especially important for resistant design. This is because resistant designs will typically be designed for multiple audiences, forms, and modes of use. And oftentimes, the ambiguities concerning the actual or primary user, form, and use will be intentional.[51]

You as User/Reader/Viewer

For this audience, within this chapter, there is design potential and possibility within these designs. Here is some: Resistant Design as a new category of everyday products.

What if the useless covered spoon and fork were "everyday useless things"? What if you actually lived with them and used them *as* useless, resistant everyday products?

The speculative proposal is that uselessness and resistance could become embodied and embedded modes of everyday use (see previous footnote on embodied and embedded use). Things *like*

---

attend to the perchiness, and let the other side of that same coin, the passing-relation side, slip behind the use we can extract from the same perception" (Massumi, *Semblance and Event*, 45). For a discussion of embodiment within HCI and design see also Dourish, *Where the Action Is: The Foundations of Embodied Interaction*, 99-126 and passim.

What I am calling embedded refers to the use of a technology that has become deeply established within the material-social environment and hence persists over time to attain a high degree of familiarity and normality. In other words, embedded use refers to use embedded within everyday, routine practice. This embeddedness within practice is crucial for a design to establish itself as a useful everyday technology. As Shove et al. write, "In so far as desires, competencies and materials change as practices evolve, there are no technical innovations without innovations in practice. In other words, if new strategies and solutions in product or service development are to take hold, they have to become embedded in the details of daily life and through that the ordering of society" (Shove et al., *The Dynamics of Social Practice: Everyday Life and How it Changes*, 12, with reference to Shove et al., *The Design of Everyday Life*).

To speak of embedded embodied use is to reference a tendency for useful technologies to become routine, habitual, familiar, mundane, commonplace, pervasive, and socially and culturally shared. Consumer products, as discussed in section 3.1, are emblematic of embedded embodied use.

[51] This discussion is elaborated in Chapter 4, section 4.3: Users, Forms, Modes of Use.

the covered spoon and elongated fork might actually become practical, integrated, familiar, pervasive, mundane, and normal. The point is not that the speculative scenario can, will, or ought to be achieved, but rather that there is exciting design potential and possibility felt somewhere within the speculative proposal.

Exemplifying Design Techniques of Resistance as a Special Function of Resistance

The speculative potential of everyday resistant design relies on using resistant designs as examples of technique. Resistant designs function as examples of technique-potential, or how-potential. They exemplify *how* they work by not quite working.

Somehow these useless things are still good designs. And it is that some*how*—by some technique (not quite working: resistance)—that makes them good designs.

Extending Resistance to Less Useless Things

As exemplification of technique—techniques of resistance, friction, uselessness—resistant designs can be extended into other things. Their uselessness can be captured as usefulness toward other resistant and resistive political, social, and cultural functions. Resistance as a design technique is useful in the design of alternative and oppositional functions. Such functions have been conveniently keyworded in prior work: critique, speculation, agonism, reflection, slowness, ludic engagement, and others, including yet-to-be-articulated functions (Chapter 2).

The useless fork and spoon are not exemplary in any of the ways alluded to above. But the techniques of resistance that they exemplify will be shown to be useful in other alternative and oppositional designs that do have political, social, and cultural functions other than being proudly exemplifying their own uselessness.

Resistance is not futile, but rather futility is a technique of resistance. Resistance can slow things down. It can make things break. More things need to be broken (Section 2.2, design is harmful in its excess and design is not critical enough). When things stop working we can see how they work and how they do not work. Sometimes broken things can be fixed or remade better than before. Resistant things can become conventional things. Other times broken things are better left broken. Breaking things is a way to interrogate things and to speculate about how things could be otherwise. Design can be a powerful way to break things, both for bettering and for leaving broken. Breaking things, inhibiting things, and negating things can be positive functions of design. And broken things, inhibited things, and negated things can be positive forms of design. New things can be created by carefully breaking existing things. Resistant uses can lead

to new uses—resistant, nonresistant, or hovering ambiguously in between (counterfunctionality, chapter 4).

Design resistance has positive functions. But do not forget,

a useless spoon and fork may be useful for the design techniques they exemplify—techniques which may be put to use for alternative and oppositional functions—but a useless spoon and fork are still quite useless as actual spoons and forks.

3.3 Varying Resistance: Proposals, Prototypes, and Products

The useless spoon and fork may be useless as conventional forks and spoons, but they work well to exemplify resistance as a design technique. As proudly useless designs they exemplify resistance independent of any clear social, cultural, or political function such as critique, speculation, or agonism. Continuing with the proudly useless spoon design, design variations will be presented that vary their position along the design trajectory, moving from proposal to prototypes to final products. Collectively they push a proposal for a proudly useless design to an end point of the design trajectory. These design variations on a proudly useless spoon will be used to elaborate three previously introduced techniques for designing resistance: resistant proposals, resistant prototypes, and resistant products. Variations on a proudly useless design give structure to the following discussion that will introduce additional examples drawn from the alternative and oppositional designs reviewed in chapter 2.[52] How social, cultural, and political functions are achieved through the techniques of resistant proposals, prototypes, and products will be revealed using novel but seemingly useless design variations that turn out to be quite useful for exemplifying techniques of design resistance. It is important to highlight that the novel design variations on Katerina Kamprani's useless covered spoon have been created primarily as a means to exemplify technique. Outside of these discussions the value of these design variations is questionable.

Another key concept introduced in this section is virtual use near the threshold of actual use. Physical product designs are presented here in the form of images and text. As such each of the

---

[52] In this discussion of resistant proposals I draw predominantly on examples of speculative design discussed in Dunne and Raby's book *Speculative Everything*, examples of critical design discussed in Dunne and Raby's book *Design Noir*, and examples of adversarial design discussed in DiSalvo's book *Adversarial Design*. My reason for doing so is not to affirm these as canonical examples, but rather to make use of the work that others have already done to exemplify and articulate speculative, critical, and adversarial designs, given my concern here with elaborating techniques of resistance. A goal is to demonstrate how resistance is a key technique used to afford speculative, critical, and adversarial functions.

design variations presented must be used without quite actually being used, meaning that they function without actually being embodied firsthand by you the reader. Instead they are imagined to be used (by you) in an embodied manner. Virtual use can happen by looking at an image of a thing. But it can also occur when holding a product in hand and imagining embodied use of it. What brings virtual use near the threshold of actual use is the perceived potential to actually use it. Technologies within a science fiction or fantasy film, for example, are often worlds away from being at the threshold of actual use. Likewise many examples of speculative design and design fiction are at a discernible experiential remove from actual use potential.

A Useless Covered Spoon: A Proposal for Something that Should Not Actually Be Prototyped or Produced?

Katerina Kamprani, from the series *The Uncomfortable*, http://www.kkstudio.gr/projects/the-uncomfortable

Design proposals virtually propose actual use. Actual potentials for use are suspended with proposals.[53] A conventional reason for proposing rather than completely building is that the designer can explore which possibilities might actually be worth building prior to spending the time and effort to do so. Proposing rather than fully prototyping is pragmatically advantageous because every detail does not need to be actualized. Another conventional reason to suspend potential is that it might actually be impossible to actualize it. Once again, proposing allows the designer to explore and communicate possibilities prior to determining if it is viable and worthwhile to actualize them. A third reason to propose rather than prototype is that the

---

[53] On suspension of potential, see, Massumi, *Semblance and Event*, 40-45 and passim.

missing or not-yet-actualized details of the design afford imagination along with discussion and debate. This third reason is of particular relevance to design resistance where imagination is a key mode of intended use.

Resistant design proposals are characterized by a predominance of virtual use involving suspended actual use. A resistant proposal offers a working by not quite working without quite actual use.

Consider the useless covered spoon above. This is not a spoon. A spoon is designed for eating. Eating with this thing is difficult if not impossible. Although you probably cannot say this with absolute certainty, because you have not actually tried eating with this thing. This is not an actually useless spoon: It is an image of a useless spoon. It is a spoon that you imagine to be actually useless.[54]

This design suspends potentials for use within two modes of experience. Suspension #1 (a useless spoon): You can easily imagine actually being unable to eat with this "spoon." It is not a spoon. It is a useless spoon. Suspension #2 (an image of a useless spoon): But you cannot actually grasp it and try. Because it is not an actually useless spoon. It is an image of an actually useless spoon.

The design is both an image of a thing and a thing that is an image. It suspends potentials for eating within (virtual) embodied use (suspension #1) and it (as an image) suspends the actual potential for embodied uselessness (suspension #2). You can feel both modes of suspension. However the first suspension—the suspension of virtually actual uselessness—tends to dominate.

You hardly notice that you cannot actually reach out and grasp this useless spoon. You probably do not feel the desire to actually use this thing. Why would you: it is clearly quite useless.

The useless spoon is most readily grasped not as an actual product or even as a proposal that argues for producing an actual product. Rather the useless spoon is most readily grasped as a proposal for a product that probably should not actually be built and distributed. The useless spoon resists (virtually: within the imagination) being actually useful in hand. Because of this the image of the spoon resists becoming an actually useless spoon. The first suspension more firmly suspends the second. Together both suspended potentials resist being actualized through

---

[54] More precisely, this is a spoon that has been visually rendered actually useless. Even more precisely, it has been rendered actually potentially useless. Because the image is not someone holding the spoon or fork and attempting to eat with it but rather a spoon and fork just sitting there exhibiting potential for actually useless use.

a conventional design trajectory.

Some would describe this useless spoon design as an example of design fiction, discussed in chapter 2. Designer and design educator Jon Kolko emphasizes the discursive functions of design fiction. Kolko writes that an "alternative vision of the future takes the form of discursive design: a design that is intended to provoke thought, and is never intended to actually be built. I'll repeat that, in case it gets lost somewhere along the way: the goal of a discursive design is to illustrate a future and provoke thought, but not to actually be built."[55] Kolko drives home the point that a design can function discursively by resisting being actually built and used. Often-times the point of a design is to imagine using it without actually using it.

The useless covered spoon outwardly anticipates its own improbability of becoming actually useless in hands, homes, restaurants, product catalogs, retail storefronts, and other sites of everyday, routine life. It seems to come very close to coming right out and saying, *I am not actually supposed to be built*. Indeed, if you look closely, this proposal has not actually been built. It is not a photograph of an actual useless spoon. It is a computer generated rendering of an actual useless spoon.

The notion of discursive design is helpful for pointing out work that a design can do other than actually being built and then used. But the total reduction of this sort of visual design to discourse would be unfortunate for two reasons. First, this design is operating quite differently than what is often associated with discourse: verbal language, statement, and argumentation. What things do resists reducing to verbal language. Second, this design does not actually come out and say it is not designed to actually be built. Even if it did, it clearly looks like it *could* be built. It even looks like it, as a proxy for its creator, might want to be built. Nonverbal or less-verbal forms can and often do compete with, contradict, and even supplant the corresponding verbal authority of image captions, art statements, and user's manuals.

This proposal for a useless spoon may only be useful as an example that demonstrates technique. But the technique has been successfully used within alternative and oppositional designs that exhibit speculative functions.

Resistant Proposals with Speculative Functions

The technique of resistant proposals helps to reveal how many examples of speculative design and design fiction operate. In chapter 2 two examples of speculative designs that function as resistant proposals were presented. Auger and Loizeau's *Carnivorous Domestic Robots: Flypaper*

---

[55] Kolko, "Discursive Design Fiction," original emphasis, paragraph nine.

Robotic Clock is a proposal for an electronic 7-segment display clock that powers itself by harvesting flies and converting them to electrical power. Sputniko's *Menstruation Machine* is a proposal for a device that replicates the pain and bleeding of the menstruation cycle.

Menstruation Machine is not available to actually use as a therapeutic or empathic device. Likewise, *Flypaper Robotic Clock* is not available at a high-end design outlet for you to actually acquire for your home. Instead they function as resistant proposals that you imagine using. However, there is a distinct possibility that these designs might someday be available for you to actually use. *Menstruation Machine* appears complicated and expensive to build, but it is technically possible. *Flypaper Robotic Clock* appears plausible, although there are certainly many engineering challenges they may ultimately prove infeasible to overcome.

Another crucial aspect to observe is how many examples of speculative design and design fiction operate as proposals for products that cannot actually be prototyped or produced. Many speculative designs make use of emerging technologies. In chapter 2, two examples were presented of speculative designs that engage with the emerging technologies of lab-grown meat. Veronica Ranner's *Biophillia: Organ Crafting* and James King's *Dressing the Meat of Tomorrow* both propose forms of artisanal lab-grown meat production before such technological possibilities exist.

Philosopher Brian Massumi refers to "uses predicated on as-yet undeveloped technology" as impossible possibilities.[56] Design proposals allow designers to partially materialize impossible possibilities, or designs and uses that are partially actualized prior to the technologies that would allow complete actualization. Resistant proposals are a useful technique for creating designs that function to interrogate, question, and debate emerging technologies before they arrive.

---

[56] "Disengaged, only-thought utilities rise like a shadowy vapor directly from the ferment of potential, skipping over the necessary intervening steps through fully fledge, instrumental-development action-perception. Impossible possibilities are prospective shadows. This is not a utopian moment because it does not matter, to the artist or anyone else, if any once really takes them seriously—yet." Massumi, *Parables for the Virtual*, 123. While the artworks that Massumi discusses may not care if anyone takes their impossible possibilities seriously, the goal of speculative designs is precisely to be taken seriously as a possibility.

Auger-Loizea, *Flypaper Robotic Clock*, 2009, from the series *Carnivorous Domestic Entertainment Robots*.

Sputniko, *Menstruation Machine*, 2010. Photograph by Rai Royal.

Veronica Ranner, *Organ Crafting*, 2011, from the series *Biophilia*.

James King, *Dressing the Meat of Tomorrow*, 2006.

At this moment, it is difficult if not impossible for you to get your hands on *actual* artisanal lab-grown meat to eat or even just look at because the requisite technologies are only just beginning to emerge. However, you can richly imagine actual artisanal lab-grown meat when you look at the images of *Organ Crafting* and *Dressing the Meat of Tomorrow.* When you realize that lab-grown meat is in fact an emerging technology,[57] these images become less science fiction and instead design proposals for possible products in the future. Situated along the emerging trajectory of in vitro meat production, these speculative design proposals are products that cannot *yet* be actually used. But crucially, they someday might. As resistant proposals, these designs allow particular futures with lab-grown meat to be imagined and subsequently discussed and debated prior to actually being developed and achieved.

Design Variation #1: A Prototype for a Product that Should Not Actually Be Produced?

It may appear as though the original useless spoon is not supposed to be built, and it may even claim it is not supposed to be built. But what happens if it is? The point of the exercises that follow are not to improve upon the original design (indeed the design's will appear to become more useless), but rather to illustrate different techniques of design resistance.

Design Variation #1.1. This second variation begins to loosen up the second suspended potential (an image of a useless spoon, not an actually useless spoon).

The variation presented above is actually a computer-generated rendering. This second variation appears as though it may have actually been built and mass-produced. You still cannot actually grasp this useless spoon, but an object that appears to have been produced in quantity feels closer to being actually grasped than a rendering or one-off object.

This design variation makes embodied use feel closer. This variation may surface embodied potentials that were not apparent before such as weirdly sipping soup or getting pieces of food stuck inside the cover. But in doing so this variation also more firmly suspends the first suspended potential (uselessness). It makes the affordances of the spoon feel even more firmly negated and useless. It makes embedded use feel even less desirable and hence less probable. It pushes the product proposal forward along the conventional design trajectory into an actual physical embody-able prototype—one capable of actually being useless in hand. Yet the overall effect is to make it feel closer in order to make it feel further away.

---

[57] In 2013, the world's first lab-grown burger was cooked and eaten by food critics at a news conference in London. See Ghosh, "World's First Lab-Grown Burger Is Eaten in London."

A useless covered spoon, design variation #1.1

This useless spoon looks like something that has actually been used. This brings the potential for actual use closer to you. Yet this variation also makes the possibility of your actual use appear less likely: Why actually use something that is so clearly useless and unusable?

Variation #1.2 (Prototyping for Actual Use).

Useless covered spoons, design variation #1.2.

Now there are multiple built variations of the useless spoon. The prototypes look as though they have been created with the intent of actually being used. They appear to be prototypes for actual embodied, firsthand use.

This variation looks like conventional design prototyping involving both divergent and convergent explorations. Minor divergent variations are created in order to yield a better convergence on a better final product. These variations communicate process. They suggest commitment to actual embodied use. They suggest that the designer thinks it is worthwhile to build this thing in order to explore actual use. The apparent fact that its actually being built implies that there must be some point to actually building it.

But there is still ambiguity about the aspiration of this variation of prototype variants. Perhaps this set of prototypes is aspiring to become a commercial product. Perhaps it is aspiring to become a better spoon. Or, perhaps it is trying to make you the viewer/reader/user think more seriously about actually using it. It may just be trying to make a point about how it works by not quite working and without actually quite working. Additional, there is ambiguity about what it is: an object, an image, a prototype, a product, an example,…?

A verbal articulation of intent can help clarify:

"We constructed multiple prototypes to see if this absurd, useless design was actually interesting or useful to use." Or, "We constructed multiple prototypes not to actually be used, but in order to demonstrate how the construction of working prototypes can facilitate more powerfully imagined use." These are the sorts of accompanying text one might expect alongside these images.

Still, such words may not be believable. In fact, such words may be designed to not be believable. Verbal articulation can create additional ambiguity, or even help clarify the use of intended ambiguity. Irony is a technique often used in parallel with design resistance. Indeed, there is something inherently ironic about designing something that works by not quite working, something whose use *is* to resist itself.

Variation #1.3 (Prototyping to Observe Actual Use).

Useless covered spoon, design variation 1.3

Now the useless spoon prototypes appear as though they have been actually used. And those that actually used them may have been people outside of the design team.

With this variation there is an apparent interest in understanding *how* the useless spoons are actually used. There is empirical investigation of actual embodied use—a lab study, for example. There may even be empirical investigation of embedded use—a long-term field study, for example. But again there is ambiguity concerning intent. Is this variation a sincere attempt to determine if it is or could become an actually useful product? Once again, verbal articulation of intent can help clarify:

"Participants expressed an interest in . . ." This the sort of statement one would expect to read alongside a report from a lab evaluation or field study of these prototypes.

A commitment to building can make actual use feel closer. And this vicarious virtual use accessed through the image can make actual use feel closer for the viewer. Verbal articulation can claim that these things are in fact worthwhile to build and actually use. Still, these seem like

prototypes for a product that will never be produced and distributed to an audience outside of these participants. They do not seem to clearly hold potential for actual use. They do not appear to be successfully useful as actual products. These variations are quite possibly only useful as examples that demonstrate technique. But the technique of resistant prototypes has been successfully used in many alternative and oppositional designs.

Resistant Prototypes with Critical and Adversarial Functions
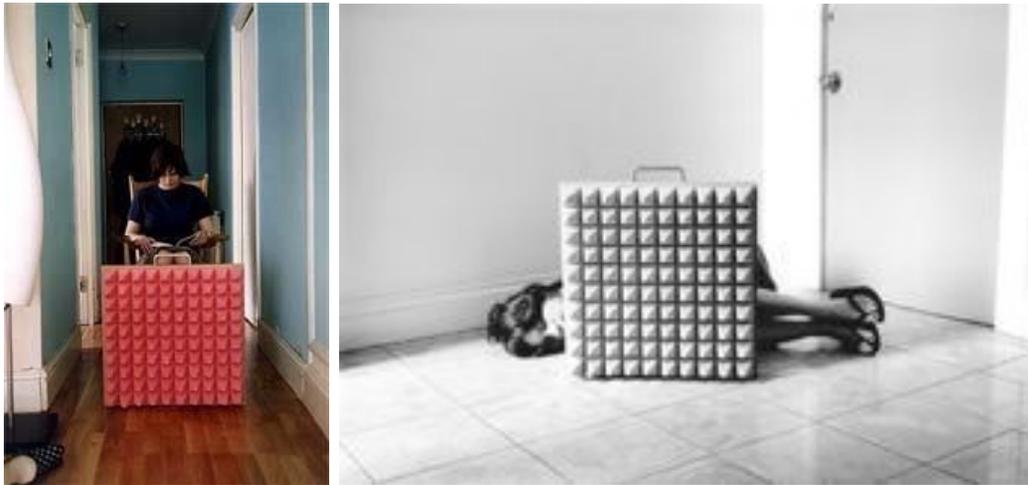
Anthony Dunne and Fiona Raby, *Electro-Draught Exluder*, 2001, from the series *The Placebo Project*.

The technique of resistant prototypes reveals how many examples of critical design and adversarial design tend to operate. Dunne and Raby's *Placebo Project*, discussed briefly in chapter 2, operates along the lines of a resistant prototype. Understood as a resistant prototype, the *Placebo Project* prototypes anticipate their own failure to develop any further as products. Instead, the prototypes function to draw the viewer/reader into the narrative of use. Documentary photographs and interview transcripts, presented in both publications and gallery exhibitions, work to depict and describe actual use of the prototypes within their actual everyday domestic environments.[58] For the viewer/reader of these publications and exhibitions, these prototypes offer compelling virtual use approaching the threshold of actual use. The strangeness of the prototypes, amplified with aestheticized documentary photography, offers resistant virtual embodied and embedded use to the viewer. Resistant prototypes are a means of creating compelling virtual use that is drawing closer to the threshold of actual use.

The *GPS Table*, *Compass Table*, and *Electro-Draught* prototypes appear and are described to

---

[58] See Dunne and Raby, *Design Noir*.

actually work from a technical and interactive perspective.[59] Actual people have actually used them, it appears. They have used them in their actual, everyday environments. These images depict people making strange use of these strange prototypes. In the process, their homes and lives are rendered strange. The viewer imagines the firsthand embodied and embedded experiences of living in an everyday environment made strange with these strange devices. These prototypes appear to have actually worked by not quite working. They appear to have been experienced as resistant prototypes. It appears unlikely that these strange, resistant prototypes would ever be developed further as products that you the viewer could actually acquire and use. But they might. After all, they have actually worked.

Mark Shepard, CCD-Me-Not Umbrella, See Shepard, "Sentient Cities."

Mark Shepard's *CCD-Me-Not Umbrella*,[60] briefly discussed in chapter 2, can also be understood as a resistant prototype. It crosses a threshold from proposed imagined into actual use by demonstrating actual interactive and embodied use of the device. The *CCD-Me-Not Umbrella* in fact goes a step further toward becoming a product that you can use by revealing the simplicity of its technical operation in a way that suggest that a technically-inclined user could easily construct one today.

The *CCD-Me-Not Umbrella* operates, virtually through images and textual descriptions, as a technically functional prototype that is capable of actually disrupting surveillance technologies. It does this in order to "let you flirt with object tracking algorithms used in advanced surveillance systems."[61] But it gains its imaginative power from not yet being a fully formed product. It is a possible future product "for survival in the near-future sentient city."[62] As an example of

---

[59] In the case of the Electro-Draught, it actually does not function to absorb radiation. The Electro-Draught is a placebo prototype, produced as a prompt. See Dunne and Raby, *Design Noir*, 78.

[60] See Shepard, "Sentient City Survival Kit."

[61] See the project website, Shepard, "Sentient City Survival Kit." "When human vision is no longer the only game in town, don't leave home without this umbrella studded with infrared LEDs visible only to CCD surveillance cameras, designed to let you flirt with object tracking algorithms used in advanced surveillance systems. Use in pairs with a friend to train these systems to recognize nonhuman shapes and patterns more common to dreams and hallucinations than to your average city street."

[62] See Shepard, "Sentient City Survival Kit."

adversarial design discussed by DiSalvo,[63] *CCD-Me-Not Umbrella* is poised to facilitate agonistic debate about both the present state of surveillance and the near-term scenarios of where it might lead.

The *CCD-Me-Not Umbrella* appears and is described to actually work. The technological construction is quite simple, at least for a certain technically-inclined audience. As the diagram shows, it consists of a battery, a switch, and an array of superbright Infra-red LEDs.

As a prototype that appears actually usable, the *CCD-Me-Not Umbrella* demonstrates the possibility of actually flirting with the pervasive CCD surveillance technology that exists today. That it is possible to actually use this prototype today draws attention to the largely invisible pervasiveness of existing surveillance technology.

What is possible today with the *CCD-Me-Not Umbrella* extends out into what might be possible, or even looming, tomorrow. Resistant use of the prototype today extends out into a possible mundane use of a new product tomorrow. The resistant prototype prompts the viewer-user to imagine a near-future where flirting with, rather than combating or countering, pervasive surveillance technology is an ordinary practice. In such a future, oppositional resistance with the goal of negation has perhaps become futile.

The power of *CCD-Me-Not Umbrella* as a resistant prototype is that its demonstration of actual use today, which brings into focus the current reality of surveillance technology, unfolds into speculative, only-imaginable uses tomorrow. Is that a future we want? Is *right now* a reality we should accept?

Within HCI the design and presentation of alternative and oppositional designs tend to favor the technique of resistant prototypes that operate close to the threshold of products. The collective work of the Interaction Design Studio and ludic design exemplars such as the *Drift Table* and *Indoor Weather Stations* are exemplary in this regard.[64] Prototypes fit nicely both with HCI's engineering interest in technical novelty and scientific interest in empirical observation and evaluation. Prototypes that demonstrate actual use and allow actual use to be empirically studied also fit well with the Research and Development paradigm in which the goal is to experiment with the technical possibilities that can then become commercialized products.

It is important to reiterate that prototypes are best understood as middlings in the design process. Some tend toward proposals, while others border on full-fledged products. Some prototypes diverge while others converge. Many waver between proposals and products. Prototypes can be crude or polished. They can commit or remain noncommittal. Once again, it

---

[63] DiSalvo, *Adversarial Design*, 105-111.

[64] See Gaver et al., "The Drift Table," and Gaver et al., "Indoor Weather Stations."

also important to remember that the goal here is not classificatory or ontological. The goal is to reveal technique. The question is not whether an example is definitively a resistant proposal or else a prototype or else a product, but rather how a designed thing is operating as a proposal, prototype, product, or some combination.

A crucial feature that allows a product to cross a threshold into a product is a compelling mode of distribution. Products are designed so that people can actually get their hands on them. Products are diligently working to become more than prototypes. Everyday products are working to be more than prototypes for an exclusive and initial few.

Design Variation #2: A Product You Do Not Want to Actually Use?

The useless spoon prototypes presented above may appear destined to never leave the lab, the field, the showroom, or the publication.[65] But once again, what if they do?

Tutorial for constructing a useless covered spoon (design variation 3).

---

[65] On the field, lab, and showroom as key contexts and methodologies for constructive design research, see Koskinen et al, *Design Research Through Practice: From the Lab, Field, and Showroom*. For a discussion of the need to add the publication to list of lab, field, and showroom, see Pierce, "On the Presentation and Production of Design Research Artifacts in HCI," 740 and passim.

This third major variant brings the actual use potentials of the useless spoon even closer. See Appendix E for the full tutorial, or visit:

http://www.instructables.com/id/Useless-Covered-Spoon/

This tutorial shows you how to make a useless spoon. The necessary materials are readily accessible. Disposable plastic spoons can be freely obtained at any fast food restaurant or gas station. A crude version of the useless spoon can be constructed with a common cigarette lighter and a pair of scissors. A basic soldering iron is required to construct the more refined version.

A tutorial—distributed through print or online publication, for example—is a mode of distribution.[66] A tutorial as a mode of distribution is a mechanism for actually putting a useless spoon in your hands, although it is a mode of distribution for a product that you will have to assemble yourself. A tutorial places the burden of production on the user. It is not as readily available as other common modes of distribution. For example, it is not a mere button-click away on Amazon or a specialty online retailer. Nor is it a commute to a major retail outlet or a boutique shop. Yet the online tutorial is a mechanism that allows for millions of people to potentially produce and then use the useless spoon at this moment.

An actual mode of distribution moves a possibility of use toward the threshold of a potential for actual use. For those with the capacity and motivation to construct one, the useless spoon is close to the threshold of becoming actually usable.

The online tutorial offers the potential for the useless spoon to actualize in people's hand, homes, and cities.

A mode of distribution allows an actual product to potentially become socially shared. Crucially, a mode of distribution moves a product closer to a threshold of actual use regardless of whether one actually acquires it and uses it. This online tutorial for creating this useless spoon is accessible to potentially millions. Moreover, the materials and tools are cheap and readily accessible for many. Consequently, it holds the potential—not to be confused with actuality or likelihood—of being produced and then actually used by any one of millions of people. Millions of people will not actually build and use it, of course. Because it is quite useless. But it appears possible that many could actually use it. And consequently, many just might actually use it.

---

[66] For a discussion of online tutorials and everyday design, see Wakkary et al., "Tutorial Authorship and Hybrid Designers: The Joy (and Frustration) of DIY Tutorials."

The online tutorial allows you to imagine that millions of people might actually construct and use the useless spoon. You know that this actually will not happen. Yet you can see that the possibility has been demonstrated. The online tutorial is an actual mode of distribution which shows you how to make a useless spoon to put in your own hand.

On the one hand, this potential of the online tutorial moves the useless spoon closer to the thresholds for shared actual use, embodied actual use, embedded actual use, pervasive actual use, and everyday actual use. Yet somehow an actual mode of production and distribution is here making actual use feel farther away.

This online tutorial for a useless covered spoon provides the information and tools to enable you to make it and use it. It offers you the possibility of actual embodied and embedded use. But you will not make it and use it, will you?

This resistant tutorial for a resistant product sets itself up for the likelihood of failure. It anticipates its own failure as an actual embodied and embedded product.

This online tutorial resists actually being executed. It is clearly possible to build, use, and even integrate the useless spoon within a daily routine. And for many, it is a fairly simple task to build it. Yet why would anyone actually build a clearly useless product? Paradoxically, distribution of the useless spoon makes it appear less likely that people will ever actually use it.

Embodied use of this thing is not impossible. Actually, it is completely possible. Yet it is actually not happening. It is an actual demonstration of the improbability of embedded use. This is the opposite of the impossible possibilities discussed by Massumi and proposed in many speculative designs and design fictions.[67] Many speculative designs and design fictions propose technologies that are not yet possible from a technological or economic perspective. The impossible possibilities of actual use today are virtually proposed as the possibility of embodied and embedded uses in the future.

In contrast this design variation is a possible impossibility: It is very possible it will not actually be used, will not be embodied, and will not become embedded. And we can feel this because its actuality is clearly possible, yet embodied and embedded use are not happening and do not seem likely to occur. It is "unlikely but not impossible."[68] It is technically very possible, but practically unlikely.

It is possible that millions could use this useless spoon. The tutorial demonstrates that it is clearly *possible* for any one of millions to actually build and use this useless covered spoon. But

[67] See note above. Massumi, *Parables for the Virtual*, 123.

[68] See Colarusso, Giuseppe. "Improbabilita'."

it is also clearly *improbable* that many people—or even a single person?—would actually build and use this useless spoon. Practically speaking, we might as well say it is impossible.

As a mode of distribution, this tutorial is a demonstration of concept that is simultaneously a demonstration of failure. But its failed actualization is a successful virtualization of possible actualization: you experience its actual failure to actualize, and this keeps its imaginative and speculative potentials alive. The design potentials and possibilities of the useless spoon are firmly suspended.

There is a potential use for a compelling product that somehow nonetheless continually fails to actualize.

As soon as the useless spoon is actually used by millions, we lose the capacity to *purely* imagine it doing so. As long as the useless spoon successfully resists reaching the threshold of actual use, we can continue to purely imagine all sorts of things it might become.

And imagination can be a very useful thing.

Resistant Products

Many alternative and oppositional designs make use of the technique of resistant products with modes of widespread distribution. Here I will focus on the web browser extension *Oil Standard*, a work by Michael Mandiberg, as an example of resistant product distributed electronically as software. The political functions of *Oil Standard* have been written about by scholars as an example of both tactical media and adversarial design.[69] *Oil Standard* advertises itself as a Firefox "web browser plug-in that converts all prices from U.S. Dollars into the equivalent value in barrels of crude oil."[70] For example, when browsing Amazon.com to shop for a digital music player, *Oil Standard* replaces the monetary price with the equivalent value in barrels of crude oil. The extension is freely available to download from the *Oil Standard* website. While the descriptive language of the website refrains from making overt political statements, this language intentionally belies the intended political functions of the browser extension. Understanding *Oil Standard* as a resistant product contributes several points to these discussions. First, *Oil Standard* operates through a widespread mode of distribution. Although it faces fierce competition among other extensions and apps, *Oil Standard* holds the potential to be actually used by millions of users around the world.

---

[69] See Raley, *Tactical Media*, 2-3 and DiSalvo, *Adversarial Design*, 48-55.

[70] Mandiberg, "Oil Standard."
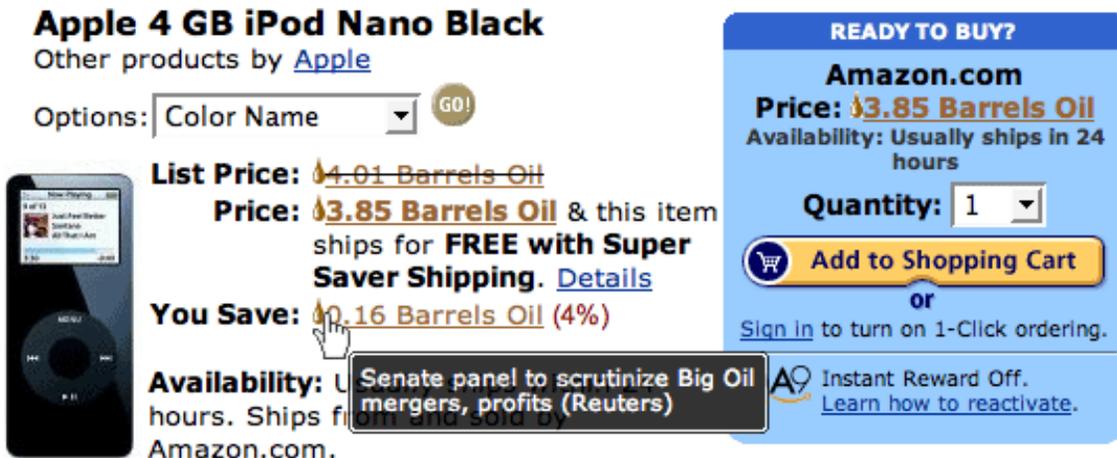
Michael Mandiberg, *Oil Standard*, 2006, http://archive.turbulence.org/Works/oilstandard/

At the time of this writing, you can download the *Oil Standard* Firefox extension: https://raw.github.com/mandiberg/Oil-Standard/master/oil_standard.xpi

Second, *Oil Standard* is not a conventional browser extension. *Oil Standard* offers resistance toward its own actual embodied and embedded use. The screenshot image featured on the website conveys this resistance. From this image, it is clear that *Oil Standard* does not make online shopping easier. Instead it offers resistance toward the familiar and typically nonresistant activity of online purchasing.

Oil Standard offers resistance toward actual use. This is summed up in a user review: "Now you want to talk about oddball extensions, I think this one takes the cake. *Oil Standard* is a tool that converts all prices from U.S. Dollars into the equivalent value in barrels of crude oil. Why would you need this? I have no clue at all. It is pretty fun to play with and to settle arguments with friends. Come on, I know we have all argued that our stuff would convert to more oil than their stuff. When you load a web page, the script seamlessly inserts converted prices into the page. As the cost of oil fluctuates on the commodities exchange, prices rise and fall in real-time."[71]

Oil Standard is definitely not a productivity application, as most browser extensions are. It resists productivity as it is conventionally understood. Instead *Oil Standard* creates a tension between desiring to purchase a new product and being resisted with an unfamiliar and seemingly irrelevant cost when trying to make a purchasing decision. In this scenario the extension replaces the familiar dollar sign value with the foreign currency of oil. *Oil Standard* is working to surface international oil politics by revealing the dependency between the dollar sign value of consumer products and the global price of crude oil. The name of the app is itself a pun on the

---

[71] "Oil Standard - Odd Extension."

gold standard by which many currencies were formerly set.

The counterproductivity offered by *Oil Standard* affords new political and reflective functionality. Carl DiSalvo uses *Oil Standard* as an example of how design can politically function to reveal hegemony.[72] "Revealing hegemony," DiSalvo writes, "is a tactic of exposing and documenting the forces of influence in society and the means by which social manipulation occurs."[73] As DiSalvo observes,

"[W]hen a user casually shops online with *Oil Standard* installed, she ubiquitously encounters the value of oil. As long as the extension is running, there is no escape from the collapse of all values into the currency of oil, thus performing the notion of the influence of oil as being all encompassing."[74]

Third, a correction to the second point concerning resisting use is in order:

At this moment, we virtually *imagine* that *Oil Standard* offers resistance toward actual embodied and embedded use. We are not *actually* using *Oil Standard* as an embodied, embedded product operating within our web browser.

The screenshot (see image above) coupled with the possibility of actually downloading the extension affords compelling virtual use nearing the threshold of actual use. As an actual product that is virtually experienced, *Oil Standard* holds the potential to reveal hegemony without being actually downloaded and used. Ironically, its potentials for widespread distribution allow it to circulate more forcefully as a product that is virtually rather than actually used. This is the idea of dissemination through distribution of a resistant product.

More people have probably imagined using *Oil Standard* than actually used it. But the reason that people have imagined using it is because they could actually use it. *Oil Standard* is disseminated through an actual mode of distribution.

Virtual use of an actual product is a reality. It is something we "can't not experience when we're faced with it."[75] But again, the distinction between actual and virtual use is not quite so clear-cut.

---

[72] As DiSalvo writes in *Adversarial Design*, "Revealing hegemony is a tactic of exposing and documenting the forces of influence in society and the means by which social manipulation occurs." "Identifying and making hegemonic forces and their means knows is vital to the discourses of agonistic pluralism because it helps people discover and label sites and themes of contention in the political landscape." (35.)

[73] DiSalvo, *Adversarial Design*, 35.

[74] DiSalvo, *Adversarial Design*, 53.

[75] Massumi, *Semblance and Event*, 41.

There are many different ways to actually use *Oil Standard*. You can download it, install it, run it on your computer. You can go to Amazon.com and browse for just a few sections to verify that it works, after which point you never use it again. You can use it every single day as a way of replacing or supplementing dollar sign value with the fluctuating price of crude oil. Or you can just browse the *Oil Standard* website, get a feel for the product, but ultimately decide not to download it.

Whose use is "more actual:" Someone who carefully reads the entire *Oil Standard* but does not download it; or someone who immediately downloads it, uses it once on Amazon.com, then promptly disables it?

The instructive question to ask here is, where are the thresholds of actual uses? The important point to observe is that what we typically assume to be actual use of a designed product is in reality just one mode of use. This is true for virtually any thing. For example, people use books all the time without having read them in their entirety. Often we reference or talk about books that we own but have perhaps only given a cursory glance through. Chances are that there are books in your home that you have never "actually read." Similarly, we own clothes, tools, toys, music, letters, emails, and photos that we seldom if ever have actually used. But this doesn't mean that they are not used or are not useful. Another way of seeing these things is that they are being used as potentials for actual use. Virtual use is not a replacement for actual use. Rather virtual use is another mode of use that differs from so-called actual use.

Virtual use of *Oil Standard* is not a replacement for actually using it. But virtual use *is* a very real use of *Oil Standard*. Moreover, *Oil Standard* has been designed for virtual use. *Oil Standard* has been designed to make you think about it, and oil, and your use of online shopping sites, money, and consumer products.

If you do actually download, install, and use *Oil Standard*, new uses will emerge. But prior to actually using it, *Oil Standard*'s *potentials for actual use* afford compelling virtual use near the threshold of actual use.

Virtual use near the threshold of actual use can effectively create compelling imaginative use of something that is never actually encountered firsthand. For example, documentary imagery and textual description of an actual prototype offers virtual use approaching the threshold of actual use. Offering virtual use near the threshold of actual can be a powerful design technique. The potential to actually use a product is compelling even if you do not actually use it. Products that are virtually usable at the threshold of actual use can be a powerful mode of *dissemination through distribution*.

In concluding this discussion, the actuality and importance of actual as opposed to purely virtual use must be asserted. Surprises always occur when crossing a threshold from virtual, anticipated use to actual use. Sometimes these surprises are disappointing or frustrating. Sometimes there are pleasant surprises. Sometime actual use is better than we ever imagined it could be. Actual use can long outlive our virtual hopes and expectations. Virtually resistant uses can turn out to be surprisingly useful and much less resistant than we imagined they would be. The transitions between resistant virtual and actual use represents a key area of empirical investigation for future work.

However, the focus of this chapter is everything virtually leading up to actual use. This chapter is working to come as close to actual use as a chapter can. If successful, this section has compellingly demonstrated the actuality and importance of virtual use in the design of resistant proposals, prototypes, and products.

3.4 Getting the Tension Right, but Not Quite Right: Composing Tensive Use

The design variations on a useless spoon have been used to reveal techniques. They have shown us hows. Design variations on a useless spoon have revealed three variations on the technique of design resistance: resistant proposals, resistant prototypes, and resistant products. Each brings potential for actual embodied and embedded use closer, although not necessarily quite within actual reach. Yet resistant proposals, prototypes, and products each continue to resist uses—actual uses, virtual uses, embodied uses, embedded uses, everyday uses, nonresistant uses. Tension is created by designing things that bring potentials for actual use closer but at the very same time are able to resist actual use. Such tensions surface across various alternative and oppositional design works and writings. Andrew Blauvelt curates designs that exhibit what he terms a "strangely familiar" quality.[76] Borrowing a phrase from Martin Amis, Dunne and Raby write about critical designs that offer "complicated pleasure."[77] Dunne writes about a design aesthetics of "user-unfriendliness" and of "functional estrangement."[78] James Auger describes

---

[76] See Blauvelt, Andrew, *Strangely Familiar: Design and Everyday Life*, 14-37 and passim.

[77] Dunne and Raby attribute this phrase to Martin Amis in Dunne and Raby, *Design Noir*, 63. Complicated pleasure is also discussed in Dunne, Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design.

[78] Dunne, *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design,* 35, 41-42. Dunne writes of "user-unfriendliness a form of gentle provocation" which could "characterize the post-optimal object. (35). Of functional estrangement, Dunne writes, "To provide conditions where users can be provoked to reflect on their everyday experiences of electronic objects, it is necessary to go behind forms of estrangement grounded in the visual and instead explore the aesthetics of use grounded in functionality, turning to a form of strangeness that lends the object a purposefulness" (41-42).

how speculative designs work by creating "desireable discomfort."[79] Kenji Kawakami's concept of chindogu (珍道具) describes that art of designing unuseless inventions, or weird tools.[80] And Giuseppe Colarusso, the designer of the second set of useless utensils that appeared in section 3.2, describes the Improbalita' series as "unlikely . . . but not impossible."[81]

These concepts suggest tensions between conventional and unconventional use, familiar and strange use, useful and useless use, and actual and impossible use. A tension is created by resisting nonresistant, everyday embodied and embedded use. But how is compelling tension created? How does one create contradictions that are not too easily dismissed out of hand, or rejected in hand? How does one create engaging tension, interesting tension, even useful tension?

For Dunne and Raby, "A slight strangeness is the key—too weird and they are instantly dismissed, not strange enough and they're absorbed into everyday reality . . ."[82] In later writings, Dunne and Raby continue this line of thought, noting that "to be effective, [speculative and critical design] needs to contain contradictions and cognitive glitches. Rather than offering an easy way forward, it highlights dilemmas and trade-offs between imperfect alternatives."[83]

Auger discusses getting the balance right between familiarity and provocation: "If a design proposal is too familiar it is easily assimilated into the normative progression of products and would pass unnoticed. However, proposals dealing with sensitive subjects such as sex or death can quite easily stray too far into provocative territory, resulting in revulsion or outright shock."[84] Getting the tension right, but not quite right, appears to require a balanced imbalanced composition. When not enough tension is felt, the user is likely to respond: That's a great idea! People would totally buy that. This is actually really useful. When there is too much tension, the response is more likely: What's the point? This is completely useless.[85]

---

[79] Auger, "Speculative Design: Crafting the Speculation," 14.

[80] See Kawakami, *101 Unuseless Japanese Inventions: The Art of Chindogu*.

[81] Colarusso, "Improbabilita'."

[82] Dunne and Raby, *Design Noir*, 63.

[83] Dunne and Raby, *Speculative Everything*, 189.

[84] Auger, "Speculative Design: Crafting the Speculation," 14.

[85] In "Critical Design FAQ," Dunne and Raby write "[Critical Design] is definitely not art. It might borrow heavily from art in terms of methods and approaches but that's it. We expect art to be shocking and extreme. Critical Design needs to be closer to the everyday, that's where its power to disturb comes from. Too weird and it will be dismissed as art, too normal and it will be effortlessly assimilated. If it is regarded as art it is easier to deal with, but if it remains as design it is more disturbing, it suggests that the everyday as we know it could be different, that things could change."

At least part of the trick is to avoid surpassing certain thresholds that yield unacceptable extremes: utterly useless or clearly useful (spectrum of utility), totally bizarre or completely familiar or normal (spectrums of familiarity and normality), pure fantasy or current reality (spectrum of possibility). All of this points to a careful composition of opposing effects to create a compelling tension. This chapter has pointed to three differentials of tension to attend to: useful-useless, familiar-strange, actual-impossible. Additional analysis is sure to reveal others.

Such heuristics are of course not a foolproof method for creating compelling design tension. Bardzell et al. discuss how their own experience suggests that "achieving this 'slight strangeness' is anything but straightforward, as it plays out across conceptual, functional, material, and aesthetic dimensions of design in complex ways. Often, designers rapidly generate and iterate on solutions as a way to reason about a problem space; when the problem space itself is transgression and provocation, some of our more familiar strategies will undoubtedly come up short."[86] When it comes to designing resistance, however, a foolproof method may be neither possible nor desired. In this chapter, I have suggested a set of techniques as resistant methods for creating compelling tension towards resistant ends. In the previous section, I revealed how design resistance can be interpreted as resisting the conventional trajectory of design along three key points that give form to the trajectory: proposals, prototypes, and products.

Getting the tension right but not quite right depends on other important questions. What constitutes the design? Who is the user/audience? What is the experiential mode of use? What is the context and duration of use? The crucial dimension of time, for example, has been largely absent from these discussions. These questions will be briefly revisited in the concluding sections of Chapter 4. A more thorough treatment of these questions, however, will have to be set aside for a later date.

3.5 Summary

This chapter has articulated and exemplified resistance as a design technique. Three variations on the technique of resistance have been formulated: resistant proposals, resistant prototypes, and resistant products. These variations plot out three points of resistance along the conventional trajectory of design. Resistant proposals resist becoming conventional prototypes. Resistant prototypes resist becoming conventional products. And resistant products resist being conventionally acquired and used.

---

[86] Bardzell et al., "Critical Design and Critical Theory: The Challenge of Designing for Provocation," 294.

The experience of using a resistant design is encapsulated in the term working by not quite working. This term is designed to capture the affective and cognitive experience of encountering and using a resistant design. The term has also been designed to precisely isolate key elements of this experience of use. Working refers to alternative and oppositional functions such as critique, speculation, reflection, or agonism. Working more generally refers to any unconventional, alternative or oppositional function. Two new alternative and oppositional functions have been articulated here: compelling tension and intellectual decoration.

Not quite working refers to the experience of feeling resistance toward conventional, nonresistant use. Not quite working is shorthand for "not quite working like a conventional design." The conceptual space between just plain working and utterly failing to work is where resistant designs operate. Working by not quite working can be difficult to grasp, especially when viewed from a conventional instrumental perspective. Yet working by not working affords a range of alternative and oppositional design functions. To do so, it riskily operates at the thresholds of usefulness and uselessness, familiarity and strangeness, possibility and impossibility, and design and art.

Another key concept introduced was working without actually quite working. As with the concept of working by not quite working, there is a precision underlying this seemingly vague notion. Conventional products are used in an embodied and embedded manner. They are actually used firsthand. The most successful conventional products become routine, familiar, pervasive, even mundane. Resistant designs are oftentimes not actually encountered firsthand. Moreover they are often designed to function as products you imagine using rather than actually use. Counter to intuition, making an actually working product is an effective technique for creating more compelling imagined actual use. Indeed, commercial advertisements and product placements in films function in this manner to create compelling imagined use for a potential consumer. With resistant designs, however, imagined use is often intended and conceived as an end use. Complicating things even further, actual firsthand use of a resistant product may extend into virtual use. Reflecting on one's own resistant use is a primary function of many resistant products.

To help grapple with the complexity of imagined uses as they intersect with actual uses, three modes of use were articulated. Resistant designs were shown to target some combination of three modes of use: (#1) virtually experiencing resistant actual embodied and embedded use, (#2) virtually experiencing resistance near a threshold of actual use, and (#3) experiencing resistance in actual, firsthand, embodied use.

Chapter 4

Digital Limitations and Counterfunctional Devices

This case study puts resistance to work among critical concerns related to digital limitations and possibilities.[1] Through the design of a series of counterfunctional digital cameras, this chapter will resistantly explore new design opportunities in digital limitations. The notion of designing digital limitations aligns with recent technology countertrends that emphasize more limited and limiting uses of technology. A design example within HCI is Odom et al. and Hallnäs and Redström's presentation of "slow technologies."[2] An everyday example is the emergence of distraction-blocking software applications that allow the user to be more productive by blocking the use of other applications, such as social networking apps or web browsers.

Many designers will note an affinity between the notion of designing limitations and the design constraints that delimit any design process. However designing limitations must not be conflated with design constraints. At some level every good designer understands both the necessity and the value of constraints. The concepts of negative space, minimalism, and feature creep are well-known in the professions of graphic design, architecture, and product design.[3] The design profession is often distinguished from the Arts by its requirements to work within "real world" constraints. Design constraints are also celebrated for their ability to yield creative techniques

---

[1] Portions of this chapter have been adapted from Pierce and Paulos, "Counterfunctional Things: Exploring Possibilities in Designing Digital Limitations;" Pierce and Paulos, "Making Multiple Uses of the Obscura 1C Digital Camera: Reflecting on the Design, Production, Packaging and Distribution of a Counterfunctional Device;" Pierce and Paulos, "Obscura 1C Digital Camera;" and Pierce and Paulos, "Some Variations on a Counterfunctional Digital Camera."

[2] Hallnäs and Redström, "Slow Technology: Designing for Reflection;" Odom et al, "Designing for Slowness, Anticipation and Re-visitation: A Long Term Field Study of the Photobox."

[3] Negative space, also referred to as white space in graphic design, is the space around and between the subjects of a visual image. Minimalism is a style or philosophy that uses reduced or pared-down elements. Feature creep is the expansion of new features in a product to the point where it becomes unwieldy and difficult to use. The phenomenon of feature creep demonstrates how too many options—or not enough limitations—can become counterproductive.

and solutions.[4] Many designers understand that design constraints are not merely practical realities, but also have useful functions.[5] This chapter extends beyond the notion that design constraints are both necessary and useful *within the design process*. The key idea of this chapter is that limitations or constraints can also be offered as positive features when *using* designed technologies.

Today digital technologies are often celebrated for the seemingly limitless options and choices that they enable. Designing digital limitations inverts this assumption. The designs presented here instead offer inhibited choices and absent options as positive technological features. Digital limitations are explored here through the design of counterfunctional devices. These devices bring into focus digital limitations as a design space. Counterfunctionality is presented as a technique for inhibiting, removing, or negating ordinary and expected functional features. By countering ordinary and expected functions, new functions can be created: counterfunctions. Because the positive possibilities afforded by digital limitations are often counterintuitive and difficult to see from the dominant perspective of digital possibilities, bringing digital limitations into focus with novel design examples is necessary. Resistance has a key function to play here.

---

[4] The use of constraints in design is also prominently exhibited in the teachings of the Bauhaus, a German art school operating in the 1920's that has profoundly influenced contemporary design practice, education, and culture. Constraints were acknowledged as a necessity of working with the technologies of mass-production that had newly arrived on the scene. Constraints were also used in the classroom and studio as a way to explore new possibilities of design materials. The preliminary studio course taught at the Bauhaus from 1922-1933 made heavy use of constraints. The tradition of the preliminary studio course is recognizable in mainstream design studio education today. Josef Albers, the director of the preliminary studio course, describes the importance of constraints:

> In order to achieve the closest contact with materials by way of the fingertips, the use of tools is limited in the beginning. In the further course of the teaching the possibilities of application become more and more restricted; the commonest methods of working are noted and, since they can no longer be discovered, they are banned. For example, in the outside world (in the crafts and industry) paper is employed, for the most part, lying flat and glued, the edge is almost never used. This is a reason for us to use paper standing up, uneven, plastically mobile, two-sided and the with edges emphasized. Instead of gluing it, we tie it, pin it, sew it, rivet it, that is, fasten it in other ways and we also investigate its capacity to withstand tension and pressure... Thus, the treatment of materials is intentionally different from that on the outside, though not basically so. The purpose is not to do things in other ways but, rather, not to do things as the others do them. This means not to imitate but, rather, to search by oneself and to learn how to discover oneself—constructive thinking." Dearstyne, *Inside the Bauhaus*, 92.

[5] The need as well as the usefulness of design constraints appears throughout the history of contemporary design. The eminent mid-century industrial designer Raymond Lowey captured the importance of design constraints in his famous design principle of MAYA (Most Advanced Yet Acceptable). This principle conveys how product designs are technological and materially constrained, yet they are also constrained by social expectations. The importance of design constrains can also be read in the classic design text by Lawson, *How Designers Think: The Design Process Demystified*. For example, the book's index lists over 30 entries for "Constraints in design", including "function of constraints" and "the role of constraints" (314).

4.1 Concerns: Digital Limitations and Possibilities

As with many alternative and oppositional designs, the impetus for this work has a basis in social and cultural critiques of digital technology. A need for digital limitations is suggested from a reading of social and cultural critiques that center upon concerns of technologically-mediated disengagement, boredom, overload, and distraction. Critical academic writings related to these concerns parallel popular culture writings that discuss technology counter-trends of disconnecting, unplugging, and digital detoxing.[6] Key academic writings related to these themes include recent books from areas adjacent to HCI discussing the value of simple communication tools in an age of digital overload,[7] the benefits of deleting and forgetting in an age where Facebook and Google remember everything,[8] the "paradox of choice" in which an overabundance of options leads to consumer choice anxiety,[9] and the literal and metaphorical lack of sleep within 24/7 culture.[10] Writings outside of academic discourse also inspire and elucidate digital limitations as a design space and counterfunctionality as a design approach. An evocative if not explicitly critical example is a recent collection of essays entitled "Photographs Not Taken."[11] In this edited volume, writer and photographer Will Steacy asks photographers to "abandon the conventional tools needed to make a photograph, and, instead, make one using words to describe the memories and experiences that didn't go through the camera lens."[12]

Paralleling these writings are a number of recent works in HCI that engage issues of busyness and overwork,[13] simple living,[14] conflicting cultural discourse surrounding the smart phone,[15] and the voluntary non-use and removal of technologies such as Facebook.[16] While a concern with limitations in HCI originates within humanities and social science oriented research, it

---

[6] For example, see articles in business magazine Fast Company filed under their hashtag #unplug.

[7] Harper, *Texture: Human Expression in the Age of Communications Overload.*

[8] Mayer-Schönberger, *Delete: The Virtue of Forgetting in the Digital Age.*

[9] Schwartz, *The Paradox of Choice: Why More is Less.*

[10] Crary, *24/7: Late Capitalisms and the Ends of Sleep.*

[11] Steacy, *Photographs Not Taken.*

[12] Steacy, *Photographs Not Taken*, preface.

[13] Leshed and Sengers, "'I Lie to Myself that I Have Freedom in My Own Schedule.'"

[14] Sengers, "What I learned on Change Islands: Reflections on IT and Pace of Life;" Håkansson and Senger, "Beyond Being Green: Simple Living Families."

[15] Harmon and Mazmanian, "Stories of the Smartphone in Everyday Discourse: Conflict, Tension and Instability."

[16] Baumer et al., "Limiting, Leaving, and (Re)Lapsing: An Exploration of Facebook Non-Use Practices and Experiences."

has since extended into computer science oriented research as evidenced by a recently organized workshop on "Computing within Limits."[17]

Writing in the context of HCI, Phoebe Sengers offers a counterpoint to dominant thinking about choice and digital technology. Reflecting on pace of life issues, Phoebe Sengers writes: "[We] might think not about how technology can give us access to more choices, but about how we can design technologies that help us create constraints on our choices."[18] Jonathan Crary's searing critique of late-capitalism and 24/7 culture serves as another useful counterpoint, representing an extreme end of the spectrum for critiquing digital possibilities. For Crary, sleep is quickly being eroded as one of the last remaining refuges from capitalism and the neoliberal imperative to monetize everything:

> [Surrounding technologies, television being among the first,] are part of larger strategies of power in which the aim is not mass-deception, but rather states of neutralization and inactivation, in which one is disposed of time. But even within habitual repetitions there remains a thread of hope—a knowingly false hope—that one more click or touch might open onto something to redeem the overwhelming monotony in which one is immersed. One of the forms of disempowerment within 24/7 environments is the incapacitation of daydream or of any mode of absent-minded introspection that would otherwise occur in intervals of slow or vacant time. Now one of the attractions of current systems and products is their operating speed: it has become intolerable for there to be waiting time while something loads or connects. … There is a profound incompatibility of anything resembling reverie with the priorities of efficiency, functionality, and speed."[19]

Disengaging momentarily from the sharpness of Crary's critique, compelling design opportunities can be located lurking within the excerpt above. Designers might create counter technologies that offer the recapacitation of daydream and other modes of absent-minded introspection. Or products that offer waiting, reverie, and slow and vacant time as a counter-offerings to the wearying orthodoxies of efficiency, functionality, and speed.

Indeed, alternative and oppositional designs have explored waiting, reverie, and slow time as positive functional offerings. The design of slow digital technologies has been explored as an

---

[17] "LIMITS represents a paradigm shift in the way we think about computing, and changes the context within which computer scientists pose questions in and across their sub-fields. LIMITS demands that societal and ecological needs become our highest priorities, requiring that technology be developed with those priorities in mind." Pargman and Raghavan. "Introduction to LIMITS '15: First Workshop on Computing within Limits."

[18] Sengers, "What I learned on Change Island," 47.

[19] Crary, *24/7*, 88.

alternative design space.[20] An example is Photobox, a bespoke digital product that occasionally prints a random photograph from the user's online photo archive.[21] The ludic design approach discussed in chapter 2 also engages with slowness and reverie as alternatives to clear utilitarian technology. An example is the Drift Table.[22] By placing objects on the electronic coffee table, the user orients a slow moving aerial map of the countryside through a small portal in the table's surface.

The design of digital limitations can be discerned in mainstream technologies as well. The translation of critical perspectives into affirmative technologies appears to have been a tactic underlying the design of the popular photo-sharing app Snapchat. Snapchat has a feature that originally distinguished it from similar services: the photos that are sent disappear second after the recipient opens them. In an interview, Snapchat CEO and cofounder explains the rationale behind Snapchat: "People are living with this massive burden of managing a digital version of themselves...It is taken all of the fun out of communicating."[23] Snapchat has indeed proven to be fun. Its user base was recently estimated at more than 100 million. As a partial remedy for the massive burden of digital online identity management, on the surface Snapchat appears as an affirmative response to the above critiques concerned with disengagement, boredom, overload, and distraction. Yet Snapchat has been so thoroughly affirmed through widespread routine use that it is very difficult to discern any sort of critique of digital possibilities that may have subtly informed its design.

As suggested by Snapchat, pursuing affirmative design opportunities often entails abandoning intentions or potentials for radical critique. For some critics, the potential recuperation of critique by design becomes another target for critique. Technology critic Evgeny Morozov interrogates the "disconnectionist movement" and asks us to consider why and by whom the virtues of disconnecting from technology are being preached:

[20] See, for example, Hallnäs and Redström, "Slow Technology: Designing for Reflection," and Odom, "Understanding Long-Term Interactions with a Slow Technology: An Investigation of Experiences with FutureMe."

[21] See, for example, Odom et al., "Designing for Slowness, Anticipation and Re-visitation: A Long Term Field Study of the Photobox."

[22] See Gaver et al., "The Drift Table: Designing for Ludic Engagement."

[23] Colao, "Snapchat: The Biggest No-Revenue Mobile App Since Instagram."

In essence, we are being urged to unplug—for an hour, a day, a week—so that we can resume our usual activities with even more vigor upon returning to the land of distraction. ... why we disconnect matters: We can continue in today's mode of treating disconnection as a way to recharge and regain productivity, or we can view it as a way to sabotage the addiction tactics of the acceleration-distraction complex that is Silicon Valley.[24]

Morozov's words echo the concerns offered by Sarah Sharma writing about the politics of slowing down. Based on her ethnographic studies of temporality as it relates to practices such as corporate yoga, Sharma offers a counter-narrative to the emancipatory rhetoric around the design of slow spaces: "Slow spaces are spaces where anxieties about the pace of life are deliberately pacified in order to produce a different experience of time. As alternative temporal spaces they instead depend on the inequitable social relations of the fast and divisive world they rail against."[25] Sharma and Morozov both highlight interests in "slowness" and "disconnecting" as largely upper and middle class conceits. Both Sharma and Morozov point out that the white-collar professionals and Silicon Valley technologists who are most loudly lamenting the excesses of technology are precisely the privileged few that already have more than enough. For Sharma and Morozov, among others, emerging digital countertrends in turn form the subject of counter-critique. While digital limitations hold the potential to be experienced as emancipatory, at the very same time they hold counter-potentials to support overwork and speed under the guise of respite from the relentless productivity associated with modern technology and capitalism.

Resistantly Designing Among an Entanglement of Concerns

Digital products are continually offering consumers faster processing speeds, more storage, and unlimited access—anytime, anywhere, with the click of a button. There are compelling reasons to interrogate these trends and their personal, social, cultural, and political consequences. Likewise there are compelling reasons to interrogate countertrends that advocate and affirm more limited technologies.

Caught among conflicting concerns, two routes to pursue are critical thought and debate, in one direction, and affirmative design leading off in another. From the perspective of design, a problem with critique is that it is ongoing, tending toward never actually affirming anything.

---

[24] Morozov, "The Mindfulness Racket."

[25] Sharma, *In the Meantime: Temporality and Cultural Politics*, 21. Sharma continues: "It is time to cast aside the individualistic and privileged weight of busyness, sacred space, and generalized precarity found in the laments over speed. If we want to grasp the complex intersections of social differences under global capital, we need to take the temporal seriously on its own terms" (19).

Critique has a tendency to refuse participation in the conventional trajectory of design. Yet the conventional trajectory of design has its problems as well. From the perspective of critique, the problem with affirming things through design is the tendency for products such as Snapchat to diffuse any potential for radical critique, or more problematically, to redirect critique toward ends at odds with the original critical intentions. Art is another possible route to pursue. But from the perspective of design, a problem with art is that it tends to always return to Art. Art maintains its status as art by maintaining itself as distinct from the everyday realm of design. This is no less true of most social practice and participatory art as it is of the Fine Arts of perspective painting and sculpture.

Repeating once again Jane Bennett's call, "we need both critique and positive formulations of alternatives, alternatives that will themselves become the objects of later critique and re-form."26 While art and critique are capable of formulating such alternatives, they lack design's capacity to create alternatives seriously considered as affirmable new realities. Because once an alternative becomes too compellingly ordinary, mundane, ubiquitous, and useful, it loses critical and artistic potential.

How else, then, can design proceed among an entanglement of conflicting concerns? One route forward is to proceed resistantly.

4.2 Designs: Counterfunctional Digital Cameras and the Obscura 1C

Designing Counterfunctional Devices: A Schematized Design Process

Grounded in a set of critical concerns and design opportunities around digital limitations, my process was to explore in an open-ended manner the redesign of everyday technologies. This process involved identifying familiar functional features of everyday technologies and then redesigning around the removal or inhibition of these features.27 Schematically this process is outlined as follows:

1. Normally one can _____ [a "positive function"].
2. Now one can not _____ [a "countered positive function"].

---

26 Bennet, *Vibrant Matter: A Political Ecology of Things*, xv.

27 Here I focus on specific technologies, such as digital cameras, but the technique similarly works on product genres or thematics. Indeed, the entire project of designing digital limitations applies this technique to digital technology as a whole.

3. But now one might (not) _____ [a new (counter)function].

To illustrate this approach, consider a set of examples from my design explorations: The 1-Pixel, 4-Pixel, 16-Pixel and 256-Pixel Camera, collectively referred to as the Ultra-Low Resolution Cameras. Within this schematized design process, the Ultra-Low Resolution Cameras outlines as follows:

1. Normally one can capture and view high-res images.
2. Now one cannot capture and view high-res images, but instead can only capture and view very low-res images.
3. But now one might capture and view images as placeholders or abstract representations rather than photorealistic depictions. These low-res images might take on significance in a world populated by increasingly high-res images.

As preliminary interpretations, the Ultra-Low Resolution Cameras can be viewed as a playful and amusing take on current digital cameras. Alternatively these cameras can be positioned as a critique of the overabundance of high-resolution images in a digital era, or of consumer electronics more broadly. The Ultra-Low Resolution Cameras may also be imagined as useful things that give rise to new photographic practices and experiences, such as capturing and possessing special images that are distinguished from high-resolution images.

Based on the review of alternative and oppositional designs in Chapter 2, the Ultra-Low Resolution Cameras could be positioned in terms of ludic engagement, critique, or speculation. However the counterfunctional design approach I adopted was to create devices that afforded a variety of both established and not-yet-established alternative and oppositional functions. The intuition was that there is a need for designs that stand somewhere in between negative critique and positive affirmation. Counterfunctional devices can function as boundary objects between varied and potentially conflicting concerns and purposes.

The Obscura 1C Digital Camera

The focus of this case study is a single counterfunctional device: The Obscura 1C Digital Camera. However the Obscura 1C has been designed to package up a wider array of counterfunctional camera variants. The Obscura 1C has slowly and iteratively developed through the design of a variety of counterfunctional camera variants. The Obscura 1C is best viewed as focal point among an array of counterfunctional camera variants, rather than a single final outcome of a design process. Conceptualized in this way, the Obscura 1C is designed as a concrete product that functions to diffract outward into new concepts and design directions. It is a resistant product trying to resist being a single product.

The Obscura 1C is not only a case study of a resistant digital product, but it is a case study of how to present a resistant design for multiple users that include both everyday users and expert researchers and designers. One of the techniques that the Obscura 1C reveals is a hybridization of proposals, prototypes, and products all packaged up together. A noteworthy feature of the Obscura 1C is its packaging. As with conventional consumer products, the Obscura 1C includes a complete set of instructional materials that explain its technical operation, functional features, and design intent. The Obscura 1C package also includes a brochure illustrating additional counterfunctional cameras.

A key feature of product packaging is that it allows the device to "speak for itself," so to speak. More precisely, the Obscura 1C offers a verbal description and interpretation of itself prior to and independent from the descriptions and interpretations offered in this chapter, for example. The significance of this feature will continue to be unpacked throughout this case study. But for now, note that one benefit of this packaging is that it is easily reproduced within this text as a means of introducing the Obscura 1C and providing the reader with virtual access to the actual firsthand, out-of-box experience of the device.

The text from the front of the packaging reads:

OBSCURA 1C DIGITAL CAMERA / COUNTERFUNCTIONAL DEVICE SERIES.

Text on the reverse side of the packaging reads:

Obscura 1C Digital Camera captures photo, video and audio recordings. In order to access the media files recorded, you must physically break apart the concrete enclosure to reveal the micro SD memory card buried inside. Obscura 1C inhibits access to its contents to offer a digital experience based on uncertainty, patience and surprise.
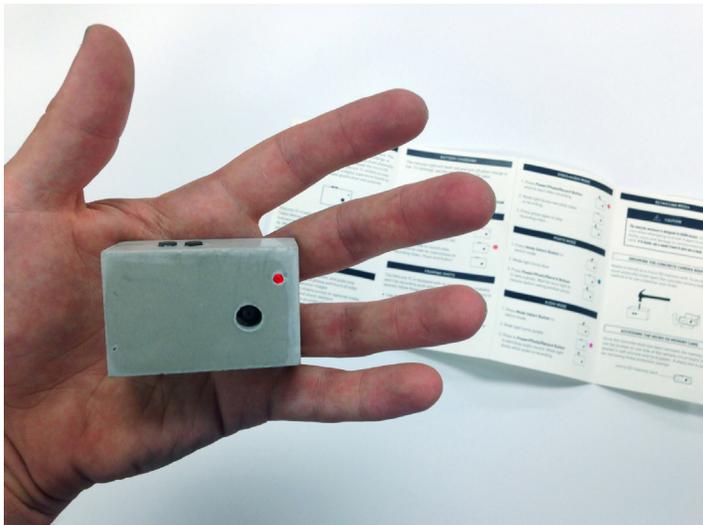
The Obscura 1C Digital Camera can capture hundreds of thousands of digital photographs and days worth of video and audio recordings. Accessing the micro SD card requires an irreversible act of physically breaking the concrete camera enclosure.

Early Counterfunctional Design Explorations

Initially I conducted concept exploration in several areas of consumer product design including digital music, interactive television, mobile telecommunication, and wireless networking. An example from these explorations is the Wireless Derouter proposal, pictured below.

Digitally Disconnected Space
Ubiquitous wireless networks allow us to digitally connect anywhere, anytime. The flipside of this ubiquity is the loss of a latent option: to be in a space where wireless connectivity is strictly not an option.[1]
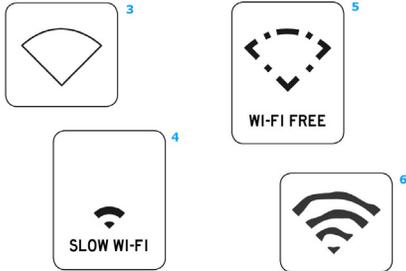
Wireless Nonspots [2]
When wireless networks are everywhere, wireless-free spaces become rare. Wireless nonspots are places free of radio signals such as cell, 4G, Wi-Fi and GPS. Wireless nonspots can range in scale from expansive public places to tiny, personal spaces: parks, workspaces, cafes; a park bench, an office desk, a section of café seating.
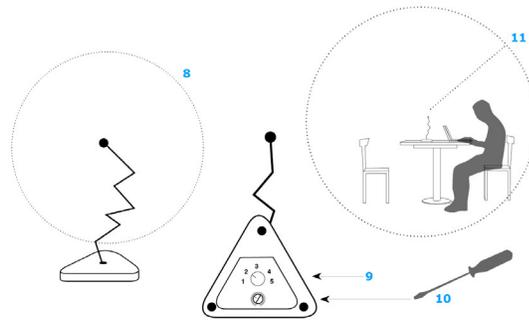
Wireless Derouters [7]
Wireless derouters enable the construction of digitally disconnected nooks: spaces free from email, phone, txt, Facebook, Twitter, Netflix, Instagram, OKCupid, Wikipedia, Google search and myriad other wireless applications.[12] While such applications are useful and enabling, their unrestricted ubiquity means there is no longer the option to have strict disconnectivity.[13] Wireless Derouters offer the possibility of something refreshingly new and different: wireless voids filled with digitally disconnected things.

Notes

1. The distinction between **NON-OPTION** and **OPTION-TO-NOT** can be subtle and easily overlooked. Setting aside a judgment on the quality of experience, we must recognize differences between the option to turn Wi-Fi On/Off and being in a space with strict inacess to Wi-Fi; between choosing to ignore a phone call and being without a phone; between deciding to walk and not owning a car; between saving some cake for later and not having bought any;…

2. Such iconography could be used as digitally disconnecte space signage, or as visuals for a Wireless Nonspot Finder app.

3.Wi-Fi Off. Indicates Wi-Fi is unavailable on a temporary or scheduled basis, e.g., "No Wi-Fi Sundays", "No Wi-Fi after 5PM)

4. Wi-Fi Free. Indicates a space where the strict absence of Wi-Fi signal is technologically enforced.

5. Slow Wi-FI. Indicates a limited bandwith connection. Ideal for checking an email or directions but not internet browing or media streaming.

6. Intermitten Wi-Fi. Indicates uncertain Wi-Fi availability and bandwith.

7. There are some substantial technical and legal challenges confronting **WIRELESS DEROUTING RESEARCH.** Wireless "jammer" technologies block radio signals including cellular and Personal Communication Services (PCS), Global Positioning Systems (GPS), and wireless networking services (Wi-Fi). However, in many countries radio jamming technologies are illegal. For example, in the United States, The Communications Act of 1934 "prohibits willful or malicious interference with the radio communications of any station licensed or authorized under the Act or operated by the U.S. Government (47 U.S.C. § 333)". Accordingly, it is illegal to block cellular telephone, GPS or Wi-Fi, even within the confines of one's private

The Wireless Derouter creates a small digitally disconnected space to interact free from network connectivity.

However I decided to focus my later experiments on digital photography and cameras. Photographic technology proved to be particularly fruitful and instructive area to explore for several reasons. Photography allows for accessible everyday modes of authorship and creation, whereas most everyday technologies related to, say, digital music are more limited in this regard. Photo-

graphic technologies also have both playful and serious uses, and people continue to use a range of old and new photographic technologies.

Counterfunctional Camera Variants and User Study

Prior to the developing the Obscura 1C, 10 counterfunctional camera concepts were refined and presented to participants (For additional details, see Appendix B). The goal of the empirical portion of this study is to investigate participants' initial reactions to counterfunctional camera prototypes and the underlying themes of counterfunctionality and new possibilities based on technological limitations.

Three counterfunctional design heuristics emerged through this study. Each heuristic was found to be an important consideration in composing a compelling tension between resistance and nonresistance. The first heuristic is to consider adding new features along with removing existing ones. For example, the Obscura 1C removes the familiar digital feature of instantaneous access to images. But it adds the unconventional feature of a concrete enclosure. The small size of the camera and extensive image capacity (100,000+ photos) may also be considered new features when compared with conventional point-and-shoot digital cameras and smart phones. However the Obscura 1C design does not offer any salient and novel conventional features, such as solar charging or integration with a new online social network. Adding new positive features can work to counterbalance the resistance created by removing expected or familiar ones. The addition of new features tends to align with the conventional trajectory of design (section 3.1), whereas the removal of conventional features aligns with design techniques of resistance.

The second heuristic is to consider recalling older technologies. For example, the Obscura 1C recalls disposable film cameras, ceramic piggy banks, and the burial of time capsules. Recalling older technologies can work to counterbalance resistance by associating it with a more or less familiar predecessor. Recalling older technologies aligns the design with a less contemporary conventional counterpart. Doing so offers a familiar reference point for counterfunctionality.

The third heuristic is to consider if the design will be interesting to actually use versus interesting to think about using. In section 3.3, this distinction was made in terms of virtual versus actual use. For example, the Obscura 1C has been designed to be potentially interesting to both actually use over time in an embodied and embedded manner, as well as designed to be interesting to virtually imagine using and extract conceptual insight and inspiration for this audience composed of designers and researchers. Designing for compelling actual use will tend to make a

design less resistant. A design that is only imaginatively interesting to an exclusive group will likely be largely useless to everyone else.

These three heuristics function as guides for composing a design that is more or less resistantly experienced.

The Unviewable Image Camera, Smash Camera, and Capsule Camera

The evolution of design concepts leading up the Obscura 1C represent varying levels of resistance. The Obscura 1C originated with the concept for an Unviewable Image camera. This design concept is essentially a conventional point-and-shoot digital camera that is missing the USB port to download the images. For artists, philosophers, or design researchers, the design may well be interesting to virtually use. For example, the camera suggests ontological questions about the digital image. But the Unviewable Image camera appears overly resistant when it comes to actual embodied and embedded use. As an everyday product, the Unviewable Image camera tends toward uselessness.

The Unviewable Image camera was transitioned into the less resistant design of the Smash Camera. The concept of unviewability was translated into the less resistant form of inhibited viewability. The Smash Camera was later renamed the Capsule Camera in an attempt to less resistantly brand the design by appealing to the familiar design of the time capsule (heuristic: recalling earlier technologies).

About half of the participants that were presented with the Capsule Camera prototype thought it would be interesting to actually use, while the other half expressed aversion or skepticism about it. Intuitively this divisive split between useful and useless appears as a positive outcome for a counterfunctional device whose vague goals are to resistantly situate itself among conflicting concerns.

PHOTO MEMORY

BUTTON
(photo, on/off)

LENS

0000057

DISPLAY FEEDBACK

POWER / CHARGE
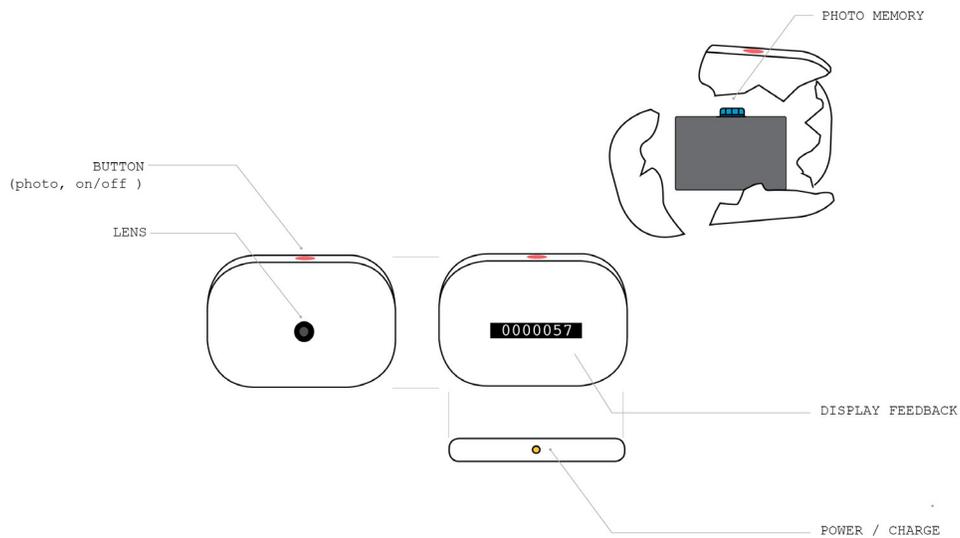
Early design proposal for the Capsule Camera.

Inhibitive Camera Enclosures

Along with the exploratory prototypes discussed above, a series of form studies was also conducted around Inaccessible Digital Cameras. One of these was a concrete camera very similar to the Obscura 1C. I found the concrete camera to be an interesting and provocative form to tangibly interact with firsthand. Photographs of the smashed cameras have also functioned well as emblematic images, which in turn help convey the concepts of inhibitive interfaces, counterfunctionlity, and enabling limitations. The wooden Inaccessible Camera make a reappearance as the Obscura 1W within the Counterfunctional Cameras brochure included inside the Obscura 1C package.
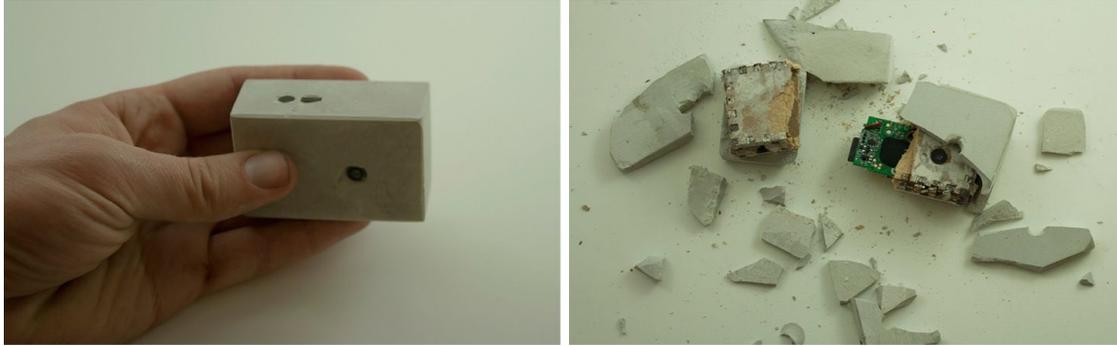
An Inaccessible Digital Camera with a concrete enclosure.
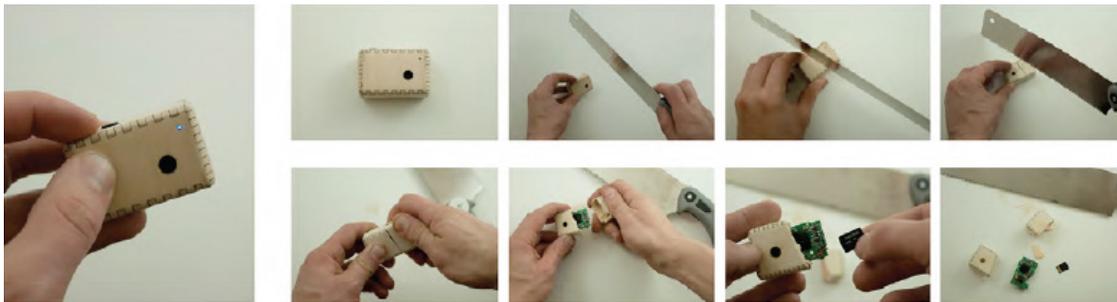
An Inaccessible Digital Camera with a wooden enclosure.

Pictorial Counterfunctional Camera Variants

The Counterfunctional Cameras brochure included inside the Obscura 1C package is a condensed and revised version of counterfunctional design proposals. Prior to developing the Obscura 1C, a selection of these counterfunctional camera proposals were formally published in the new Pictorial format at the Designing Interactive Systems conference (See Appendix A).[28] This publication consisted of schematic illustrations, diagrams, and textual descriptions. This pictorial publication was subsequently revised and translated into an ambiguously fictional product brochure included inside the Obscura 1C package (See Appendix D). This demonstrates a translation of resistant proposals for the design research community back into a resistant product designed to be used firsthand by non-researchers and non-designers.

Contents of the Obscura 1C Package

The full contents of the Obscura 1C package are depicted below. Equal care and attention was given to the design of the packaging and out-of-box experience as to the design of the Obscura

---

[28] Pierce and Paulos, "Some Variations on a Counterfunctional Digital Camera."

1C camera product.[29] As will be discussed, the elements of the Obscura 1C package collectively offer resistance towards conventional use and assimilation with conventional digital products.
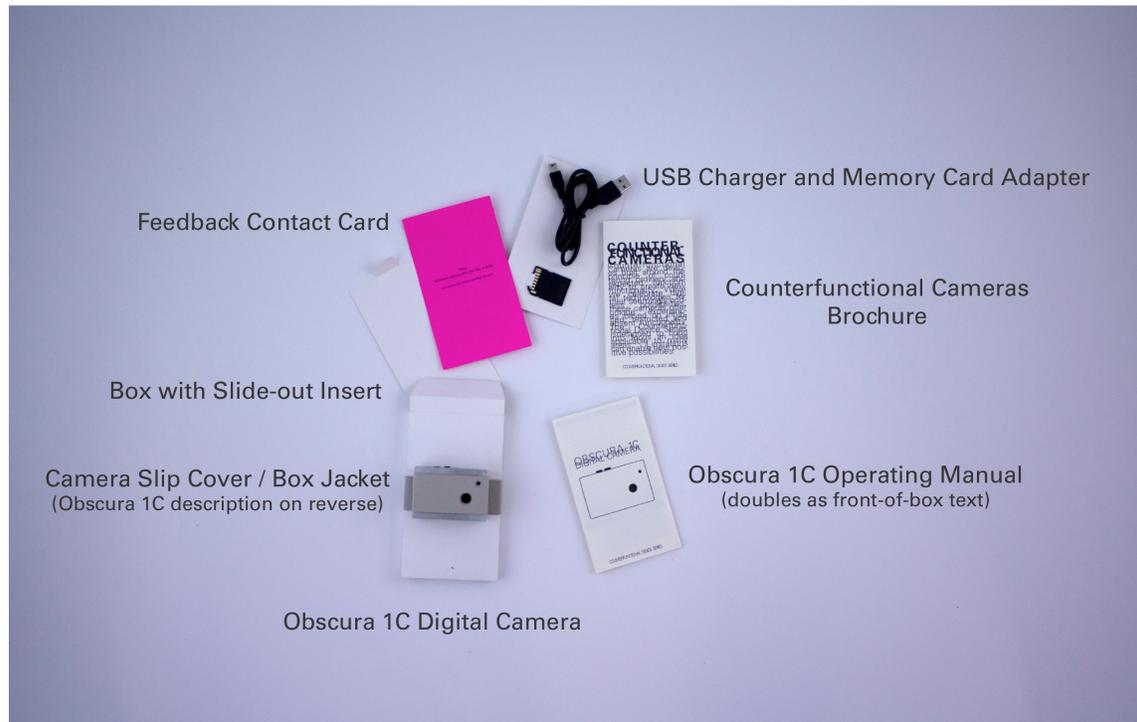
Contents of the Obscura 1C Package

The Name: Obscura 1C

Names and titles are an important and often initial point of contact for retail products, experimental designs, and artistic works alike. Given the emphasis on the representational and conceptual functions of the Obscura 1C, it is worth devoting space to explain the design of its name.

Previously the concept underlying the Obscura 1C has been encapsulated in several differently named forms. However in its present form a new name was desired to help suggest representational and conceptual functions. The name "Obscura 1C" serves this function well. Most familiarly to camera geeks, the Obscura 1C references the camera obscura, the technological predecessor to the modern camera. Obscura is a Latin word meaning "dark." Yet phonetically, and stripped if its Latin context, "obscura" has a crisp, modern ring to it. Further, "obscurus" is the etymology of "obscure," which means both to visually conceal and to intellectually make

---

[29] Out-of-box experience is a term used in design and marketing to describe the user or customer experience of initially using a new product. In packaging and experience design, it is often literally applied to the experience of opening the box and encountering what is inside.

difficult to understand. This name is doubly fitting since the Obscura 1C literally inhibits access to its visual contents, yet the purpose of this may be intellectually obscure. Taken together, these three references—the perceptual obscurity of the image, the intellectual obscurity of the conceptual intent, and the somewhat obscure historical reference to the camera obscura—have been designed with the possibility (not to be confused with likelihood) of prompting deeper intellectual engagement with the device.

The "1C" portion of the naming references the popular Apple iPhone 5s and 5c. 1C is as an abbreviation for "version 1, concrete model." This reference to the iPhone is, in part, a subtle joke. The source of the joke lies in the Obscura 1C describing itself as a "counterfunctional device" in opposition to the celebrated and "seemingly endless possibilities [of 'digital technologies']." Such "endless possibilities" are exemplified by the elegantly multifunctional iPhone. But at the same time this iPhone reference is serious in that the Obscura 1C is also designed so it can be taken as a legitimate, functional counterpart to everyday electronics.

At face value, then, the name "Obscura 1C" can be taken as an attempt to associate with a product genre composed of sleek, modern electronic products. But on closer inspection, the reference may create a humorous tension. Is this product presenting itself in a literal, serious manner? Is it trying to sell itself like the iPhone? Or, is it rather trying to ostensibly associate in order to ultimately distance itself from this genre of products? This orchestrated ambiguity mirrors the multiple, overlapping intentions underlying the product. It can be taken as simply a novel and unusual product. Or it can also be engaged with at a deeper conceptual level as a conceptually counterfunctional device.

Clearly this manner of closely reading the Obscura 1C is something that even many academics or designers are unlikely to do. But attention to this linguistic detail is important for several reasons. First, the ambiguous semantic function of the name is useable even if only one or two of the references is noted in passing. Second, this discussion emphasizes the possible rhetorical and discursive functions of design artifacts *for this audience* (an artifact that is also intended for embodied, embedded everyday use).

The Hybrid Visual and Form Languages of the Obscura 1C

Products that are mass-produced carry an aesthetics based on the possibilities and limitations of industrial processes, tools, and materials. One-off and batch-produced products and prototypes will typically depart from the aesthetics of mass-production. But one-off prototypes may also replicate or simulate mass-produced goods. In the production of the Obscura 1C a hybrid

aesthetic was sought that references mainstream commercial product design but without attempting to fully replicate or simulate the formal aesthetics of mass-produced commercial electronics.

The intent was to create tensions and ambiguities concerning what the Obscura 1C is and how it can be used. On the one hand, the Obscura 1C is clearly a hand-produced artifact. But on the other hand it asks the user to consider that it or something like were in fact a mass-produced product. On the one hand, the Obscura 1C looks and operates similar to mainstream electronic products. But on the other hand it is associating itself with this genre so it can be a tool for questioning and interrogating these products. On the one hand, the Obscura 1C is completely functional and usable. It is not asking the user to creatively imagine technical features that are not supported. But on the other hand, it wants to also be used conceptually to imagine products and scenarios that extend beyond its immediate technical capacities.

The final packages are designed to present themselves in a way that, if read carefully—and with the proper expertise—can be verbally translated as follows: "You can take me as a mass-market retail product. Or conversely, you can take me as a one-off art project. (But in actuality, I'm an experimental design product produced in limited quantities—a product that intentionally plays into the genres of both mass-market consumer products and artistic productions." This transla-tion is developed in more detail below.

The visual and physical form of the Obscura 1C packaging references 5 key product genres:

a. *Sleek, modern product design exemplified by Apple*. Examples: The name "Obscura 1C"; lots of whitespace and a modern sans-serif logotype on the cover.

b. *Lower-end consumer electronics and instruction manuals*. Examples: The layout and language of the manual, such as black headers and a "Caution" message.

c. *Artist's books*—a genre where the particular codec form dovetails with the artistic inten-tion.30 Examples: The use of high-quality archival paper for the manual and brochure; the tongue-in-cheek uses of the Frequently Asked Questions format; the negative leading of the Obscura 1C logotype and brochure cover (which plays into both "obscurity" and "counterfunc-tionality").

---

30 For a seminal study of the development of artists' books as an art form, with many examples, see Drucker, *The Century of Artists' Books*.

d. *Zines* (self-published, typically low-cost print publications). Examples: All of the packaging elements can be created with accessible everyday tools without relying on offset printing, injection molding, 3D printing, etc.

e. *A one-off, hand-crafted object aesthetic* exhibited in the camera body, which creates a juxtaposition with the industrial aesthetic of everyday cameras and consumer electronics. Examples: The rough, hand-deburred edges of the slightly imperfect rectangular concrete camera bodies.

Each of these product genre references can become an interpretive focus, offering a single stable interpretation of the Obscura 1C (e.g., as a sleek modern product, a hand-crafted artistic object, a zine-like DIY consumer product alternative, etc.). Alternatively, the juxtaposition of these competing genres can encourage a closer reading of the conceptual intent underlying the Obscura 1C package.

User's Manual and Counterfunctional Cameras Brochure

The user's manual was designed to clearly explain the camera operation for everyday embodied, firsthand use. The manual was also designed to describe some of the conceptual intentions underlying the Obscura 1C and the Counterfunctional Device Series. This was done partly by offering a resistantly designed Frequently Asked Questions (FAQ) section of the manual. For example, the second FAQ entry reads:

> [Question] I don't get it. What the point of this?
> [Answer] That's okay. Just use your camera phone instead.

Also included in the Obscura 1C package is a brochure of additional Counterfunctional Cameras. This document references the genre of a promotional product brochure. In light of the fact that the Obscura 1C is a real operational digital product, the user may be led to believe that counterfunctional cameras depicted in the brochure are actual product offerings. However the at times subtly absurd descriptions and illustrated rather than photographic depiction of these cameras render the reality of these counterfunctional cameras ambiguous.

OBSCURA 1C DIGITAL CAMERA

Thank you for acquiring the Obscura 1C Digital Camera. The Obscura 1C captures photo, video and audio recordings. In order to access the media files recorded, you must physically break apart the concrete enclosure to reveal the micro SD memory card buried inside. The Obscura 1C inhibits access to its contents to offer a digital experience based on uncertainty, patience, delayed gratification, and surprise.

Obscura 1C is part of the Counterfunctional Device Series. These devices are built around the principle of countering ordinary and expected functionality to create new functionality. While we celebrate digital technologies for their seemingly endless possibilities, Obscura 1C offers a unique experience based on digital limitation. As a Counterfunctional Device, it brings into focus an idea applicable to many areas: Limitations can enable new positive possibilities.

FEATURES

• captures video (with audio), photo, and audio only
• 4GB memory = 1000s of photos and hours of video
• distinctly lower resolution images
• concrete enclosure inhibits access to captured media
• extremely durable and shock resistant
• no viewfinder for less accurate and predictable frames
• small size convenient for carrying in pocket or bag

BATTERY CHARGING

The indicator light will flash red and turn off when charge is low. To recharge, use the mini USB to USB cable.

USB

Note: Media is not accessible via USB. To access stored media you must break the camera apart. (See "Retrieving Media" section.)

POWER ON/OFF

1. Press and hold for 2 seconds the **Power/Photo/Record Button**.

2. The Mode Indicator light turns red.

3. Camera is ready to record video. (See reverse side for instructions on recording Video, Photo and Audio.)

FRAMING SHOTS

The Obscura 1C is equipped with no viewfinder. You probably won't be recording quite what you think you are. If accuracy is desired, follow these heuristics:

• Use the top edge to guide vertical alignment and the sides to guide horizontal alignment.
• With the camera held 6 inches from the eye, the area obscured by the camera body 2 feet away is approximately the area within the camera view.
• When in doubt, step back. The view angle is narrow.

VIDEO+AUDIO MODE

1. Press **Power/Photo/Record Button** once to start video recording.

2. Mode light blinks red while video is recording.

3. Press **Power/Photo/Record Button** to stop recording video.

PHOTO MODE

1. Press **Mode Select Button** to switch mode.

2. Mode light turns blue.

3. Press **Power/Photo/Record Button** to take a photo. Wait for blue light to resume before taking another photo.

AUDIO MODE

1. Press **Mode Select Button** to switch mode.

2. Mode light turns purple.

3. Press to **Power/Photo/Record Button** to start/stop audio record. Mode light blinks while audio is recording.

RETRIEVING MEDIA

⚠ **CAUTION**

The concrete enclosure is designed to inhibit access. Use care when attempting to break it apart to avoid bodily injury and damage to camera memory card. **If in doubt, ask a handy friend to give you a hand.**

BREAKING THE CONCRETE CAMERA BODY

Media is stored on a micro SD memory card. To access it, you must physically break apart the concrete camera body. One method is to use a hammer and chisel.

ACCESSING THE MICRO SD MEMORY CARD

Once the concrete shell has been removed, the memory card can be located on one side of the camera circuit board. It is sealed in soft silicone and hard plastic. A sharp tool is useful for removing these protective casings.

micro SD memory card

Mode Select
Mode: ● Video+Audio ● Photo ● Audio
Charge (Mini USB)
Power ON/OFF (hold 2 sec)
Photo / Record Button

FREQUENTLY ASKED QUESTIONS

1. **Will my photos and recordings really be there?**
Yes, as long as you are operating the camera properly. Although one can never be completely certain of anything.

2. **I don't get it. What's the point of this?**
That's okay. Just use your camera phone instead.

3. **Can I tell how much memory is left?**
No. The camera can store 1000s of photos and hours of video and audio. When the memory is full, the indicator light will turn off after a few seconds and will not switch modes.

4. **It seems to have stopped working. What do I do?**
Although our devices have been carefully tested, they are still hand-crafted prototypes. If it has stopped working, now could be a good time to open it, or store it away.

4. **Will this product ever be available at a major retail outlet?**
Probably not.

5. **Where can I get another one of these cameras?**
Currently our supply is very limited. But please send inquiries to counterfunctionaldevices@gmail.com

6. **What will the images look like? How will the audio sound?**
Like the image below. Audible, but not great.

date / time

MORE OBSCURA CAMERAS...

Obscura 1W

Snap the wooden enclosure to retrieve media.

Obscura 1F

Remove the 24 aluminum fasteners to retrieve media.

Obscura 1C-L

Break the large concrete body to retrieve media.

For additional counterfunctional devices visit
www.counterfunctionaldevices.com

OBSCURA 1C
DIGITAL CAMERA

COUNTERFUNCTIONAL DEVICE SERIES

The Obscura 1C User's Manual included within the Obscura 1C package. See appendix D for a readable version.

COUNTERFUNCTIONAL CAMERAS are devices built around the principle of countering ordinary and expected functionality to create new functionality. While we celebrate digital technologies for their seemingly endless possibilities, these cameras offer unique experiences based on inhibited, restricted and absent functionality. The Counterfunctional Device series is designed to bring into focus an idea applicable to many areas: Limitations can enable new positive possibilities.

For more Counterfunctional Devices visit

counterfunctionaldevices.com

Ultra-Low Resolution Cameras
These cameras offer a refreshing reversal of the trend toward higher and higher resolution technology. The displays are composed of discrete LCD lights with frosted glass overlays. These images stand in sharp contrast to the overabundance of high resolution images that surround us. The ultra-low resolution images can be transferred off of the camera in JPG and RAW formats.

0x0 Pixel

1x1 Pixel

2x2 Pixel

4x4 Pixel

8x8 Pixel

16x16 Pixel

Cameras have the option to shoot in Color or Black & White. Note that these cameras do not capture high-resolution counterparts, so you can be sure the photographs are uniquely ultra-low res.

Cabinet Cameras
The Cabinet Cameras are akin to printed photo album. You can only view the photos you take on the built-in display. You can not transfer, reproduce or edit the photos. Deleting photos leaves a visible void when viewing in Gallery mode. These limiting features allow you to enjoy the imposed uniqueness of the digital photographs you take, view and share with those nearby.

The **Cabinet 1/12** model can be initalized with an image capacity of either 12 photos or just 1 photo. This irreversible decision is one you must make during the initial setup of the camera. Similarly, the **Cabinet 120/1200** gives you the option for either a 120 or 1200 photo capacity, while the **Cabinet 12K/120K** offers either a 12,000 or 120,000 photo capacity! The Cabinet 1/12 is recommend if you want to appreciate a small, select group of images. The Cabinet 12K/120K is recommended if you prefer to capture many images on an ongoing basis or wish to pass this camera on to others for years to come.

Obscura L Series and S Series
Also available are the larger, heavier format L Series (ideal for capturing photos of a specific location like a home or workplace) and the smaller, lighter format S Series (ideal for capturing diverse moments on the go).

Fixephemera Camera
Fixedephemera allows you to hold fleeting photographic moments. It's like the popular app Snapchat, but personal. The photos you take pixelate and deteriorate with every second they are displayed. After 1 minute of total viewing time the photo has deteriorated to a single color representative of the orginal image. However, you can always pause the deterioration by hiding the image.

It's up to you how you choose to engage with each Fixedephemera image: You can look at it right away, but never again. Or you can glimpse at it occassionally, and watch it slowly decay over time. Or you can save it indefinitely, as a hidden but potentially viewable image.

@ 0 seconds of total display time

@ 5 seconds of total display time

@ 10 seconds of total display time

@ 30 seconds of total display time

@ 45 seconds of total display time

@ 60 seconds of total display time

Obscura Cameras
Obscura is a digital revitalization of disposable film cameras. These cameras inhibit access to their contents to offer digital experiences based on uncertainty, patience, delayed gratification and surprise.

Obscura 1C
In order to access the media files recorded, you must physically break apart the concrete enclosure to reveal the micro SD memory card buried inside.

Obscura 1W
Snap the wooden enclosure to access the SD memory card. Obscura 1W is less inhibitive than Obscura 1C.

Obscura 1F
Remove 24 aluminum fasteners to access the SD memory card. Return the fasteners to resume taking photos. Obscura 1F encourages infrequent access to its contents.

Obscura 1P+
Shatter the delicate porcelain enclosure to access the SD memory card. Obscura 1P+ is designed to discourage access and encourage intrigue. Comes equipped with a display showing total number of images taken.

Single-Shot Cameras
The earliest cameras could take only one photograph at a time. In order to take another photo you had to manually reload the camera. The Single-Shot Cameras give back the option to only take one single photo at a time, and to appreciate an only photo taken. Before taking another photo you must manually transfer the image to your computer.

USB

Single-Shot Multi-Angle
The multi-angle version entices you to adopt a single-shot mentality with a unique new postive feature. The camera instantly captures photos in 5 orthogonal directions. A composite photo is created along with a separate photo for each of the 5 angles.

Even more counterfunctional cameras...

Retrieval Camera
The Retrieval Camera does not display the photo you've just taken. Instead it displays a photo previously taken. Choose between two shooting modes: Random Photo -or- Related Photo.

Peripheral Camera
Peripheral Camera captures images to either side and puts them at the center.

Prompt Camera
You can only take pictures when the Prompt Camera lights up and chimes at random moments—prompting you to take a picture when you otherwise would not.

Fixture Camera
This camera is bulky and extremely heavy. Think carefully about where you put, because it's a hassle to move.

COUNTER-FUNCTIONAL CAMERAS

Cameras functional principle around counting ordinary and expected functionality create. While we celebrate digital technologies for their seemingly endless cameras offer unique based on inhibited, restricted and absent functionality. Device Series designed to focus an idea applicable to many areas enable new positive possibilities.

COUNTERFUNCTIONAL DEVICE SERIES

Counterfunctional Cameras Brochure included within the Obscura 1C package. See appendix D for a readable version.

Operating the Obscura 1C Digital Camera

Operating the Obscura 1C camera is not very intuitive. The device's functionality and operation are not clear without consulting the manual. In fact, without the packaging, it is not readily apparent that Obscura 1C *is* a digital camera. The Obscura 1C is a poorly designed conventional product when judged from the perspective of user-centered design. Yet as a counterfunctional device, the Obscura 1C's user-centered design failures are reconstituted as positive resistant features. The nonintuitive interface forces the user to read the manual. This increases the likelihood that the user will read the entire manual, along with the resistantly designed FAQ and brief description of the Obscura 1C as a "Counterfunctional Device... built around the principle of countering ordinary and expected to create new functionality."

There are three other features of the Obscura 1C that have been reconstituted as positive counterfunctional features rather the user-centered shortcomings. First, because the camera has no viewfinder, it is not entirely clear what is being captured. While the user's manual offers some heuristics for framing shots, it clearly explains the caveat that "You probably won't be recording quite what you think you are." Second, the quality of how the images will appear is unclear. The user's manual offers only the cryptic clue that one of the features of the Obscura 1C is "distinctly lower resolution images." Third, the key feature of the Obscura 1C is that it resists immediate access to the images. On the other hand, the Obscura 1C offers an extensive image capacity of over 100,000 images and hours of video and audio. The Obscura 1C can thus be used to capture media for years. The extensive image capacity coupled with inhibited access is designed to encourage periodic use of the device distributed over an extended period of months or years.

Producing and Distributing the Obscura 1C

To date 10 complete Obscura 1C packages have been distributed to non-acquaintances. The primary goal has been to experiment firsthand with different forms of distribution and exchange. This was approached as both exploratory prototyping (with ties to packaging and service design) and as a means of demonstrating "proof of distribution concept." See Appendix C for details of this process.

Batch producing Obscura 1C packages.

4.3 Users, Forms, Modes of Use

In section 3.5 it was noted that getting the balance of tension between resistance and nonresistance "right but not quite right" depends on several questions. What constitutes the design? Who is the user/audience? What is the experiential mode of use? Because design resistance resists embodied and embedded use, the experience of interacting with a resistant design will tend to oscillate between actual and virtual embodied use, between an embodied and virtual user, and between an actual and virtual thing. These actual/virtual binaries can diffract out into a multiplicity of users, forms, and modes of use. As is the case with the Obscura 1C, a resistant design may be intended for multiple users, in multiple forms, through multiple modes of use.

The Obscura 1C's Multiple Forms

What *is* the actual Obscura 1C design? The Obscura 1C is not a conventional mass-market product. If it were, the question of what it actually is would have a straightforward answer: It would be a product that can be purchased and used. The Obscura 1C has instead been produced in small quantities and is not widely available. Instead you the reader are restricted to accessing the Obscura 1C as a virtual product through the images and textual descriptions presented here. However these images and descriptions are presenting the Obscura 1C as a product that has in fact been batch-produced and distributed to 10 people as a way of experimenting with alternatives to conventional user studies. This experimental distribution also demonstrates the potential for the Obscura 1C to actually reach a broader audience of tens, hundreds, even thousands of users. The evidence that some people were willing to purchase the Obscura 1C (with a price rage of $20 USD) further demonstrates that it has niche market potential. As discussed in chapter 3, this demonstration of a mode of production, distribution, and acquisition virtually brings actual use closer to you the reader. It is easier to imagine actual and widespread use of the Obscura 1C because it is, potentially, actually out there right now, circulating in use—or else, lying dormant or forgotten.

All of this is making it more difficult to pin down exactly what the Obscura 1C is. Here, for the present discussions, the Obscura 1C is best understood as intentionally having multiple forms. These include:

1. The 10 Obscura 1C packages distributed via Craiglist and retail outlets. (see Appendix C)

2. The Obscura 1C as advertised on Craigslist online classified ads (see Appendix C)

3. The potential ongoing use, or non-use, of the Obscura 1C packages by the 10 people that acquired them.

4. My own Obscura 1C camera, which I have been using for over year at the time of this writing.

5. The multiplicity of Obscura 1C products that can potentially be produced through a batch-production process, which currently allows additional Obscura 1C cameras to be produced at a cost of approximately $20 USD each.

6. The Obscura 1C as documented and reproduced in publications and presentations, includ-

ing the images, descriptions, and discussions constituting this chapter.

The Obscura 1C's Multiple Users

A typical design research artifact will have two audiences or user groups. One is the convention-ally understood *end-user* in HCI. The end-user is typically an everyday user that a final product is intended to be used by in an embodied and embedded manner. As discussed in chapter 3.1, use and user are often defined in relation to the conventional trajectory of design which aligns most readily with industry and the design of consumer products. A second user group of a design research artifact is the research community that uses the design as an example, concept, or source of knowledge or inspiration. The actual and virtual uses of one user group may affect and potentially amplify the uses of another. A key example is when a design research artifact is presented to the HCI community within the format of a publication or conference presenta-tion. The HCI community will typically makes use of conceptual insights and design inspira-tions based on descriptions of the design coupled with empirical discussions of study partici-pants' use. But this will occur without the HCI audience experiencing a firsthand demonstra-tion of the prototype or product.[31] In a sense, the HCI designer or researcher is vicariously making use of a study participant's actual firsthand use.

That HCI designers and researchers themselves may be constituted as users is not a new insight. The distinction between an everyday user and the expert HCI user is highlighted in Sengers et al's discussion of reflective design (section 2.4). Sengers et al. discuss how artifacts can be designed to guide HCI experts in "rethinking dominant metaphors and values and engaging users in this same critical practice."[32] In this sense, the Obscura 1C is a reflective design, and this section critically reflects on relationships among resistant uses of the Obscura 1C for multiple users, especially everyday users and HCI experts.[33]

---

[31] This point is made in Pierce, "On the Presentation and Production of Design Research Artifacts in HCI," 736 and passim.

[32] Sengers et al., "Reflective Design," 57.

[33] The tone of this chapter reflects the fact that HCI typically understands the user to be other than the HCI researcher or design (with the exception of clearly defined design and research tools). However, the critical observation their are other possible users within HCI, including ourselves, can be found as far back as 1995 in Cooper and Bowers' "Representing the User: Notes on the Disciplinary Rhetoric of HCI." For example, Cooper and Bowers note that "users are not like designers (or computer scientists or system managers or programmers etc.) is repeatedly emphasised in HCI texts"(8). Cooper and Bowers argue that HCI would benefit if we were to "consider the rhetorical and disciplinary status of our own arguments" (28). This call to analyze our discourse, including the discursive construct of the user, foregrounds ourselves as yet another way of discursively constructing the user—deconstructing the conventional user in the process.

With alternative and oppositional designs, it is even more important to be aware of multiple audiences as user groups. Oftentimes a design may appear as though it should be judged according to how well it worked with an everyday user, but in fact the design has been intended primarily for the exclusive audience, such as HCI researchers and designers. An everyday user might find it useless but an expert design researcher will find a great deal of use in its everyday embodied and embedded uselessness, resistance, and working by not quite working. In many more cases, things are not so clear-cut. Resistant designs will often exhibit some potential to be appreciated by a wider, less exclusive audience yet are nonetheless too resistant to become mainstream or mass-market product. Somewhere in between mainstream success and uselessness (which may well be synonymous with intellectual and artistic exclusivity) there oftentimes will lay compelling design potential and possible.

It is particularly important to consider multiple potential audiences of a resistant design. The resistance that is felt depends on who you are and what you are using. A design researcher that specializes in designing resistant things will have a very different resistant experience than someone who has little knowledge or interest in design research, speculative design, critique, art, and so on. At the same time, the expert will often vicariously imagine another user's resistant experience. In this way, *the design researcher makes use of an other's use*. Empirical findings from user studies offer one source from which the researcher can imagine the resistant uses of another. This can create compelling vicarious resistant use.

The counterfunctional designs presented in this chapter have been designed both for an exclusive expert HCI audience as well as other audiences. This is reflected clearly in the design of the packaging, which offers a working product and set of usable instructions yet is subtly cued into an exclusive design, art, and research audience. For example, as was discussed previously, the name "Obscura 1C" and the hybrid visual and form languages of the product packaging are largely designed for an exclusive design and HCI audience. However the primary user of the Obscura 1C is best viewed as lying among several groups ranging in inclusivity, but here in the context of this chapter directed primarily toward you—the expert in design research, HCI, and quite possibly alternative and oppositional design. The Obscura 1C has been designed to be used by several different user groups.

1. Inclusive everyday users. The reference point for the inclusive everyday user is the generic user/consumer of electronic products. The inclusive everyday user could be any person that uses a smart phone to take pictures and post them to social media. As noted in Chapter 3, everyday use is embodied and embedded. Everyday use tends toward the routine, familiar, ordinary, and pervasive.

2. Exclusive groups of everyday users. The reference point for an exclusive everyday user is any group that is isolated from the generic everyday user. Generically speaking, this could be any niche market or select group with special interest or exclusive access. In section 4.4, this group is composed of the 10 people that purchased or were given complimentary Obscura 1C cameras. In section 4.2, this group consists of 8 research participants. Participants in a field study deployment would also constitute an exclusive group of everyday users. However, in the chapter, this group does not yet exist since the Obscura 1C has not been formally distributed as part of a research field study.

3. Exclusive expert users. The reference point for the exclusive expert user is you, the reader of this dissertation. (Anyone who has reached this point of this dissertation almost certainly fits this label.) Any expert in HCI or interaction design could constitute a *casual exclusive user*. An expert in alternative and oppositional HCI or Design would constitute a *core exclusive user*.[34] Both the exclusive expert and exclusive everyday user share privileged forms of access.[35]

4. The Obscura 1C was also designed to be used by me, a very special case of an expert and every-day firsthand user. I wanted to live with and use the Obscura 1C firsthand over an extended period of time. I also wanted to present the Obscura 1C to others, both for actual and virtual use. I wanted to use it to disseminate-distribute concept-things: digital limitations, counter-functional devices, enabling limitations, and inhibitive interfaces bundled up with the Obscura 1C.

Given these multiple forms designed for multiple users, what uses can be made of the Obscura 1C?

4.4 Uses: Working with Resistance

Situated within a multiplicity of conflicting concerns with digital limitations and possibilities, the Obscura 1C has been designed with multiple forms for multiple users. How, then, can we use it here? And to what ends? The Obscura 1C has unfolded, unplanned, into a case study of

---

[34] And yet among even the hardcore exclusive user group the preferred mode of use and the preferred uses may vary considerably. Some may prefer readings lots of words, while others prefer more visual communication. Some may be more interested in design inspiration while others may be more interested in design criticism.

[35] Most people will not be faced with the opportunity to get their hands on an actual Obscura 1C camera or this research publication. Moreover, wrapping your head around the Obscura 1C is likely going to be easier if you are a practicing product designer or a camera enthusiast, or you have an M.F.A in studio art or a penchant for weird things.

these questions. Here the Obscura 1C becomes a case study in using, thinking, and writing a resistant design artifact.

Based on my own experiences with the Obscura 1C, I will present a series of concepts that help elucidate design resistance, digital limitations, and the Obscura 1C. These concepts elucidate resistantly because the key orienting concept they are working to articulate is that *working with resistance*, rather than working out a way to resolve it, is a worthwhile and appropriate approach to take.

Working with Design Resistance

If there is one clear lesson that I have learned from using the Obscura 1C, it is that much can be gained from resisting too quickly trying to reduce it an instrumental or well-understood function, outcome, method, technique, concept, or thing. I have learned this in part through my ongoing firsthand embodied and embedded interactions with the Obscura 1C.

I have been periodically using my Obscura 1C for just over one year at this point. But I can continue to do so only as long as I resist the urge to break it apart and retrieve the images inside. I continue to extract meaning, insight, inspiration, thought, and joy (along with bouts of frustration and anxiety) by resisting both the urge to break it apart and the urge to reduce its value and function to the digital image data that is, I expect and hope, safely stored inside.

It is not that I have completely resolved to revel indefinitely in the pure potential for actual images (although that thought has more than once crossed my mind and poised my body). Rather, my uncertain, ongoing, unfolding, and not-quite-actual-use of the potential images inside has turned out to be a more compelling use than breaking it apart and actually seeing what is inside. *I have come to realize that this is one useful analogy for how to make use of resistant designs.*

Generalizing from this lesson: Much can be learned from working with design resistance rather than immediately attempting to pin it down and extract something unambiguously useful.

The very terms for articulating the value (?), knowledge (?), or use (?) of design research artifacts is a very open question. Many design researchers have openly resisted the urge to codify and instrumentalize design research artifacts. Bardzell and Bardzell argue that some research through design objects are more complex than others, thus "offering an (in principle) inexhaustible source of knowledge production."[36] Michaels argues that "built into the very practices of speculative design is a proactive idiocy in which its eventuations necessarily trigger overspill-

---

[36] Bardzell, Bardzell, and Hansen, "Immodest Proposals: Research Through Design and Knowledge," 2094.

ing and the enablement of unforeseen participant actions, that is, misbehaviors."[37] Such practices produce artifacts that create engagement which exhibit "less a step-wise progression of collecting data, analyzing, representing and influencing and more a process of continuing, rhizomic accretion of voices and things around the design objects that shape and reshape—complexify—them as they circulate along multiple paths."[38] Gaver urges the design research community to "take pride in its aptitude for exploring and speculating, particularising and diversifying, and - especially - its ability to manifest . . . results in the form of new, conceptually rich artefacts."[39] Sengers and Gaver argue that HCI researchers "can and should systematically recognize, design for, and evaluate with a more nuanced view of interpretation in which multiple, perhaps competing interpretations can co-exist."[40]

Inexhaustibility. Overspillage. Conceptual richness. Multiple co-existing interpretations. These are four conceptual starting points for working with resistant design research artifacts. The concepts that continue to unfold from the Obscura 1C have not (yet) been made to form a strongly connected system or story. Instead they are presented as a series of strong points. The comparatively weak lines running through them is the potential for detachment, extension, modification, and reconnection. As Höök and Löwgren might put it, what follows forms a series of more or less "strong concepts" which lie somewhere between general theory and particular instances.[41]

Among these points, one stands out: *Resistantly actualized potential and possibility can very compelling*. Yet to experience the resistantly actualized as compelling requires *working with resistance*, letting it divert us at times while we struggle to make sense, make meaning, and make use of it. It is not that clear instrumental utility cannot be extracted from a resistant design; it most certainly can. The point is rather that there is potentially much to be gained by resisting extracting instrumental utility longer than would conventionally be the case.

I conclude this section by drawing out three concepts based on working with resistance. Beginning with the firsthand operation of the Obscura 1C, these concepts generalize into three techniques that may be used to design alternative and oppositional functions, especially in the

---

[37] Michaels, "What are We Busy Doing?," 537. Here Michaels draws upon Isabelle Stengers concept of the idiot, adapted from Deleuze.

[38] Michaels, "What are We Busy Doing?," 543.

[39] Gaver, "What Should We Expect from Research through Design?," 937.

[40] Sengers and Gaver, "Staying Open to Interpretation," 99.

[41] Höök and Löwgren, "Strong Concepts: Intermediate-level Knowledge in Interaction Design Research," 23-24 and passim.

context of designing digital limitations.

Resistantly Actualized Image-Potentials

The Obscura 1C *does not quite work* like a conventional digital camera.

The Obscura 1C is encapsulated in concrete. It resists being opened and its images accessed.

Using the Obscura 1C demands *not quite actually using the images*—not quite yet.

Since you do not have an actual Obscura 1C camera in front of you, you will have to imagine using one. But doing so is not altogether different from actually using the Obscura 1C. For actually using the Obscura 1C involves a great deal of imagination. Prior to breaking the camera apart the user can only imagine what has actually been recorded. The images are triply obscured: they are embedded in concrete, they are captured without a viewfinder, and their resolution and quality are vaguely specified in the user's manual as "distinctly low."

The Obscura 1C's not quite working without quite actually being used affords a new form of functionality: resistantly actualized image-potentials.

Instead of seeing images, the user virtually feels image-potentials. In my own use of the Obscura 1C, I have occasionally sat and held the camera while I vaguely imagined what might be inside. I also have distinct memories of images I believe I captured but that I know I may never actually see. In several instances, I consciously chose not to capture a corresponding image with a conventional camera. Those digital image-potentials lodged inside my Obscura 1C are the only (potential) visual record of the event. But that last statement is not quite accurate: The Obscura 1C serves as an actual material record of those events and many others, ranging from the vaguely remembered to the completely forgotten. All of this can be felt and visualized when I actually hold, or even just think about holding, the concrete camera.

I did not anticipate these specific experiences of use when I designed or began using the Obscura 1C. Rather these uses have taken some time to solidify as distinct uses.

Resistant image-potentials are a form of working without quite (yet) actually working. But once the images are seen and made to actually just plain work, they cannot not quite work again.

The Obscura 1C will work by not quite working up until the point at which it is broken apart. After that point the device is broken and no longer works as it originally did. After the concrete shell is broken, the images can be accessed via the micro SD memory card buried inside. However, once actualized, the images can never again be the resistant image-potentials that they once were. Images are gained, but resistantly actualized image-potentials appear forever lost.

No longer working ever again as a digital camera sealed in concrete is a sacrifice that enables the

just plain working of the images. At the same time, resistantly actualized image-potentials are sacrificed for the actualization of images.

Resistantly actualized image-potentials are a potential *working by not quite working, used without quite being actually used*. The usefulness of these image-potentials hinges upon the user resisting and allowing the Obscura 1C to resist immediate actual use of the images.

Compellingly Inhibitive Interfaces

The concrete enclosure of the Obscura 1C resists being broken apart. It resists letting its images be seen. The Obscura 1C offers a potentially compelling tension between taking images and accessing them. The Obscura 1C is interesting to actually use because it resists letting its user actually see the digital images stored inside. This creates anticipation. This anticipation can be enjoyed.

The Obscura 1C's interface potentially compellingly offers resistantly actualized image-potentials: The images are intriguing because they are "seen" only as potential images firmly held in suspense. The concrete interface hinders, restrains, or prevents the user from using it. *Inhibition* is resistance focused at the interaction-interface level. The Obscura 1C exemplifies an openly and compellingly inhibitive interface.

How?

The Obscura 1C resists some conventional digital features: immediate and unlimited access. But it also enhances a conventional digital feature of a typical smart phone camera: it practically approaches unlimited capacity. With a capacity of 100,000+ images (and no indicator of how much capacity remains), the number of potential images one may take feels practically unlimited. The Obscura 1C is clearly not a film camera, which has very limited storage capacity for photographs and has no capacity for capturing video and audio. While the Obscura 1C's concrete casing showcases its unconventional inhibitive interface, the camera is still clearly digital, complete with a blinking LED.

The Obscura 1C openly resists being conventionally digital. It showcases its inhibitive interface with the unconventional material choice of concrete. Its inhibitive interface resists immediate and unlimited access, anytime, anywhere, with the click of a button. But there is a saliently digital feature that it enhances rather than resists: practically unlimited capacity. The Obscura 1C offers a potentially compelling tension between digitally unlimited capacity and concretely limited access.

Counterfunctional Devices

Why does the Obscura 1C counter ordinary and expected functionality in order to create new, resistant functionality? It does so in order to reveal how a device can function counterfunctionally. Counterfunctionality is the idea that new embodied and embedded functionality can resistantly emerge from directly countering ordinary or expected functionality.[42] A counterfunctional thing is a thing that saliently counters some of its own functionality. The functionality that is countered gives rise to new and less conventional functionality: counterfunctionality. In the case of the Obscura 1C, a digital camera counters its own potentials for immediate and unlimited image access, resistantly giving rise to counterfunctions.

The Obscura 1C counters the ordinary and expected digital feature of immediate and unlimited access with the click of a button. Resistantly this gives rise to a new counterfunction: compelling resistantly actualized image-potentials. As stated on the packaging: "The Obscura 1C inhibits access to its contents to offer a digital experience based on uncertainty, patience, delayed gratification, and surprise."

As a way of doing design counterfunctionality involves first identifying common positive features of a particular technology and then designing around the absence or restriction of these features. In the case of the Obscura 1C, a positive and desirable feature is first identified: immediate and unlimited access to digital media. An ordinary point-and-shoot camera is then redesigned to inhibit this positive feature by encasing the camera and SD card in cement.

It was said that technique is resistant to step-by-step method. Yet the format of a step-by-step method can be an effective way to package up a design technique of resistance.

Method for designing a counterfunctional device.

Step 1: Identify a positive function.
Step 2: Counter the positive function: inhibit, remove, negate.

---

[42] When framed as way of approaching the design process, counterfunctionality has similarities with Gaver, Beaver, and Benford's strategy to "block expected functionality to comment on familiar products." Gaver, Beaver, and Benford, "Ambiguity as a Resource for Design,"239. Counterfunctionality similarly resonates with Sengers and Gaver's strategy of "stimulating interpretations by blocking expected ones." Sengers and Gaver, "Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation," 103. One important difference between these works and the present work lies in the focus here on offering counterfunctionality as a salient positive feature of a thing. Put another way, limitation is presented to users as a positive design offering. Limitations are presented as unique product features, negatively characterized by absence and inhibition. Another key difference is that the counterfunctional things presented here function to draw attention to themselves and the concepts they embody. In this way counterfunctional cameras function discursively as conceptual focusing devices.

Step 3: Isolate any new counterfunctions.
Step 4: If the results are uncompelling, repeat: go to Step 1.

This method clarifies a simple sequence of steps, but it offers little guidance for how to design a compelling counterfunctional device. What might make a counterfunctional device compelling?

Counterfunctionality is a bridge that can resistantly connect conventional design with art and critique. Think of counterfunctionality as the middle of a spectrum. At one pole is critique. Call this pole *COUNTER*. Capitalization emphasizes critique's often emphatic, verbal form. At the other pole is ordinary, conventional, nonresistant, just plain functioning in the form of everyday things. Call this pole *(function)*. Parentheses emphasize functional things' less verbal, more muted, more experientially backgrounded forms. Consider the following diagram of counterfunctionality:

COUNTER - countered function - counterfunction - (counter)function - (function)

A brief interpretation of the Obscura 1C as a *COUNTER device*:

The Obscura 1C is a critique of the pervasive and uncritically accepted rhetoric of technological possibilities.

A brief interpretation of the Obscura 1C as a *functional device*:

The Obscura 1C is a prototype for a new and compelling interactive consumer experience.

A brief interpretation of the Obscura 1C as a *counterfunctional device*:

The Obscura is a device designed to waver between a COUNTER device and functional device.

Waverability is one vaguely compelling criterion by which we may judge a counterfunctional device. A compellingly counterfunctional device will waver between stable nonresistant functionality and unwaveringly resistant countering of functionality. A well-designed counterfunctional device is a well-designed counterpoint, carefully poised between counterattack and counterbalance. Vaguely we can ask of a counterfunctional device, how well does it waver? How vibrantly does it quiver with irresolution? How compelling is the amalgamation of potential critique, speculation, reflection, agonism, ludic engagement, and other unconventional, alternative, and oppositional functionality that it offers? Is it compelling enough to spread? And if so, what are the better and worse directions in which it may do so? Can we design things that resist

in order to ultimately spread along better trajectories, while knowing that we cannot fully know in advance what those better trajectories are until they've unfolded more fully?

Accessing the SD memory card buried inside the Obscura 1C.

4.5 Summary

This chapter has illustrated how design techniques of resistance can be used to engage a set of conflicting concerns. In this case, the motivating concerns initially centered upon issues of disengagement, boredom, overload, and distraction associated with digital technologies and the expanding possibilities that they offer. As a counterperspective, designing digital limitations was explored as a counterintuitive design space. Balanced between counter-critiques and uncritical design opportunities for innovation, a space of designing digital limitations was resistantly explored. A design process pivoting around the creation of new functionality from countering familiar functionality slowly converged on a single counterfunctional camera device—the Obscura 1C Digital Camera. However this single counterfunctional device has been presented as having multiply resistant uses and forms for multiple users or audiences.

The key lesson extracted from this case study is that working with design resistance is an alternative to too quickly trying to extract instrumental design knowledge from design research artifacts, processes, experiences, and events. Working with resistance has yielded three designed-oriented concepts: resistantly actualized image-potentials, compellingly inhibitive interfaces, and counterfunctional devices. There are surely additional concepts and insight that can be gained through continued resistant use of the Obscura 1C and these concepts.

Chapter 5

Materializing Energies

Energy is a strange matter.[1] According to physicists energy can neither be created nor destroyed. Yet ordinary language speaks to the contrary: energy is produced, consumed, used, saved, and, too often, wasted. Energy—in the most general sense of the term as well as the more limited and commonplace usage as a commodified and usable resource—is without question a matter of fundamental importance. Energy is deeply implicated in the quality of our everyday lives and experiences, our bodily and psychological energy and well-being, global conflict and war, the exercise of political power, and the sustainment of planetary resources and our world. Energy is strange in part because it can be difficult to say what kind of matter it is, or if it can properly be considered matter at all.

In the context of design and HCI, energy and electrical power are integral to the operation of digital and interactive technologies. Without energy and electricity, there would be no digital technology as we know it. In this context, energy and power are physical and technological constructs or materials.[2] Electrical power and energy are typically treated as a purely instrumental material in the design of technology. The experiential, interactive, and aesthetic qualities of energy as a material are for the most part neglected in the design of everyday technologies.[3]

Each of the design cases in this chapter is working to materialize energy in provocatively engaging ways. The design cases are both grounded in and embody critiques of dominant research and design approaches. While the design cases each offer resistance, their resistance is primarily intended to provoke and inspire designers and researchers in ways that can be translated and transitioned into less resistant, more conventional technologies.

---

[1] Portions of this chapter have been adapted from Pierce and Paulos, "Materializing Energy;" Pierce and Paulos, "The Local Energy Indicator: Designing for Wind and Solar Energy Systems in the Home;" Pierce and Paulos, "Designing for emotional attachment to energy;" and Pierce and Paulos, "Beyond Energy Monitors: Interaction, Energy, and Emerging Energy Systems."

[2] In the physical sciences energy and power are distinct. Put simply, energy is the capacity to do work, while power is the rate of producing or consuming energy. In scientific terms, electrical energy is not consumed or produced but instead converted into heat and light energy.

[3] For design philosophies and examples that run counter to this prevailing approach, see, for example, Backlund et al., "Static! The Aesthetics of Energy in Everyday Things;" Dunne, *Hertzian Tales*; and Gaver et al., "Indoor Weather Stations."

The resistant design cases presented in this chapter operate at a variety of scales, they utilize a range of both mature and emerging technologies, and they materialize a multiplicity of energy sources for electrical power. The resistant designs in this chapter will materialize energy generated from wind and solar sources of power. They will connect to emerging and not-yet actualized technological infrastructure that allows individual homes, neighborhood, and cities to generate their own power and store up their own energy. These resistant designs will reveal to users the sources of these energies using energy metadata. They will demand that users use their own bodies to generate power. In each of these cases, energy is designed to be more visible, more tangible, more differentiated, and less readily available—all with an eye toward creating more sustainable consumption with energy resources.

Materializing energy is an approach that runs counter to how energy systems are currently designed. Electric technologies demand a source of energy. Yet within use, the direct experience of energy is typically only felt in the background, if at all. A design approach of materializing energy works to foreground energy as it is embodied and embedded within the use of everyday technologies. Materializing energy further connotes that energy is far from immaterial as it relates to pressing social and environmental issues. Global warming, nuclear catastrophe, conflict over dwindling resources, and growing energy demand coupled with energy security concerns are major societal issues that pivot around energy and connect up with the design of everyday products, systems, and infrastructures. Materializing energy is intertwined with the discourses and concerns of sustainable design and sustainable HCI.[4] Materializing energy is presented as an alternative approach for sustainable design and HCI. This approach leverages resistant designs, but it does so in ways that are amenable to a transition toward new and more sustainable conventions as manifest in the design of everyday products, systems, and infrastructures. The reason that materializing energy is running counter to prevailing unsustainable approaches is in order to realign with sustainable ones.

The design approach of materializing energy builds on design research associated with the Interactive Institute and Umea University in Sweden. The work of the now defunct Static! research group pioneered a number of provocative yet grounded examples that investigated "energy as a material in design."[5] This chapter builds on this notion of energy as a material in design by further highlighting *energy as a material of design*. Approaching energy as a material of design means working to foreground and amplify the largely invisible, intangible, undifferenti-

---

[4] See, for example, Blevis, "Sustainable Interaction Design;" DiSalvo et al., Mapping the Landscape of Sustainable HCI; Froelich, Findlater, and Landay, "The Design of Eco-Feedback Technology;" and Pierce et al., "Introduction to the Special Issue on Practice-Oriented Approaches to Sustainable HCI."

[5] Backlund et al., "Static! The Aesthetics of Energy in Everyday Things," 6 and passim.

ated, and readily available flows of electrical power surging through everyday technologies, along with the sources of energy that supply this power.

The materializing energy approach builds upon and embodies critiques of dominant and conventional approaches within HCI and other areas of research and design. Three critiques are framed as points of departure for alternative design approaches. As such, short summaries rather than detailed arguments are presented here. A more detailed discussion that grounds these critiques in a thorough review of literature within and without HCI is presented in Pierce and Paulos, "Beyond Energy Monitiors: Interaction, Energy, and Emerging Energy Systems."[6]

Beyond Energy Monitors and Consumption Feedback

Electricity consumption feedback represents the prevailing research agenda for designing sustainable energy systems within HCI. Electricity consumption feedback is focused on a specific type of intervention, namely presenting users with feedback based on electricity consumption data (e.g., the amount of electricity a home is consuming), typically displayed to users via a computational visualization. Electricity consumption research also focused on a specific goal, namely promoting individual energy conservation behavior and/or cognitive awareness of energy consumption. A 2012 review of 51 energy related research publications in HCI found that roughly 70% of the energy-related research in HCI was characterized by an electricity consumption feedback paradigm.[7] All of the works reviewed that identified as sustainable HCI research and predominantly contributed a novel technology design were also characterized as electricity consumption feedback.

While prior research has demonstrated that displaying consumption information to occupants can reduce overall household consumption, others have highlighted limitations and counter-effects of this approach. A well-known counter effect is the notion of rebound effects. Others have more deeply critiqued electricity consumption feedback.[8] For example, DiSalvo et al. note that many persuasive technologies designed to encourage energy consumption border on coercion.[9] A more pointed critique of the persuasive technology paradigm underlying electricity consumption feedback has been elaborated by Brynjarsdottir et al.[10]

---

[6] Pierce and Paulos, "Beyond Energy Monitiors: Interaction, Energy, and Emerging Energy Systems."

[7] See Pierce and Paulos, "Beyond Energy Monitiors: Interaction, Energy, and Emerging Energy Systems," 666.

[8] In HCI, see for example Strengers, "Designing Eco-Feedback Systems for Everyday Life;" and Pierce et al., "Some Considerations on the (In)Effectiveness of Energy Feedback Systems."

[9] DiSalvo et el., "Mapping the Landscape of Sustainable HCI,"1981.

[10] Brynjarsdottir et al., "Sustainably Unpersuaded: How Persuasion Narrows our Vision of Sustainability."

Shifting from Sustainable Behaviors to Practices

A number of scholars and researchers both within and without HCI have critiqued a narrow focus on targeting the behaviors and decisions of individuals. Notably Elizabeth Shove has critiqued the popularity of "ABC" framework for sustainable policy decisions, where ABC stands for individual attitudes, behaviors, and choices. As Shove writes, under this framework, "responsibility for responding to climate change is thought to lie with individuals."[11] The concern articulated by Shove and others is that individual behaviors and decisions are an overly reductive focus for addressing issues as complex as consumption and sustainability. This critique has been echoed by those within HCI that highlight the limitations of approaching sustainability primarily as a problem that can be addressed at the individual scale.[12] Practice-theoretic approaches, expounded by Elizabeth Shove and others, have been pursued as an alternative to the ABC paradigm for sustainable design.

Much of the energy-related HCI research draws predominantly on theories and approaches from the fields of behavioral and social psychology. Practice-theoretic approaches have recently emerged as an alternative theoretical bases for sustainable design and research in HCI.[13] Rooted in the anthropology, cultural studies, and philosophy, theories of social practice emphasis the routine and mundane activities of everyday life, foregrounding a concern with how those activities are situated within social, cultural, and material contexts.[14] As my co-authors and I have written, there are at least three themes evident in recent sustainable HCI research that has shifted from behavior to practices:

> The first involves the repositioning of materiality, particularly computers and interactive technologies,

---

[11] Shove, "Beyond the ABC: Climate Change Policy and Theories of Social Change," 1274.

[12] See, for example, Brynjarsdottir et al., "Sustainably Unpersuaded: How Persuasion Narrows our Vision of Sustainability;" Strengers, "The Designing Eco-Feedback Systems for Everyday Life;" Dourish, "HCI and Environmental Sustainability: The Politics of Design and the Design of Politics;" and Dillahunt, Mankoff, and Paulos, "Understanding Conflict between Landlords and Tenants: Implications for Energy Sensing and Feedback."

[13] See, for example, Kuijer, Jong, and Eijk, "Practices As a Unit of Design: An Exploration of Theoretical Guidelines in a Study on Bathing;" and Kuutti and Bannon, "The Turn to Practice in HCI: Towards a Research Agenda;" "Strengers, Designing Eco-Feedback Systems for Everyday Life;" and Strengers, *Smart Energy Technologies in Everyday Life*.

[14] Pierce et al, "Introduction to the Special Issue on Practice-Oriented Approaches to Sustainable HCI," 2. On social practice theory, see, for example, Reckwitz, "Toward a theory of social practices: A development in culturalist theorizing;" Schatzky, *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*; and Shove, Comfort*, Cleanliness and Convenience*; Shove, Pantzar, and Watson, *The Dynamics of Social Practices: Everyday Life and How it Changes*.

in ways that decenter both the human and the computer from HCI research. The second engages with the role of practice analyses to both situate themselves within as well as to transcend time and place by drawing attention to the dynamic and sometimes contingently contextual nature of practices. Finally, the articles highlight some of the ways in which engaging with the concept of practice reframes the scope and nature of design interventions that HCI practitioners could engage with to achieve sustainability outcomes.[15]

Working with and against Emerging Energy Technologies

We are currently witnessing a surge of technical and social innovation in the energy sector across various areas of academic research, government, and industry. However our review reveals that the HCI community has been slow to fully and explicitly engage with important areas of this work—either to build upon it or critique it. One important areas of emerging energy systems include renewable generation, distributed generation, and micro generation. Renewable generation refers to electricity generated from naturally replenished energy sources, such as sunlight, wind, geothermal heat, and tides. *Distributed generation* typically refers to the means of generating electricity using technologies that have both smaller generation capacities and are located within close proximity to the people and technologies that consume the energy.[16] *Microgeneration* refers to the use of small-scale distributed generation to support one's own needs.[17] Two well-known and popular examples of microgeneration are photovoltaic generation (solar panels) and micro-wind turbines.

5.1 Energy Mementos: Attachment to Energies

Centralized energy regimes employing large-scale power plants and distribution networks position all energy as the same, differentiated only by abstract metrics such as kilowatt-hour. While engineering and scientific conceptualizations of energy are materially manifested in household outlets and portable power adapters that we interact with on a daily basis, we do not ordinarily experience differentiated instances, types, or qualities of energy. Note for example that the plural form of energy—energies—is rarely used in everyday language. If energy as a *thing* can be said to enter into our everyday experience it is as a single, totalizing entity or phenomena—something vague and amorphous with which our only real concern is to instrumentally connect in order power our devices so we can go about our daily activities. Once connected, energy does not matter to us so long as we are able to continue to power our devices,

---

[15] Pierce et al., "Introduction to the Special Issue on Practice-Oriented Approaches to Sustainable HCI," 2.

[16] See, for example, Zareipour et al., "Distributed generation: current status and challenges."

[17] See, for example, Strengers, *Smart Energy Technologies in Everyday Life*; and Dobbyn & Thomas, "Seeing the Light."

our homes, and our cities. From the perspective of everyday use, all energy is essentially the same. As an infrastructural technology, modern electrical power systems have been designed to function this way.
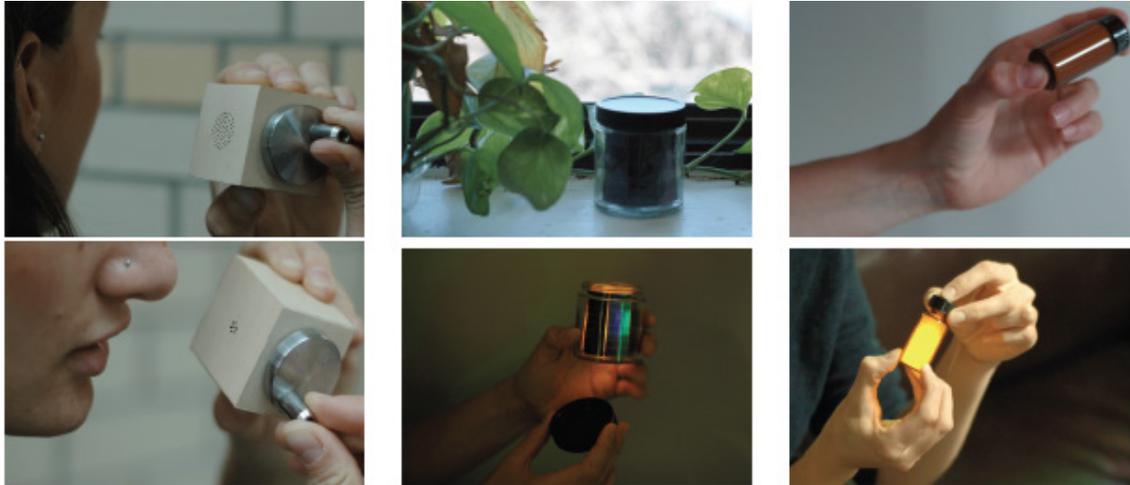
Energy Mementos.

Energy Mementos have been designed as a way of exploring alternate engagements and relationships with electrical power and energy. Energy Mementos are small objects that allow people to collect, keep, share, and activate small bits of energy. The Energy Mementos employ resistance as a design technique. They resist allowing electrical energy to be used for any conventionally useful function. Instead the Energy Mementos propose that electrical energy be treated as something worthwhile independent of any instrumental use. By resisting the use of energy as an instrumental and perceptually backgrounded material, the Energy Mementos afford new experiences and perspectives on how people can engage with and relate to electrical power and energy. Here the Energy Mementos will used to articulate the concepts of energy attachment, energy possession, and singular energy as new models to explore for designing sustainable energy systems.

Energy Mementos

Energy Mementos are small and unassuming objects for collecting, keeping, sharing, and activating small amounts or "pieces" of singular energy. The Energy Mementos exemplify the design of electrical energy as materiality—energy-as-materiality. The Energy Mementos were inspired by the deep attachments that people often develop toward material possessions such as family heirlooms or mementos. I designed the Energy Mementos with the goal of prompting reflection on and engagement with particular energies as objects of emotional and perhaps

irreplaceable significance. This is a notion that runs counter to the typical instrumental use of electricity. By adopting a resistant design approach, the intent was to explore implausible design scenarios with the intuition that useful concepts and techniques would emerge through the process.

Energy Mementos were partly inspired by studies of material culture that investigate uses and meanings of everyday objects.[18] One area of material cultures studies investigates the ways in which particular objects become unique, personalized, decommodified, and irreplaceable. Through various *possession rituals* objects can provide, acquire, and mediate meaning.[19] Drawing on several strands of material culture studies research as inspiration, the Energy Mementos were designed along with the concepts of energy attachment, energy possession, and singular energy. These concepts parallel research that investigates people's attachment to particular material objects.

It is odd to think of developing sentimental attachment to batteries, power outlets, and other sources of electrical power. The concept of energy as a meaningful possession contrasts with the distinctly utilitarian design of power chargers, battery icons, overhead power lines, and residential energy meters. Indeed, these technologies are often perceptually hidden from the user. But if we momentarily suspend instrumental thinking, we can forge ahead along a resistant trajectory of designing for emotional attachment to energy attachment, possession and dispossession rituals around energy, and the singularization of particular energies. How might we design technologies such that users become attached to particular and plural energies? Could particular energies be experienced as singular things that are inherently meaningful and differentiated from other energies?

The physical size and form of each Energy Memento is suggestive of a small physical keepsake and does not communicate any obvious utilitarian function. The interaction with the Energy Mementos was further intended to facilitate discussion of various possession rituals possibly leading to attachment (e.g., using, displaying, storing, discussing, comparing, bequeathing, inheriting, altering, personalizing). A general description in terms of a framework of collecting, keeping, sharing and activating energy is given as follows: *Collecting*—Small amounts of electrical power is generated from bodily motions (turning, spinning, pushing, pressing, etc.) or other sources of micro-power, such as sound or light; the energy is collected by physically manipulating the memento (e.g., placing it in sunlight; shaking it). *Keeping*—The electrical

---

[18] For a review and definition, see Woodward, *Understanding Material Culture*, 3 and passim.

[19] Woodward, *Understanding Material Culture*.

energy collected is stored with small batteries or supercapacitors; the energy is kept "within" the containers (e.g., bottle, jar, box). *Sharing*—The energy cannot be directly transmitted electrically to other mementos or devices, however individuals can share the Energy Memento by physically giving it to someone. *Activating*—The kept energy can be activated as light (e.g., LED, LCD display), sound, or mechanical motion.

For example, the *Shake-Light Bottle* works as follows: Shaking the bottle collects energy; the collected energy can be activated as light energy by twisting and removing the cap, making the bottle glow. One envisioned scenarios for the shake-light bottle would be to carry the bottle in ones pocket, allowing it to collect energy throughout the day as a result of ones routine bodily motions. Later, the bottle could be given to a loved one as an expression of the giver's personal energy. The recipient could then keep the bottle in a special place, such as a shelf or drawer in the home. The recipient could, perhaps in a moment of longing for the giver, open the bottle to activate the giver's energy. The energy would be activated as a unique pattern of light colors and intensities, communicating a unique pattern of daily energy-generating activity of the giver.

Inviting Participants to Engage with Energy Mementos

To help ground these conceptual explorations, the Energy Mementos were presented to a small group of participants. I initiated interaction and discussion with participants around several Energy Memento prototypes during semi-structured interview sessions. As expected, some participants struggled to find utilitarian value in the Energy Mementos. Other participants responded enthusiastically and imaginatively to the Energy Mementos:

> Participant: I think of it like magic. Pure, like special little energy. Like my special little recipe for energy, cuz this is like energy that is not a part of that big amorphous grid I was talking about. It is, like, *in my hand*.
> James: Is this energy different from other energy?
> Participant: Isn't like all energy the same? Like physics? At the same time: No. I feel very different about this energy. Because it is not very practical...? Like...this infinite world of three pronged outlets...like what am I going to do with this? But at the same time it is better.

Another participant responded particularly strongly to a scenario I proposed in which the Energy Mementos had been in his family for many generations: "I'd want to *add* to it! ... I'd never even use it, except maybe for special occasions." Overall, most participants expressed that the Energy Memento, as energy rather than object, was in some ways very different yet in others very similar to the electrical energy they accessed through the power outlet. The notion that energy could be differentiated and acquire emotional significance was apparently an unfamiliar one yet one that could be assimilated to existing experiences with objects. Still, participants readily highlighted differences between physical mementos and Energy Mementos. For exam-

ple, the differences in sensorial richness of a handwritten note versus an LED, and the differing rate and quality of the degradation of energy versus materials like wood over time.

The anecdotal participant reactions suggest how the Energy Mementos effectively resisted conventional instrumental functions and in doing so helped prompt imaginative, speculative uses aligned with the notion of emotional and sentimental energy attachment and possession to singular electrical energies.

Designing Energy as Material and Symbolic

Proposing a more explicit treatment of the design of energy as both material and symbolic is certainly not without problems. On a very pragmatic note, the fact that energy is consumed— its materiality degrading and eventually dissolving entirely— suggest longevity and endurance as possibly misguided notions to apply to the design everyday technologies. How and why should the symbolic value of energy endure if its materiality does not? In terms of sustainably re-designing our everyday interactions with energy and energy consuming products, the notion of *care of energy* may be more appropriate than that of *attachment to energy*. We might design for caring for our energy in the same ways that one cares for the materiality of food when gardening or preparing an elaborate meal. It may be worthwhile to design microgeneration technologies in ways that promote a form of emotional attachment to or care for energy. Indeed evidence from interviews with residents using domestic microgeneration technologies points toward forms of attachment to energy based on the introduction of these technologies, even among those that did not commission their installation. For example: "The advantage with [solar power tech-nologies installed in his home] is that it makes you think about your energy use more. You value it more..." and "I want to feel that as much electricity as I can use is my own electricity."[20]

Perhaps more problematic is that designing energy to more explicitly enter into the symbolic realm of consumption may lead to the increased material consumption of energy by way of its being increasingly sought after as an unsustainable object of desire. Criticism of such a "reifica-tion of energy" must be taken seriously, yet we must also acknowledge that all material and immaterial technologies are already symbolically consumed. The material-symbolic value of energy and energy technologies can be considered or ignored by designers as well as manipulated in ways working for or against goals of sustainability. Whatever the case, the symbolic value of energy and energy technologies is always to some extent present. As such, it is imperative that designers aim to sustainably redefine our understandings of and interactions with energy through careful attention to the material-symbolic value of emerging as well as commonplace

---

[20] Dobbyn and Thomas, "Seeing the Light," 51-53.

energy related technologies and the energy they materialize. This task is all the more imperative given the emergence of more visible and tangible energy technologies including solar panels, wind farms, and in-home energy monitors.

The Energy Mementos may be viewed as a way of materializing the concept of the material-symbolic value of energy. Bequeathing an heirloom Energy Memento, for example, seems quite unlikely to ever become a common practice. Yet it nonetheless serves as useful counterpoint to the current undifferentiatedness of energy and offers an alternative to our currently unsustainable situation in which energy is something purely instrument, and undemanding and undeserving of our sustained care and attention.

Design Transition: Scenarios for Everyday Energy Collection

Everyday heirloom energy is a concept that is highly resistant to becoming a reality. As a pervasive everyday practice it is entirely unrealistic. Yet there is the germ of a compelling and plausible design scenario within this resistant proposal. If Energy Mementos represent the smallest, most personal, and most meaningful scale and form for electrical power and energy, how might we scale and transition the Energy Mementos into less resistant, more plausible everyday technologies? As observed in chapter 4, there is value in slowly and carefully working with resistant designs and ideas before distilling them into clearly useful, nonresistant designs. The strategy taken in this chapter is to slowly transition resistant designs into less resistant designs.

Energy Mementos cannot be used to power useful everyday electrical technologies. What if singular, personal, emotional energy was generated and used to power everyday devices? How might people keep, share and activate different energies collected from everyday routine practices: Kids-jumping-on-the-couch energy? Restless-sleep energy? Making-love-in-bed energy? Entering-and-leaving-home energy? Cycling-to-work energy?
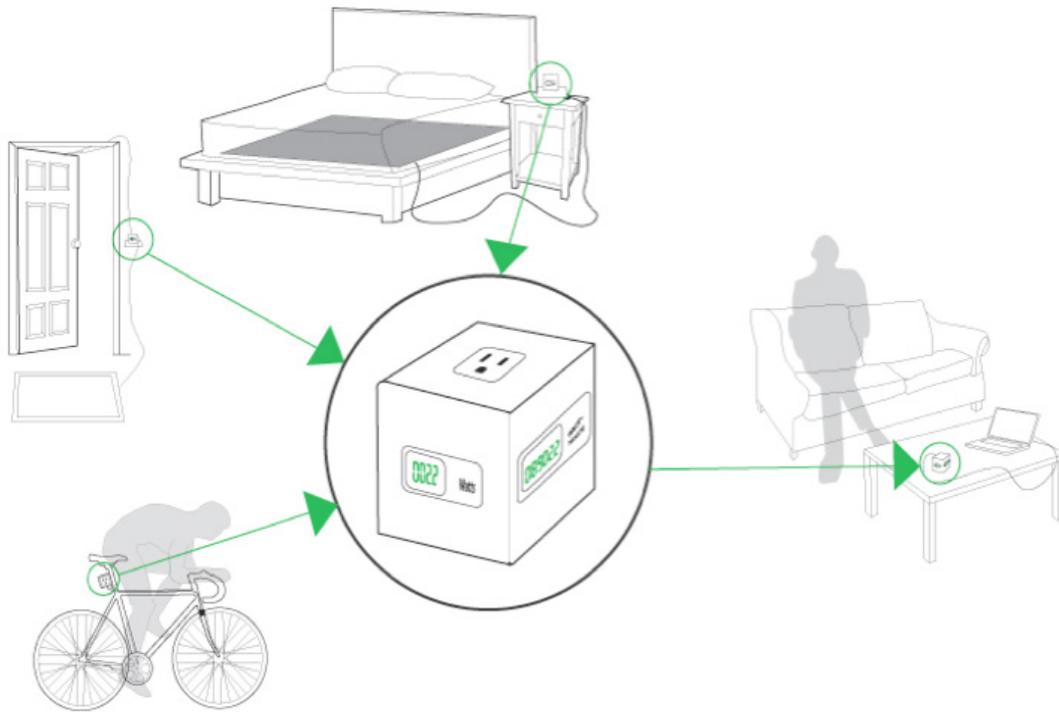
Scenarios for everyday energy collection.

5.2 The Local Energy Indicator: Local, Slow, and Unreadily Available Energy Systems

This section explores the conceptual design space of *local energy systems*. In order to explore this new design space, I present The Local Energy Indicator, a novel system that measures and displays local energy information. As was said at the beginning of this chapter, the design of systems to support and encourage sustainable energy consumption has become an important area of concern for HCI research especially in the area of home energy-monitoring and eco-feedback technologies.[21] However HCI as a field has been slow to situate sustainable consumption research within recent trends in emerging energy infrastructure and policy. This emerging infrastructure includes a range of technologies associated with the "smart grid" and smart metering.[22] The design of the Local Energy Indicator is based upon two emerging energy technologies: distributed generation and renewable generation. *Renewable generation* refers to electricity generated from naturally replenished energy sources, such as sunlight, wind, geo-thermal heat, and tides. *Distributed generation* typically refers to the means of generating

---

[21] See, for example, Froehlich, Findlater, and Landay, "The Design of Eco-Feedback Technology."

[22] Pierce and Paulos, "Designing Everyday Technologies with Human-Power and Interactive Microgeneration."

electricity using technologies that have both smaller generation capacities and are located within close proximity to the people and technologies that consume the energy.[23] *Microgeneration* refers to the use of small-scale distributed generation to support ones own needs.[24] Two well-known and popular examples of microgeneration are photovoltaic generation ("solar panels") and micro-wind turbines.

Local Energy

The concept of local energy was inspired by observation that distributed and renewable generation depart in unique ways from current centralized systems of energy production, such as coal and nuclear generation. This is most evident in the case of domestic microgeneration, the subarea of distributed and renewable generation that I will focus on. Empirical work has suggested that householders with microgeneration systems are more likely to actively manage their resource consumption.[25] Other scholarly writings have discussed how microgeneration can afford new forms of awareness and engagement both in terms of individual consumption as well as more broadly in terms of community and political involvement with energy issues.[26] For example, environmental psychologist Patrick Devine-Wright articulates a utopian vision of microgeneration and "decentralized" energy systems as sites for the emergence of new behavioral, social, and political paradigms of energy:

> It is likely that decentralized generation from homes and buildings, along with local power plant such as small-scale wind farms or district heating systems with CHP plant, will represent very different contexts for energy behaviour in the future. Deployment of micro-generation and smart-metering technologies will transform buildings into power stations and offer unprecedented opportunities for 'in sight and mind' energy systems. These devices not only challenge accepted ways of imagining or talking about energy generation and supply, such as the utility of the concept of 'power station' in a decentralized energy future…but are also likely to substantially raise the salience of energy issues in everyday life, making people more aware of how heat and power is generated, supplied and consumed, and closing the current awareness gap between personal energy consumption and the consequences of such consumption for environmental problems such as climate change.[27]

---

[23] See, for example, Ackermann, Andersson, and Söder, "Distributed Generation: A Definition."

[24] See, for example, Dobbyn and Thomas, Seeing the Light: The Impact of Micro-Generation on our Use of Energy."

[25] See, for example, Woodruff, Hasbrouck, and Augustin, "A Bright Green Perspective on Sustainable Choices;" Strengers, "Designing Eco-Feedback Systems for Everyday Life;" and Strengers, *Smart Energy Technologies in Everyday Life*.

[26] See Tatum, "Technology and Value: Getting Beyond the 'Device Paradigm' Impasse;" and Devine-Wright, "Energy Citizenship: Psychological Aspects of Evolution in Sustainable Energy Technologies."

[27] Devine-Wright, "Energy Citizenship: Psychological Aspects of Evolution in Sustainable Energy Technologies," 72.

A decentralized energy system is one important yet largely overlooked emerging context on which HCI and interaction design research and practice can focus and in doing so help shape emerging technologies in more sustainable ways. Resistant designs hold the potential to divert emerging systems in new directions that radically depart from dominant and unsustainable systems.

This section characterizes and sets out to investigate local energy in terms of three themes. The first is *contextuality*. In contrast to large, centralized modes of energy production, microgeneration is situated physically close to consumers. Consequently, those that consume microgenerated energy may have direct knowledge of where and how it was generated. Further, different geographic regions have different capacities for microgeneration. For example, some regions have a higher amount of wind and solar potential than others. These characteristics of domestic microgeneration highlight ways that *local energy may be strongly tied to a particular place or context.*

The second theme is *seasonality*. Because microgeneration is highly reliant upon local conditions, it is often characterized by unpredictable and intermittent generation.[28] In the case of wind and solar power, energy product is directly related to local weather conditions. These characteristics highlight ways that *local energy may be highly dependent on particular seasons*. The term season here connotes cyclical ecological conditions but it may generally refer to any period of time.

The third theme is *visibility and tangibility*. Domestic microgeneration technologies such as solar panels and wind turbines, in contradistinction with large centralized generation facilities, can literally be seen and even touched by consumers during the course of everyday life. Because microgeneration may also be dependent on factors particular to a certain time and place, it may also be less readily and consistently available. This inconsistent availability of local energy may lead to individuals being more aware of the particular contextuality and seasonality of the energy they use. These characteristics highlight ways that *local energy may be more visible and tangible* as compared to energy that is non-locally produced.

A number of design research questions unfold from these themes. Can local energy systems be designed to promote new forms of awareness and engagement with the local environment including the household, community, or local weather conditions? In what ways and to what extent can local energy systems amplify the visibility and tangibility of energy? Must the

---

[28] See, for example, Zareipour, Bhattacharya, and Canizares, "Distributed generation: current status and challenges."

seasonal and intermittent nature of local energy always be constituted as a problem of unreliable and uneven production? Or could seasonal energy be enjoyed and appreciated in ways similar to recent trends of appreciating seasonal foods?

A More Resistant Precursor: The Local Energy Lamp

A direct precursor to the Local Energy Indicator was the Local Energy Lamp. The trajectory leading from the Local Energy Lamp to the Local Energy Indicator is instructive in revealing a direct translation from a more resistant to less resistant design. The Local Energy Indicator represents a translation of a poetic ambient system into an unconventional display readily aligns with dominant trends in home energy monitoring and information visualization.

The Local Energy Lamp.

The Local Energy Lamp was conceived as a way to communicate different qualities of energy. Energy qualities are visually communicated by dynamically altering the light quality emitted by the lamp depending on the various energy sources used to power it. For example, wind power may cause the lamp to glow blue while solar power may cause the lamp to glow orange. Other less conventional qualities of energy such as age or distance traveled may also be communicated. For example, "fresh energy" is displayed with a gently pulsing glow, while "stale energy" is presented as an anxious, intermittent series of blinks. The concept of *energy metadata* provides a speculative technical infrastructure for communicating unconventional attributes of electrical energy.

The Local Energy Lamp was designed as a probe to engage participants in a conversation. In addition to the Local Energy Lamp, participants were also presented with several functional microgeneration systems including a small-scale solar and hand-powered microgeneration and storage systems. Participant responses included descriptions of microgenerated energy as "free," "homemade," "personal," and "clean." Several participants described envisioned scenarios of

deep and meaningful engagement with micro generated energy. For example, in reaction to scenarios in which he was able to generate solar, wind, and human energy and engage with this energy via the Local Energy Lamp, one participant responded: "I feel like that'd be kinda cool, especially in today's culture. 'Cause you'd get a real sense of satisfaction. . . . It'd be like gardening but with a laptop, like harvesting power... I wanna compare it to gardening. A lot of people find that pleasurable—in the same way people find cooking pleasurable. Like it is sort of sustaining your life, but a lot of people find it fun...like tending to your solar garden."

The analogy to gardening, farming, and cooking was a recurring theme in this limited empirical study as well as other empirical studies of microgeneration technologies. In the previously cited study of microgeneration technologies in the home such comparisons with gardening and food come up on several occasions. For example, one individual using micro-hydro power remarked: "It gives a certain satisfaction knowing that you're using something you've produced yourself, like growing your own vegetables."[29] These findings point toward design opportunities related to local energy, perhaps communicated and verified with systems employing energy meta-data, similar to recent "local food" movements. Another promising finding was several participants claiming that they may change their routine consumption practices in relation to the availability of different energy sources, as communicated by the Local Energy Lamp, such as altering the times at which laundry is done to coincide with the availability of solar or wind energy. Again, evidence from the use of actual microgeneration technologies in the home indicates similar practices. For example, an individual using off-grid wind power describes his alteration of heating practices based on wind conditions: "When the wind is blowing right up then I turn the electric heaters on – rather than use the gas from the gas bottles."[30]

Transitioning the Local Energy Lamp to the Local Energy Indicator

The Local Energy Lamp suggests a scenario in which individual appliances and devices poetically respond to the various local energies that power them. Indoor lighting subtly changes hue depending on whether blue-wind, orange-solar, or clear-centralized energy is being drawn upon. The concept is easily extended to other appliances. An excess of local energy might cause household outlets to might emit sound and light begging occupants to charge up their personal devices. Perhaps the washing machine refuses to operate in the absence of local energy.

---

[29] Dobbyn and Thomas, "Seeing the Light: The Impact of Micro-Generation on our Use of Energy," 3.

[30] Dobbyn and Thomas, "Seeing the Light: The Impact of Micro-Generation on our Use of Energy," 7.

While amusing, these scenarios appear to resist becoming everyday and familiar. Yet the underlying tactic of inviting consumption that aligns with the seasonality, contextually, visibility, and tangibility of local energy is compelling. The trick is to try and transition the resistantly compelling idea into less resistant designs. The Local Energy Indicator does this by employing adopting the form and function of a more conventional in-home energy monitor, or eco-feedback technology.[31] The form factor of the Local Energy Monitor more readily aligns with familiar household energy infrastructure such as thermostats, light switches, and power outlets. However the Local Energy Monitor still offers resistance.
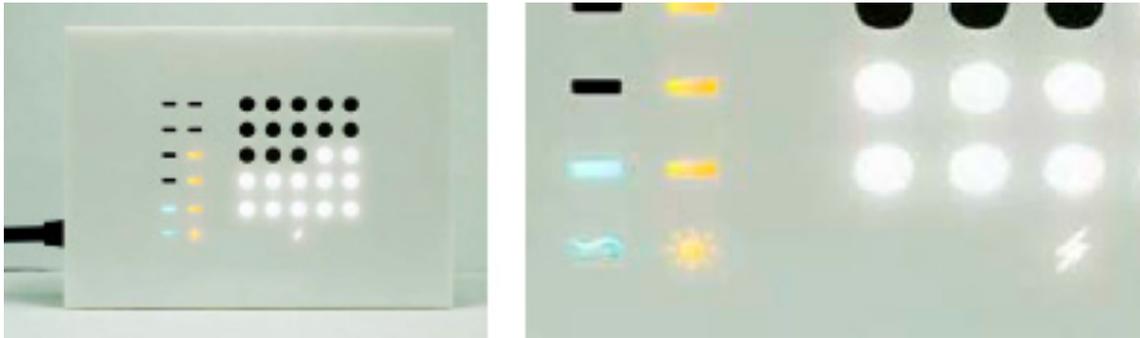
The Local Energy Indicator

The Local Energy Indicator

The Local Energy Indicator display is built on top of an imaginary but plausible infrastructure in which households are equipped with solar panels and wind turbines generates and store electrical power within large on-site batteries. The Local Energy Indicator is a minimal display unit that presents the real-time levels of wind and solar generation along with the level of the battery that stores up the locally generated power. The information layout of the display was designed to have a simple look and feel. The display does not assign specific values to the levels, such as "kilowatt" or "dollars per hour." Nor does the display offer clear behavioral cues such as red/yellow/green traffic light display. These design decisions were made to resist reducing local energy to a numerical values or behavioral cues in order to facilitate and persuade domestic resource management grounded in rational choice models of human behavior. By using a more ambiguous visual representation that resists clear reduction to monetary or scientific quantities, the design goal was to invite more playful, poetic, and aesthetic engagement with local energy resources. The Local Energy Indicator is best viewed as a resistant eco-feedback device. It resistantly aligns with a dominant eco-feedback paradigm in an attempt to push both designers and users to expand beyond resource management or behavioral persuasion. Yet the Local

---

[31] Froelich et al., "The Design of Eco-Feedback Technologies."

Energy Indicator much more readily aligns with eco-feedback technologies and ubiquitous household technologies than the Local Energy Lamp or Energy Mementos. The Local Energy Indicator appears to lie much closer to a technology that might someday be found in homes around the world.

The Local Energy Indicator utilizes the speculative infrastructure concept of *energy metadata*, or electrical power and energy tagged with metadata that defines attributes such as the source and location of energy resources. The Local Energy Indicator display unit consists of three primary informational components: (1) current wind power level, (2) current solar power level, and (2) stored available energy. The wind power level and solar power level indicators display the approximate amount of (potential) wind and solar power generation on a scale from 0 bars (no power) to 5 bars (most power) based on current wind speed and UV index as measured by the locally positioned weather station. The stored available energy indicator displays the amount of local energy that is currently stored and available to use. Zero dots indicate that no local stored energy is available for usage while twenty-five dots indicates a full storage of available local energy. The stored available energy was estimated based on the average wind and solar levels and an estimated consumption rate that depended on time of day and average household electricity bills. The stored available energy indicator was also designed to fluctuate over time in order to give participants a sense that their local energy levels were in fact dependent on local weather conditions and their own consumption. Although many microgeneration systems are *grid-tied* rather than relying on on-site battery storage, we chose to focus on the latter scenario because it more strongly supports the theme of visibility and tangibility.

Because of the challenges with integrating the system with a functional microgeneration system I chose to simulate generation from wind and solar energy using data from a home weather station. This led me to design and implement a system that includes three primary components: (1) a set of local energy in-home display units for communicating local energy data, (2) a weather station for measuring the actual real-time potential energy collection, and (3) a computer for logging and relaying data from the weather station to the local energy displays.

Field Study Deployment and Methods

I deployed the systems in 2 homes for approximately 2 weeks each in March of 2011 in Pittsburgh, Pennsylvania, USA. Participants were recruited through Craigslist and each was compensated 100 USD. I recruited one household with members that self-identified with environmental issues and another group that did not, with the goal of diversifying to draw out comparisons. I briefly summarize each group.
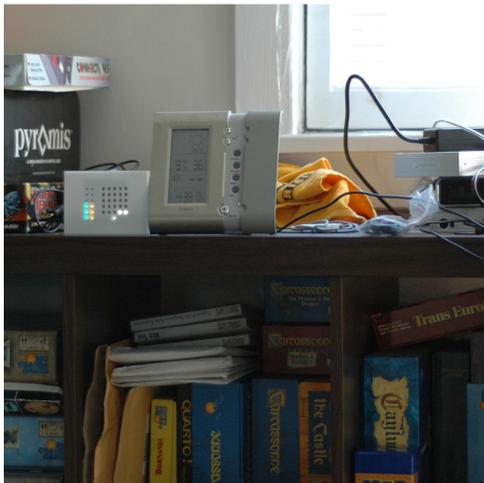
The Local Energy Indicator field study deployments.

John and Julia's home. Both John and Julia are in their 30's and live with 3 young children—two of whom are Julia's, one John's. They own their own 4-bedroom house. Both John and Julia are professional computer programmers.

Tom's home. Tom is in his late 20's, and is a self-described community organizer and activist concerned with social, political and environmental issues. Tom lives with one roommate in a 2-bedroom apartment that they rent.

The field study method involved an initial setup of the system at participants' homes along with a short informal interview, a brief mid-study check-in interview, and a final extended exit interview. I conducted each home visit and interview session. Both deployments were accompanied by some technical problems that required me to visit the homes to correct. These visits

ended up providing a useful way of learning about the participants and discussing the system with them.

The basic presentation of the system to participants was as follows. First I briefly described the basic notion of domestic solar and wind generation, and then told the participants that this type of display was one that could be used if they had wind and solar generation along with a battery storage system installed in their home. Each component was then described (similar to the way described above), as well as summarized on a handout given to participants. Participants were then asked to consider that such a system had in fact been installed, and asked to go about their daily routines with this idea in mind. Participants were told the study was open-ended in that our goal was to learn their various thoughts and opinions of this type of system, and that there would be an extended discussion of various issues at the conclusion of the study. I intentionally refrained from offering much further detail, such as the amount of power corresponding to each wind or sun bar. This was done to help encourage participants to think beyond the specific implementation of the display and to more generally consider the idea of local energy and energy metadata systems for their home or community.

Findings

Imagining shifting practices and emergent practices. Participants discussed ways that they might shift their practices to different times of day depending on the amount of wind power, solar power, or stored energy. For example, when asked if the wind or sun power levels would affect any everyday activities, Julia and John quickly mentioned some activities that they would consider shifting:

> Julia: Yeah, I might think [if I saw a lot of wind power being generated], Now's a great time to do the laundry!
> John: … or make a loaf of bread, or run the dishwasher.

These findings are suggest that certain practices such as laundering are may be highly "shiftable" according to the varying availability of local energy.[32]

In some instances participants suggested changes to existing practices that may be better characterized as new practices altogether. The most salient example is the routine of monitoring local energy levels. Participants also indicated that this might extend beyond the displays. Julia suggested a new practice of checking the weather to gauge energy generation levels and plan

---

[32] On shiftable practices, see Pierce, Paulos, and Schiano, "Home, Habits, and Energy."

ahead accordingly, similar to how she currently checks the weather "obsessively" in order to help plan her day. John and Julia also discussed concerns with routine maintenance and upkeep of solar panels, wind turbines and batteries, which highlights a completely new area of home maintenance practices.

Both groups of participants suggested increasing some conservation measures. In the case of Tom, he suggested a new routine of double-checking to make sure everything in his home was turned off before leaving, especially if his stored energy level was low. Tom's reasoning was that he'd want to "look forward to coming home to a full load of energy." Both groups indicated that they became more conscious of energy and thought that this system would help them become "more mindful" of their energy use. Tom's concern also highlights how the Local Energy Indicator draws attention to the total available energy for his home.

In terms of resistance, these findings demonstrated how the Local Energy Indicator and interview process led participants to imaginatively speculative about shifting their habitual everyday practices, or developing new practices. This suggests how resistant designs can divert imagination in new directions that depart from existing conventions.

Celebrating and wasting local energy. Participants also indicated ways they might increase their consumption. For example, Tom discussed how he considered pre-heating and pre-cooling, as well as turning lights on more frequently when there was available wind or solar power, or during periods when energy storage levels were plentiful. This is interesting because Tom was extremely environmentally conscious and habitually left lights off and used heating and cooling sparingly in order to conserve energy. Yet Tom's remarks suggest that the introduction of microgeneration may actually lead to an increase in his overall consumption. The wind-day laundering and sunny-day bread making suggested by Julia and John may also lead to a form of increased consumption of energy. However, we may also view such practices as a form of celebrating the production and use of personally generated local energy. These findings suggest ways the microgeneration systems can be designed to encourage a new type of relationship to and ownership of energy that one produces and stores at home. The extent to which such practices increase or decrease overall consumption, or positively or negatively affect energy and ecological systems overall, is an open questions this work raises.

In terms of resistance, these findings suggest both pros and cons of transitioning resistance into less resistant designs. On the one hand, the nonresistant integration of celebratory or conversation oriented practices signals a success for sustainable design. On the other hand, nonresistant integration can establish new unsustainable practices and conventions, such as developing

wasteful or celebratory consumption practices that do little to sustainably reduce or shift overall consumption, or to establish more careful and conscious consumption practices and lifestyles.

Non-negotiable practices. The study also uncovered practices that were apparently highly resistant to change. Such practices have been characterized in prior works as non-negotiable practices.[33] For example, when asked if they would alter other practices such as cooking John and Julia were much more resistant, stating "But we're not gonna change when we eat our meals. … unless I was feeling playful (John)." Julia and John agreed that cooking dinner is not a practice that is likely to be affected by the introduction of local energy or energy metadata. The one notable exception discussed was if John was "feeling playful," where John indicated he might try to create a "no-cook" meal if it was an overcast and calm day. These findings bring into relief the limitations of design resistance to easily transition into radically new and nonresistant ways of living. Designing systems that encourage people to shift their meal times may be a less resistant possibility than bequeathing heirloom Energy Mementos. Still, a great deal of design work is needed to transition such a resistant scenario into reality.

Discussion

Altering everyday practices. A major research question guiding this work is concerned with understanding how local energy systems may (or may not) alter everyday practices. Here we highlight three categories of everyday practices to consider. (1) Shiftable energy practices. This study suggests that laundering is one everyday practice that many individuals may be willing to shift depending on the availability of local energy. While demand-response programs typically aim to motivate people to shift their consumption to off-peak hours based on cost, this study suggests a non-financial motivation that is based more on engaging with the local environment and local energy sources. (2) Non-negotiable energy practices. This study also points to areas of everyday practice that are highly resistant to change. Taking these into consideration is equally important in the design of any local energy system, which may involve eco-feedback displays. (3) New local energy practices. Finally, this work suggests some interesting opportunities for the emergence of new social practices, such as celebratory meals prepared with local energy. Such practices can serve to inspire many creative design concepts. For example, Julia's suggestion of checking the weather as a way to measure the energy suggests the design concept of a "local energy forecast." At the same time I have highlighted potential dangers with increased consumption of local energy, such as the emergence of new pre-heating and pre-cooling practices.

---

[33] On non-negotiable consumption practices, see Strengers, "Designing Eco-feedback Systems for Everyday Life," and Strengers, *Smart Energy Technologies in Everyday Life*.

Slow energy systems. Related to the idea of designing new social practices in the context of local energy, I highlight *slow energy* as one concept worth pursuing. Paralleling trends such as the slow food movement, and research in slow and reflective technology,34 this work suggests ways of amplifying the contextuality and seasonality of energy to encourage slower, more engaged or more thoughtful consumption, such as the windy day laundering and sunny-day bread making practices suggested.

Engaging interactive microgeneration systems. Building on the ideas of "feel good" incentive and celebration of local energy, I highlight another design challenge: designing microgeneration that people want to purchase, acquire and use. While the lack of economic incentive is often suggested to be the primary factor inhibiting adoption of microgeneration, this work suggests that these systems could be designed as desirable acquisitions in terms of non-financial value, such as symbolic status, user satisfaction, or experiential engagement.

Exploring new types of energy metadata. This work utilizes and explores the concept of energy metadata specifically with regards to the availability of wind and solar power. However the applicability of this concept extends beyond our application here. Other scenarios include renewable production and distribution systems at the scale of the neighborhood, city, or state. I envision future designs that explore other interesting uses of energy metadata to engage people with different attributes of local energy, such as it is age, location of origin, distance traveled, time of use, producer, mode of production, etc. Such unconventional attributes of energy offer unique opportunities to investigate non-financial incentives, such as the "feel good" incentive described by one of the participants in the study.

5.3 Summary

The chapter began with critical perspectives on electricity consumption feedback (ECF) research in HCI. Based on this critique, three research and design directions were highlighted for energy related Sustainable HCI. The first is to broaden the focus beyond energy monitors and the eco-feedback paradigm. The second is to engage more with emerging energy systems rather than focusing on existing technologies. The third is to expand beyond interventions targeting individual attitudes, behaviors, and rational choices. A practice-oriented approach is proposed is an alternative perspective.[35]

---

34 See, for example, Hallnäs and Redström, "Slow Technology: Designing for Reflection;" and Sengers et al., "Reflective Design."

35 See Pierce et al., "Introduction the Special Issue on Practice-Oriented Approaches to Sustainable HCI."

The chapter makes three contributions to HCI. First, this chapter contributes a set of resistant design artifacts including Energy Mementos and the Local Energy Indicator. Second, this chapter has presented materializing energies as an alternative design approach for HCI and electricity consumption feedback research. Third, this chapter has shown how design resistance can be transitioned into the design of less resistant technologies. A summary of key concepts resulting from this case study chapter are presented in conclusion.

Materializing Energies as a Sustainable Design Approach

A materializing energy design approach works to foreground and amplify the largely invisible, intangible, undifferentiated, and readily available sources and flows of electricity that power everyday technologies and enable everyday routine practices. Designing technologies that materialize energy in engaging and aesthetic ways suggest alternative routes to sustainable consumption. A materializing energies design approach has been articulated through several design-oriented concepts that are embodied in resistant design artifacts. Collectively the examples and concepts embody the critiques offered at the beginning of this chapter by demonstrating sustainable design strategies and techniques that move beyond energy monitors, existing technologies, and interventions that target individual behaviors, attitudes, and choices.

Energy Mementos: Collecting, Keeping, Sharing, and Activating Singular Energies

The Energy Mementos are small and unassuming objects for collecting, keeping, sharing, and activating small amounts or electrical energy. The Energy Mementos were designed with resistance towards conventional use of electrical energy as a strictly utilitarian, instrumental means of powering everyday technologies. By offering this resistance, the Energy Mementos surface new ways of designing everyday technologies. One direction is to design energy as a material and symbolic thing in order to invite more sustainable forms of attachment to and care for electrical energy. Energy attachment, energy possession, and singular energy were proposed as speculative concepts that parallel familiar experiences with everyday material possessions.

At a broad conceptual level, the Energy Mementos function as a resistant counterpoint to how energy is currently designed and experienced in everyday life. The Energy Mementos offer an alternative to current energy systems in which energy is typically undifferentiated, invisible, intangible, and readily available at all times and places. Given the unsustainability of current energy systems, such counterpoints are needed as a means to explore and experiment with sustainable alternatives. The thinking underlying the Energy Mementos design was encapsulated in a simple framework for designing *energy-as-materiality*:

- **collecting** energy (generating/producing)
- **keeping** energy (storing/maintaining)
- **sharing** energy (transmitting/distributing)
- **activating** energy (using/consuming)

Several aspects of this framework are worth highlighting. First, the terms suggest designing for energy as something interacted with and experienced as a tangible thing. Second, the terms collecting, keeping, and sharing suggest expanding interactions beyond the overwhelming emphasis of interaction design on using/consuming energy. Individuals might instead be more actively involved in collecting the energy they use on a daily basis, or concerned with how energy is shared within their community. Finally, the terms collecting, keeping, sharing, and activating were chosen with the intention of creating some conceptual distance between their more technically-oriented respective terms generating/producing, storing/maintaining, transmitting/distributing, and using/consuming.

Local Energy Indicator: Designing Local Energy Systems

The Local Energy Indicator is a minimal display unit that presents the real-time levels of wind and solar generation along with the level of the battery that stores up the locally generated power. The Local Energy Indicator extends concepts embodied in the design of the Energy Mementos. As a prototype for a ubiquitous everyday technology, the Local Energy Indicator exhibits considerably less resistance than the Energy Mementos. Yet as an eco-feedback technology for sustainable behavioral and attitudinal change, the Local Energy is designed to offer some resistance. Built upon speculative infrastructure that is not yet ubiquitous, the Local Energy Indicator proposes a scenario in which household occupants shift and alter everyday routines to align with the intermittent and unreliable character of wind and solar generation. Instead of treating intermittent and unreliable generation as a problem, the Local Energy Indicator suggests a scenario in which occupants positively engage with locally generated energy, such as taking pride in their sustainable use of limited resources or feeling emotionally connected to environmentally generated electricity.

The Local Energy Indicator exemplifies three themes characterizing local energy. The first is contextuality. In contrast to conventional energy sources from centralized production, local energy may be strongly tied to a particular place or context. The second theme is seasonality. Because the intermittent character of wind and solar generation, local energy may be highly dependent on particular seasons, where season generally refers to a particular period of time.

Third, local energy is likely to be more visible and tangible compared to energy generated and distributed through centralized production. *Energy metadata* was introduced as a key design concept which emphasizes data associated with attributes such as the source and location of energy resources. Energy metadata can be viewed as speculative infrastructure. A prototype deployed in households surfaced additional design directions, including *slow energy systems* and *energy forecasts*.

Transitioning Resistance

The progression from Energy Mementos to the Local Energy Lamp to the Local Energy Indicator illustrates how resistance can be transitioned from more to less resistant technologies. As resistant proposals, the Energy Mementos do not propose designs for a mass-market product. Instead they have been translated into concepts that can be extended into new design trajectories culminating in new designs. Here the Energy Mementos have been used to articulate the concepts of energy-as-materiality, energy metadata, energy attachment, energy possession, and singular energy. The Energy Mementos foreground these concepts by resisting the use of electricity for conventional purposes, such as powering household lighting or electronic devices. By preventing conventional utility, the Energy Mementos bring into focus concepts such as singular energies: This energy that was made by shaking this bottle and is contained here in the palm of my hand and may only be used to power this light, for example. The Energy Mementos coupled with the concept of singular energies is translated into the Local Energy Lamp. Wind and solar are made to shine through the conventional household lamp with subtly shifting hues of blue and orange. Singular energies are used for the conventional purpose of providing light. Yet the period tinges of blue and orange lighting still resist a clear utilitarian use. Translating the Local Energy Lamp into the Local Energy Indicator offers clearer utilitarian function. The Local Energy Indicator more readily aligns with a wide range of eco-feedback and energy monitoring devices for the home. The goal of such systems is to raise awareness, trigger behavior change, persuade attitudinal changes, and provide tools for resource management. The Local Energy Indicator aligns more readily with these goals but still resists them. The Local Energy Indicator does not provide numerical units, suggesting that it is not designed as a tool for resource management. The Local Energy Indicator also does not clearly communicate a goal of behavioral changes. It is left to the user to decide what if any behavioral changes are warranted by the new information provided. In doing so, the Local Energy Indicator suggests that new renewable and distributed infrastructure can materialize energy in ways that do not easily reduce to the instrumental goals of raising awareness, altering consumption behavior, or changing attitudes. Instead, systems may be designed in ways that more fundamentally connect dwellers to the contextually, seasonality, and visibility and tangibility of local energy sources.

Chapter 6

Conclusion

In chapter 1, I articulated my two-part thesis. First, there is a body of design work that becomes coherent when held together by themes of oppositionality and alternatives. Second, operating throughout these designs is the technique of design resistance. Design resistance supports alternative and oppositional functions, including critique, speculation, agonism, and reflection. Chapter 2 established the first part of my thesis by reviewing, characterizing, and summarizing alternative and oppositional designs. Chapter 3 presented the second part of my thesis by articulating and exemplifying design techniques of resistance and connecting these with alternative and oppositional designs. Chapters 4 and 5 extended and refined design resistance through design case studies. The contributions of this thesis are thus twofold. The first contribution this thesis makes is to isolate resistance as a design technique at work across a range of alternative and oppositional designs. The second contribution of this thesis is to extend and refine the technique of resistance through two design case studies.

In conclusion, I review how I have achieved these contributions. I also highlight an important feature of design resistance that has periodically surfaced throughout this dissertation: In order to afford alternative and oppositional functions, design resistance must maintain some degree of failure as a conventionally successful design. Grasping this point is crucial for understanding why alternative and oppositional designs may appear as useless or failed designs.

Characterizing Alternative and Oppositional Designs

In chapter 2, I gave definition to the body of unconventional design work that I have here termed alternative and oppositional designs. The conjunctive term highlights two broad themes. The first is *a commitment to the production of design alternatives*. I have presented examples of designs that are committed to the generation of alternatives to conventional design. Alternative designs offer divergence. They offer other possibilities. Alternative designs can operate as *designs that keep designing,* meaning they work to defer arriving at a possibly premature, inappropriate, or even harmful design product or solution. The second broad theme running throughout the unconventional designs reviewed here is oppositionality. Oppositional designs are commmited to an *oppositional stance toward convention, hegemony, and the status quo*. Oppositional designs can operate as *designing against design*, meaning they work to

critique, disrupt, and subvert the practices and outcomes of design. Alternatives and oppositionality suggest a spectrum that spans from the more neutrally alternative to the radically oppositional. Alternatives can be a means to opposition, and opposition can be a means to an alternative.

The rise of alternative and oppositional designs was presented as a response to sentiments of discontent voiced within the traditions of Design. The first is the sentiment that design has become harmful in its excess. The second is that design is not critical enough. The historical rise of alternative and oppositional designs can be read as a response to these sentiments of discontents. Another set of discontents expressed within the traditions of Art and humanities-based Critique further help explain and situate the rise of alternative and oppositional designs. Within Art, many have voiced concerns that Art is not real or social enough. Within humanities-based Critique, many have voiced concerns that critique is too critical and not affirmative enough. The need for art that is more real and critique that is more affirmative dovetail with need for design that is less harmful and more critical. Situating alternative and opposition design in relation to the traditions of Art and humanities-based Critique is a useful device for understanding why they have arisen and what gap they are working to fill. Reiterating once more Jane Bennet's critique of critique, "we need both critique and positive formulations of alternatives, alternatives that will themselves become the objects of later critique and reform."[1] This is a call that alternative and oppositional designs are well positioned to respond to.

Articulating and Exemplifying Design Techniques of Resistance

In chapter 3, I turned to techniques of design resistance. Having established a body of examples and conceptual framings, the project of chapter 3 was to articulate and exemplify how resistance is a design technique that is operating within alternative and oppositional designs, and how resistance supports alternative and oppositional design functions. As discussed in chapter 1, the turn to technique is demanded by the subject of this inquiry. Design methods often exhibit an apply-use-repeat logic where the primarily goal is to instrumentally produce reliably expected outcomes in the form of conventionally better designs. This logic runs counter to alternative and oppositional designs. The apply-use-repeat logic of method, simply put, will not work for the project of articulating design techniques of resistance. Resistant designs work by not quite working. They require a method that operates similarly. Instead, a subtle shift to technique is needed. Technique articulates *how* to design but do so in a way that resists an apply-use-repeat logic.

---

[1] Bennet, *Vibrant Matter: A Political Ecology of Things*, xv.

Chapter 3 offers an answer to the question of what techniques are at work across alternative and oppositional design. The answer that is elaborated is techniques of resistance. A number of technique concepts were presented in chapter 3. There are three that sufficiently capture resistance for the sake of summarization. First, resistance is a *working by not quite working*. Put another way, resistant designs resist embodied and embedded everyday use. *Working* refers to alternative and oppositional functions such as critique, speculation, reflection, or agonism. *Not quite working* refers to the experience of feeling resistance toward conventional, nonresistant use. Not quite working is shorthand for "not quite working like a conventional design." The conceptual space between just plain working and utterly failing to work is where resistant designs operate.

Second, resistance often operates through using without quite actually using. Put another way, resistant designs are often virtually rather than actually used. Conventional products are used in a nonresistant embodied and embedded manner. They are actually used firsthand. The most successful conventional products become routine, familiar, pervasive, even mundane. Resistant designs are oftentimes not actually encountered firsthand. Moreover they are often designed to function as products you *imagine* using rather than *actually* use.

Third, there are three key variations on the overarching technique of resistance: resistant proposals, resistant prototypes, and resistant products. Each are resistant variations on conventional design proposals, prototypes, and products. Along the conventional trajectory design, the ultimate desired outcome is ideally conceived as a final product. Within a conventional design process, proposals and prototypes are treated as instrumental means toward a final product. However, in alternative and oppositional design, resistant proposals, prototypes, and products are all treated as "final outcomes" of the design process. Resistant proposals resist becoming more functional prototypes. Resistant proposals resist becoming final products. And resistant products resist becoming nonresistantly embodied and embedded within ordinary routines of use. In operating as such, they are able to variously engage alternative and oppositional functions such as critique, speculation, reflection, and agonistic debate.

The concepts of working by not quite working, using without quite actually using, and resistant proposals/products/products are not only useful as technique concepts. These concepts are also useful for explaining and positioning alternative designs for audiences who may dismiss them as utterly useless. Alternative and oppositional designs intentionally create tensions among art, critique, and conventional design. A reason that alternative and oppositional designs are often dismissed as useless is because they are misunderstood to be exclusively aligned with the conventional trajectory of design. In actuality, they are only partly aligned with conventional design.

This misunderstanding is understandable and in many cases is an expected if not intended outcome of the design. In order to afford alternative and oppositional functions, resistant designs resist conventional use. As such, they risk being dismissed as useless, or else being reduced to art or discourse. As with all designs, resistant designs will not be useful to everyone. But in sharp contrast to conventional designs, resistant design must be resist use for some audience or user group in order to work, by not quite working.

The Necessity of Design Resistance's Failure as Conventional Design

Complete and utter success as a conventional design is simultaneously a failure as an alternative and oppositional design. This point is crucial: In order to alternatively and oppositionally succeed, resistant designs must at some point fail as conventional design. Once a design outcome becomes undeniably useful, ordinary, normal, affirmed, accepted, pervasive, and routine, it then loses potentials to function alternatively and oppositionally. A design that has been completely affirmed loses potentials for critical functionality. A design that has been completely actualized loses potentials for speculative functionality. A design that has been commonly accepted loses potential for agonistic functionality. A design that has been thoroughly embodied and embedded within daily routines loses potential for reflective functionality. A design that has become the new normal and new conventional loses potential for politically disruptive functionally.

Failing to conventionally succeed is of course insufficient to succeed as resistant design. Successfully resistant designs must conventionally fail at some point in ways that support new alternative and oppositional functions. A resistant design that transitions into or informs conventionally successful design may of course be judged as a success.[2] But it must be recognized that a technology the potentials for design resistance will tend to dissolve as a technology becomes more conventionally useful, ordinary, normal, affirmed, accepted, and pervasive.

This chapter has argued that working by not quite working, using without quite actually using, and resistant proposals, prototypes, and products are techniques by which designs can produc-

---

[2] Judging and evaluating the quality or impact of design resistance is beyond the scope of this dissertation. But there are two key directions to consider in these discussions: affirming and opposing conventional design and the creation of new utility, normality, and hegemony. The limitations of such a sharp polarization must also be considered. A defining feature of design resistance appears to be the ability to navigate both poles without a predetermined judgment of what constitutes the desirable future. Design resistance leaves open the possibilities of both affirmation and critique; of the actualization or instead the suspension, or even negation, of new possible futures. Design resistance prioritizes the process of engaging both the question of a desirable future along with possible answers. Hence the keyworded alternative and oppositional functions that design resistance affords: critique, speculation, reflection, agonism, debate, disruption, and so on.

tively fail in order to provide alternative and oppositional functions. As reviewed in chapter 2, many such functions have been articulated and exemplified in prior work. The project of this dissertation and chapter 3 in particular has been to articulate and exemplify technique at work in the alternative and oppositional designs that have been carefully articulated and exemplified by others.

Extending and Refining Techniques of Design Resistance with Design Cases

I have presented two designs case studies that extend and refine techniques of resistance. By extensions I mean that the design cases put resistance to work in order to create novel alternative and oppositional design examples. These design examples were then used to draw out specific concepts that may be used to continue designing more or less resistant things. The case studies further exemplified to distinct ways of using, writing, and thinking resistant designs, and articulating this knowledge for the HCI and design research communities.

In chapter 4, I presented a case study of counterfunctional digital cameras. The focus of this case study was a specific design research artifact, the Obscura 1C. This case study illustrated how design resistance can be used to create design artifacts situated among conflicting sets of concerns in order to engage with these concerns. This case study concluded with a discussion of how *working with resistance* is one novel route to making use of resistant designs and the design resistance they offer. An approach of working with resistance as an alternative to extracting design knowledge that is readily digested and instrumentally geared was contextualized among nascent concerns with how to grapple with, and even embrace design complexity. A central question that these discussions bring into focus is the very terms and forms of communicating design research knowledge within HCI. Based on my own experiences with the Obscura C, I described in detail how I have continued to extract new and variegated uses, meanings, and ideas from resisting the urge to literally break apart the Obscura 1C and retrieve the digital image files embedded inside the concrete enclosure. This lesson generalizes to the design research knowledge that is potentially extracted from using and thinking with a resistant design research artifact. It was generally asserted that much can be learned from working with design resistance rather than immediately attempting to pin it down and extract something unambiguously useful for designing conventional, nonresistant, everyday technologies. This was demonstrated by presenting three design-oriented concepts that offer insight and inspiration with respect to the design of digital limitations in particular and digital design more generally. First, resistant embodied and embedded use of the Obscura 1C was framed in terms of an unconventional embodied and embedded function in which resistance itself is offered as a compelling new experience in the form of *resistantly actualized image-potentials*. The Obscura

1C exemplifies a novel way of experiencing and understanding digital images *as potentials*. What makes the image-potentials embedded inside the Obscura 1C compelling is precisely the resistance that is felt toward actualizing them, and the anticipation, delayed gratification, wonder, and more that may follow from *not* actually seeing them.

The second concept that was presented in chapter 4 articulates how the Obscura 1C offers resistantly actualized image-potentials: through the crafting of a *compellingly inhibitive interfaces*. The Obscura 1C exemplifies how an interactive technology can employ resistance at the interface level in order to create a compelling experience. A differential between actually and only potentially seeing the images is created through a tension between an image capacity that approaches limitless and an extraordinarily limiting interface that inhibits access by demanding that the user literally break through concrete to gain access. This inhibitive interface creates something compelling: resistantly actualized image-potentials.

The third concept that was articulated is that of a *counterfunctional device*. As a counterfunctional device, the Obscura 1C exemplifies a technique of creating new and, at least initially, unconventional functionality by countering ordinary or expected functionality. While it was suggested how counterfunctionality may be applied to the design of conventionally innovative products, here I have instead proposed that counterfunctional devices be judged based on their ability to waver between pointed critiqued and affirmative solutions. The ability to quiver vibrantly with irresolution is an unconventional function that design resistance can work to provide and which fills a gap between the established traditions of Design, Art, and Critique. While irresolution can of course be appreciated as an aesthetically or intellectually worthwhile quality in its own right, what is more compelling is the potential for resistant designs to offer new insight and inspiration that can be captured and used to help refine critical perspectives, or alternatively be put to use in the creation of less resistant, more readily usable and useful yet transformative everyday designs.

Chapter 5 offered a different take on design resistance and how it may be presented to the HCI research community and subsequently used. Chapter 5 focused on two novel resistant design research artifacts that illustrate an approach of materializing energy as an alternative to dominant approaches to sustainable HCI that emphasize changing individual attitudes and behaviors for more sustainable consumption of electricity. This case study of the Energy Mementos and the Local Energy Indicator illustrates an approach of transitioning design resistance into less resistant technologies. Whereas chapter 5 proposed that resistant designs be judged according to their ability to waver between critique and affirmative solutions—perhaps implying an inclination toward critique through the deferment of actual solutions—chapter 5 proposes that

design resistance can be intentionally directed toward a more conventional design trajectory, eventually culminated in nonresistant, everyday technologies. The Energy Mementos, devices for generating and sharing tiny bits of electrical energy that cannot be used for anything useful, were used to articulate concepts including emotional attachment to energy and singular energy. These concepts were then extended into the design of the Local Energy Indicator, a system for putting occupants in touch with locally generated electrical energy from wind and solar power. While the Local Energy Indicator is intended as a provocation, at the same time it illustrates movement closer toward an everyday pervasive technology. As a concrete resistant design exemplar, it suggests an alternative route for sustainable design and brings into focus new design opportunities amid emerging energy technologies that have not yet fully arrived. Generalizing from the Energy Mementos and the Local Energy Indicator, the underlying approach was captured in terms of *materializing energies*. This design approach emphasizes designing everyday technologies in ways that promote sustainable consumption by giving electrical energy more engaging and aesthetic forms, rather than perceptually backgrounding it. The term *energies* draws attention to the multiplicity of new sources and scales of electrical power offered by trends in distributed and renewable energy systems. This approach was encapsulated in a simple framework for designing energy-as-materiality: collecting energy (generating/producing), keeping energy (storing/maintaining), sharing energy (transmitting/distributing), and activating energy (using/consuming). This framework promotes an expansion from focusing on use/consumption of energy to include designing modes of collecting, keeping, and sharing energy in everyday interactions.

What is Next for Design Resistance and Alternative and Oppositional Designs?

Alternative and oppositional designs have proliferated since the work began to clearly take root in the early 2000s. However in light of this dissertation and the techniques of design resistance it reveals, a number of open questions are brought into focus: How can we judge resistant designs in terms of quality and impact? How can we begin to study and evaluate design resistance empirically? And what are the dangers in evaluating design work that often resists instrumental evaluation? What other unconventional forms and functions of design can techniques of designs resistance generate? What are the limitations of design resistance? In addition to resistance, what other general techniques are at work across alternative and oppositional designs? The project of this dissertation has been to articulate and exemplify design techniques of resistance but without overly formalizing them in a manner that contradicts the ways in which design resistance operates. Doing so offers a new vantage point from which to pose and engage the above questions.

Bibliography

Ackermann, Thomas, Göran Andersson, and Lennart Söder. "Distributed Generation: A Definition." *Electric Power Systems Research* 57, no. 3 (2001): 195–204.

Aipperspach, Ryan, Ben Hooker, and Allison Woodruff. "The Heterogeneous Home." In *Proceedings of UbiComp* 2008, 222–231, 2008.

Agre, Philip. *Computation and Human Experience*. Cambridge University Press, 1997.

Akrich, Madeleine. "The de-Scription of Technical Objects." *Shaping Technology/building Society*, 1992, 205–24.

"AMAZON NOIR ~ The Big Book Crime." Accessed August 6, 2015. http://www.amazon-noir.com/index0000.html.

Antonelli, Paola. *Design and the Elastic Mind*. The Museum of Modern Art, 2008.

Antonelli, Paola, Jamer Hunt and Anne-Marie Slaughter. *Design and Violence*. The Museum of Modern Art, 2015.

Antonelli et al., "Design and Violence." Accessed July 11, 2015. http://designandviolence.moma.org/.

Arad, Ron, and Paola Antonelli. Ron Arad: *No Discipline. The Museum of Modern Art*, 2009.

Attfield, "FORM/female FOLLOWS FUNCTION/male: Feminist Critiques of Design," in *Design Studies: A Reader*, edited by Hazel Clark and David Brody, 49-53. Berg Oxford, 2009.

Auger, James. "Speculative Design: Crafting the Speculation." *Digital Creativity* 24, no. 1 (2013): 11–35.

———. "Why Robot? Speculative Design, the Domestication of Technology and the Considered Future." PhD Diss, Royal College of Art, 2012. http://researchonline.rca.ac.uk/1660/.

Auger, James and Jimmy Loizeau, "Carnivorous Domestic Entertainment Robots." Accessed November 13, 2015. http://www.auger-loizeau.com/?id=13.

Auger, James Henry. "Living With Robots: A Speculative Design Approach." *Journal of Human-Robot Interaction* 3, no. 1 (2014): 20–42.

Backlund, Sara, Magnus Gyllenswärd, Anton Gustafsson, Sara Ilstedt Hjelm, Ramia Mazé, and Johan Redström. "Static! The Aesthetics of Energy in Everyday Things." In *Proceedings of Design Research Society Wonderground International Conference*, 2006

Bardzell, Jeffrey. "Interaction Criticism and Aesthetics." In *Proceedings of CHI 2009*, 2357–66, 2009.

Bardzell, Jeffrey, and Shaowen Bardzell. "What Is 'Critical' About Critical Design?" In *Proceedings CHI 2013*, 3297–3306, 2013.

Bardzell, Jeffrey, Shaowen Bardzell, and Lone Koefoed Hansen. "Immodest Proposals: Research Through Design and Knowledge." In *Proceedings CHI 2015*, 2093–2102, 2015.

Bardzell, Jeffrey, Shaowen Bardzell, and Erik Stolterman. "Reading Critical Designs: Supporting Reasoned Interpretations of Critical Design." In *Proceedings CHI 2014*, 1951–60, 2014.

Bardzell, Shaowen, Jeffrey Bardzell, Jodi Forlizzi, John Zimmerman, and John Antanitis. "Critical Design and Critical Theory: The Challenge of Designing for Provocation." In *Proceedings of DIS 2012*, 288–97, 2012.

Bardzell, Shaowen, Shad Gross, Jeffrey Wain, Austin Toombs, and Jeffrey Bardzell. "The Significant Screwdriver: Care, Domestic Masculinity, and Interaction Design." In *Proceedings of BCS-HCI 2011*, 371–77, 2011.

Baumer, Eric P.S., Phil Adams, Vera D. Khovanskaya, Tony C. Liao, Madeline E. Smith, Victoria Schwanda Sosik, and Kaiton Williams. "Limiting, Leaving, and (Re)Lapsing: An Exploration of Facebook Non-Use Practices and Experiences." In *Proceedings of CHI 2013*, 3257–66, 2013.

Baumer, Eric P.S., and M. Six Silberman. "When the Implication Is Not to Design (Technology)." In *Proceedings of CHI 2011*, 2271–74, 2011.

Beaver, Jacob, Tobie Kerridge, and Sarah Pennington, eds. *Material Beliefs*. London: Goldsmiths College, 2009.

Bell, Genevieve, Mark Blythe, and Phoebe Sengers. "Making by Making Strange: Defamiliarization and the Design of Domestic Technologies." *ACM Trans. Computer-Human Interaction*. 12, no. 2 (June 2005): 149–73.

Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Duke University Press, 2009.

"Best Inventions of 2002 - TIME." *Time*, November 18, 2002. http://content.time.com/time/specials/packages/article/0,28804,1934259_1934277_1934497,00.html.

Beyer, Hugh, and Karen Holtzblatt. *Contextual Design: Defining Customer-Centered Systems*. Elsevier, 1997.

Bierut, Michael. *Seventy-Nine Short Essays on Design*. Chronicle Books, 2012.

Binder, Thomas, and Johan Redström. "Exemplary Design Research." In *Proceedings of Design Research Society Wonderground International Conference*, 2006.

Bishop, Claire. *Artificial Hells: Participatory Art and the Politics of Spectatorship*. Verso Books, 2012.

Blauvelt, Andrew, ed. Walker Art Center, Carnegie Museum of Art, and Musée de l'Hospice Comtesse. *Strangely Familiar: Design and Everyday Life*. Minneapolis, Minn.: Walker Art Center, 2003.

Bleecker, Julian. "Design Fiction: A Short Essay on Design, Science, Fact and Fiction | Near Future Laboratory." Accessed September 20, 2014. http://blog.nearfuturelaboratory.com/2009/03/17/design-fiction-a-short-essay-on-design-science-fact-and-fiction/.

Blevis, Eli. "Sustainable Interaction Design: Invention & Disposal, Renewal & Reuse." In Proceedings of CHI 2007, 503–12, 2007.

Blinder, Justin. "Vacated - Justinblinder.com." Accessed July 6, 2015. http://projects.justinblinder.com/Vacated.

Blythe, Mark. "Pastiche Scenarios." Interactions 11, no. 5 (September 2004): 51–53.

———. "Research Through Design Fiction: Narrative in Real and Imaginary Abstracts." In *Proceedings of CHI 2014*, 703–12, 2014.

———."The Hitchhiker's Guide to Ubicomp: Using Techniques from Literary and Critical Theory to Reframe Scientific Agendas." *Journal of Personal Ubiquitous Computing*. 18, no. 4 (April 2014): 795–808.

Blythe, Mark, Jamie Steane, Jenny Roe, and Caroline Oliver. "Solutionism, the Game: Design Fictions for Positive Aging." In *Proceedings of the CHI 2015*, 3849–58, 2015.

Blythe, Mark, Peter Wright, John Bowers, Andy Boucher, Nadine Jarvis, Phil Reynolds, and Bill Gaver. "Age and Experience: Ludic Engagement in a Residential Care Setting." In *Proceedings of DIS 2010*, 161–170, 2010.

Bødker, Susanne. "When Second Wave HCI Meets Third Wave Challenges." In Proceedings of NordiCHI 2006, 1–8, 2006.

Boehner, Kirsten, Janet Vertesi, Phoebe Sengers, and Paul Dourish. "How HCI Interprets the Probes." *In Proceedings of CHI 2007*, 1077–86, 2007.

Bogost, Ian. *Alien Phenomenology, Or, What It is like to Be a Thing*. Minneapolis: University of Minnesota Press, 2012.

Boucher, Andy, David Cameron, and Nadine Jarvis. "Power to the People: Dynamic Energy Management Through Communal Cooperation." In *Proceedings of DIS 2012*, 612–20, DIS, 2012.

Bourriaud, Nicolas. *Relational Aesthetics*, trans. Simon Pleasance and Fronza Woods, with Mathieu Copeland. Les presses du reel Dijon, 2002.

Bowers, John. "The Logic of Annotated Portfolios: Communicating the Value of 'Research Through Design.'" In *Proceedings of DIS 2012*, 68–77, 2012.

Brynjarsdottir, Hronn, Maria Håkansson, James Pierce, Eric Baumer, Carl DiSalvo, and Phoebe Sengers. "Sustainably Unpersuaded: How Persuasion Narrows Our Vision of Sustainability." In Proceedings of the CHI 2012, 947–56, 2012.

Buchanan, Richard. "Wicked Problems in Design Thinking." *Design Issues*, 1992, 5–21.

———. "Design Research and the New Learning." *Design Issues* 17, no. 4 (2001): 3–23.

Buchanan, Richard, and Victor Margolin. *Discovering Design: Explorations in Design Studies*. University of Chicago Press, 1995.

Buckley, Cheryl. "Made in Patriarchy: Toward a Feminist Analysis of Women and Design." *Design Issues*, 1986, 3–14.

Butler, Judith. "What Is Critique? An Essay on Foucault's Virtue," 2002. http://f-origin.hypotheses.org/wp-content/blogs.dir/744/files/2012/03/butler-2002.pdf.

Buxton, B. "What Sketches (and Prototypes) Are and Are Not." Paper presented at the *CHI 2006 Workshop "'Sketching' Nurturing Creativity: Commonalities in Art, Design, Engineering and Research."* https://www.cs.cmu.edu/~bam/uicourse/Buxton-SketchesPrototypes.pdf

Clark, Hazel, and David Brody, eds. *Design Studies: A Reader*. Berg Publishers, 2009.

Colarusso, Giuseppe. "Improbabilita'." Accessed November 13, 2015. http://www.giuseppecolarusso.it/improbabilita_.html.

Colao, J.J. "Snapchat: The Biggest No-Revenue Mobile App Since Instagram." *Forbes*, 2012. Accessed July 7, 2015. http://www.forbes.com/sites/jjcolao/2012/11/27/snapchat-the-biggest-no-revenue-mobile-app-since-instagram/.

Cooper, Geoff and John Bowers. "Representing the user: notes on the disciplinary rhetoric of human-computer interaction." In *The Social and Interactional Dimensions of Human-Computer Interfaces*, edited by Peter J. Thomas, 48-66. Cambridge University Press, 1995.

Crary, Jonathan. *24/7: Late Capitalism and the Ends of Sleep*. Verso Books, 2013.

Cross, Nigel. "Design Research: A Disciplined Conversation." *Design Issues* 15, no. 2 (July 1, 1999): 5–10.

———."Designerly Ways of Knowing: Design Discipline versus Design Science." *Design Issues* 17, no. 3 (2001): 49–55.

Csikszentmihalyi, Mihaly, and Eugene Halton. *The Meaning of Things: Domestic Symbols and the Self.* Cambridge University Press, 1981.

Dearstyne, Howard. *Inside the Bauhaus*. Edited by David Spaeth. London: Architectural Press, 1986.

"Design Futurescaping — V2_Institute for the Unstable Media." Accessed July 5, 2015. http://v2.nl/archive/articles/design-futurescaping.

Devendorf, Laura, and Kimiko Ryokai. "Being the Machine: Exploring New Modes of Making." In *DIS 2014 Extended Abstracts*, 33–36, 2014.

———. "Being the Machine: Reconfiguring Agency and Control in Hybrid Fabrication." In *Proceedings of CHI 2015*, 2477–86, 2015.

Devine-Wright, Patrick. "Energy citizenship: psychological aspects of evolution in sustainable energy technologies," in *Framing The Present, Shaping The Future: Contemporary Governance of Sustainable Technologies*, edited by J. Murphy, 63–86. Earthscan, London, 2007.

Dillahunt, Tawanna, Jennifer Mankoff, and Eric Paulos. "Understanding Conflict Between Landlords and Tenants: Implications for Energy Sensing and Feedback." In *Proceedings of UbiComp 2010*, 149–58, 2010.

DiSalvo, Carl. "Design and the Construction of Publics." Design Issues 25, no. 1 (2009): 48–63.

———. *Adversarial Design*. The MIT Press, 2012.

———. "Spectacles and Tropes: Speculative Design and Contemporary Food Cultures." *Fibreculture Journal*, 2012.

DiSalvo, Carl. moderator. "Feature Discussion Session 4: Is There a Post-Critical Design?" Accessed July 19, 2015. https://www.designresearchnetwork.org/drn/content/feature-discussion-session-4%3A-there-post-critical-design%3F.

DiSalvo, Carl, Ann Light, Tad Hirsch, Christopher A. Le Dantec, Elizabeth Goodman, and Katie Hill. "HCI, Communities and Politics." In *CHI 2010 Extended Abstracts*, 3151–54, 2010.

DiSalvo, Carl, and Jonathan Lukens. "Towards a Critical Technological Fluency: The Confluence of Speculative Design and Community Technology Programs." *Digital Arts and Culture* 2009, December 12, 2009.

DiSalvo, Carl, Jonathan Lukens, Thomas Lodato, Tom Jenkins, and Tanyoung Kim. "Making Public Things: How HCI Design Can Express Matters of Concern." In *Proceedings of CHI 2014*, 2397–2406, 2014.

Disalvo, Carl, Johan Redström, and Matt Watson. "Commentaries on the Special Issue on Practice-Oriented Approaches to Sustainable HCI." *ACM Transatctions on Computer-Human Interaction* 20, no. 4 (September 2008): 26:1–26:15.

DiSalvo, Carl, Phoebe Sengers, and Hrönn Brynjarsdóttir. "Mapping the Landscape of Sustainable HCI." In *Proceedings of CHI 2010*, 1975–84, 2010.

Dobbyn, J., and G. Thomas. "Seeing the Light: The Impact of Micro-Generation on Our Use of Energy." *Sustainable Consumption Roundtable*, 2005.

Dourish, Paul. *Where the Action Is: The Foundations of Embodied Interaction*. MIT Press, 2001.

———. "Implications for Design." In *Proceedings of CHI 2006*, 541–50, 2006.

———. "HCI and Environmental Sustainability: The Politics of Design and the Design of Politics." In *Proceedings of DIS 2010*, 1–10, 2010.

Dourish, Paul, and Genevieve Bell. "'Resistance Is Futile': Reading Science Fiction Alongside Ubiquitous Computing." *Personal Ubiquitous Computing* 18, no. 4 (April 2014): 769–78.

"Droog – a Different Perspective on Design." Accessed August 3, 2015. http://www.droog.com/.

Drucker, Johanna, Peter Lunenfeld, Todd Presner, and Jeffrey Schnapp. *Digital_Humanities*. MIT Press, 2012.

Drucker, Johanna. *The Century of Artists' Books*. Granary Books, 2004.

Dunne, Anthony. "Design for Debate." *Architectural Design* 78, no. 6 (2008): 90–93.

———. *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*. Cambridge, Mass.; London: The MIT Press, 2008.

———."Hertzian Tales: An Investigation into the Critical and Aesthetic Potential of the Electronic Product as a Post-Optimal Object." PhD diss., Royal College of the Art, 1997.

———. *Speculative Everything: Design, Fiction, and Social Dreaming*. Cambridge, Massachusetts ; London: The MIT Press, 2013.

Dunne, Anthony, and William W. Gaver. "The Pillow: Artist-Designers in the Digital Age." In *CHI 1997 Extended Abstracts*, 361–62, 1997.

Dunne, A., and F. Raby. *Design Noir: The Secret Life of Electronic Objects*. Birkhauser, 2002.

———. "Critical Design FAQ" Accessed July 6, 2015. http://www.dunneandraby.co.uk/content/projects/75/0.

———."Do you want to replace the existing normal? 2007/08" Accessed November 20, 2015. http://www.dunneandraby.co.uk/content/projects/75/0.

Erickson, Thomas, Ming Li, Younghun Kim, Ajay Deshpande, Sambit Sahu, Tian Chao, Piyawadee Sukaviriya, and Milind Naphade. "The Dubuque Electricity Portal: Evaluation of a City-Scale Residential Electricity Consumption Feedback System." In *Proceedings of CHI 2013*, 1203–12, 2013.

Ernevi, A., M. Jacobs, R. Mazé, C. Müller, J. Redström, and L. Worbin. "The Energy Curtain: Energy Awareness." In *IT+Textiles*, edited by Johan Redström, Maria Redström, Ramia Mazé, 66-75. Centre for Textile Research, IT Press/Edita, 2005.

Feinberg, Melanie, Daniel Carter, and Julia Bullard. "Always Somewhere, Never There: Using Critical Design to Understand Database Interactions." In *Proceedings of CHI 2014*, 1941–50, 2014.

———. "A Story Without End: Writing the Residual into Descriptive Infrastructure." In *Proceedings of DIS 2014*, 385–94, 2014.

"Feral Robotic Dogs." Accessed November 19, 2015. https://www.nyu.edu/projects/xdesign/feralrobots/.

Ferri, Gabriele, Jeffrey Bardzell, Shaowen Bardzell, and Stephanie Louraine. "Analyzing Critical Designs: Categories, Distinctions, and Canons of Exemplars." In *Proceedings DIS 2014*, 355–64, 2014.

Flusser, Vilém. *Shape of Things: A Philosophy of Design*. Reaktion Books, 2013.

Forlizzi, Jodi. "Product Ecologies: Understanding the Context of Use Surrounding Products." PhD diss., Carnegie 2007. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.91.5827&rep=rep1&type=pdf.

Forlizzi, Jodi, and Katja Battarbee. "Understanding Experience in Interactive Systems." In *Proceedings of DIS 2004*, 261–68, 2004.

Foucault, Michel. "What Is Critique?" in *The Politics of Truth*, eds. Sylvère Lotringer and Lysa Hochroth, (New York: Semiotext(e), 1997.

Frayling, Christopher. "Research in Art and Design" *Royal College of Art Research Papers*, Vol 1, No 1, 1993/4). Monograph, 1994. http://researchonline.rca.ac.uk/384/.

Froehlich, Jon, Leah Findlater, and James Landay. "The Design of Eco-Feedback Technology." In *Proceedings of CHI 2010*, 1999–2008, CHI '10.

Fry, Tony. *A New Design Philosophy: An Introduction to Defuturing*. UNSW Press, 1999.

———. *Design Futuring: Sustainability, Ethics and New Practice*. Berg Oxford, 2009.

Gaver, Bill. "Provocative Awareness." *Computer Supported Cooperative Work* 11, no. 3 (November 2002): 475–93.

Gaver, Bill, and John Bowers. "Annotated Portfolios." *Interactions* 19, no. 4 (July 2012): 40–49.

Gaver, Bill, Tony Dunne, and Elena Pacenti. "Design: Cultural Probes." *Interactions* 6, no. 1 (January 1999): 21–29.

Gaver, Bill, and Heather Martin. "Alternatives: Exploring Information Appliances Through Conceptual Design Proposals." In *Proceedings of CHI 2000*, 209–16, 2000.

Gaver, William. "Making Spaces: How Design Workbooks Work." In *Proceedings of CHI 2011*, 1551–60, 2011.

———. "What Should We Expect from Research Through Design?" In *Proceedings CHI 2012*, 937–46, 2012.

Gaver, William, John Bowers, Tobie Kerridge, Andy Boucher, and Nadine Jarvis. "Anatomy of a Failure: How We Knew When Our Design Went Wrong, and What We Learned from It." In *Proceedings of CHI 2009*, 2213–22, 2009.

Gaver, William, and Anthony Dunne. "Projected Realities: Conceptual Design for Cultural Effect." *In Proceedings of CHI 1999*, 600–607, 1999.

Gaver, William, Mike Michael, Tobie Kerridge, Alex Wilkie, Andy Boucher, Liliana Ovalle, and Matthew Plummer-Fernandez. "Energy Babble: Mixing Environmentally-Oriented Internet Content to Engage Community Groups." In *Proceedings of CHI 2015*, 1115–24, 2015.

Gaver, William, Phoebe Sengers, Tobie Kerridge, Joseph Kaye, and John Bowers. "Enhancing Ubiquitous Computing with User Interpretation: Field Testing the Home Health Horoscope." In *Proceedings CHI 2007*, 537–46, 2007.

Gaver, William W., Jacob Beaver, and Steve Benford. "Ambiguity As a Resource for Design." In *Proceedings of CHI 2003*, 233–40, 2003.

Gaver, William W., John Bowers, Kirsten Boehner, Andy Boucher, David W.T. Cameron, Mark Hauenstein, Nadine Jarvis, and Sarah Pennington. "Indoor Weather Stations: Investigating a Ludic Approach to Environmental HCI Through Batch Prototyping." In *Proceedings of CHI 2013*, 3451–60, 2013.

Gaver, William W., John Bowers, Andrew Boucher, Hans Gellerson, Sarah Pennington, Albrecht Schmidt, Anthony Steed, Nicholas Villars, and Brendan Walker. "The Drift Table: Designing for Ludic Engagement." In *CHI 2004 Extended Abstracts*, 885–900, 2004.

Gentès, Annie, and Max Mollon. "Critical Design." In *Empowering Users through Design*, edited by David Bihanic, 79–101. Springer International Publishing, 2015.

Ghosh, Pallab. "World's First Lab-Grown Burger Is Eaten in London." BBC News. Accessed August 4, 2015. http://www.bbc.com/news/science-environment-23576143.

Gibson, James J. *The Theory of Affordances*. Hilldale, USA, 1977.

Gillick, Liam, "Contingent Factors: A Response to Claire Bishop's 'Antagonism and Relational Aesthetics,'" *October*, no 115, 2006.

Grojs, Boris, Daniel van der Velden, Marina Vishmidt, and Vinca Kruk. *Uncorporate Identity*. Lars Muller Publishers, 2010.

Gustafsson, Anton, and Magnus Gyllenswärd. "The Power-Aware Cord: Energy Awareness through Ambient Information Display." In *CHI 2005 Extended Abstracts*, 1423–26, 2005.

Håkansson, Maria, and Phoebe Sengers. "No Easy Compromise: Sustainability and the Dilemmas and Dynamics of Change." In *Proceedings DIS 2014*, 1025–34, 2014.

Hallnäs, Lars, and Johan Redström. "Abstract Information Appliances: Methodological Exercises in Conceptual Design of Computational Things." In *Proceedings of DIS 2002*, 105–16, 2002.

———. "From Use to Presence: On the Expressions and Aesthetics of Everyday Computational Things." *ACM Transactions Computer-Human Interaction* 9, no. 2 (June 2002): 106–24.

———. "Slow Technology &Ndash; Designing for Reflection." *Personal Ubiquitous Computing* 5, no. 3 (January 2001): 201–12.

Harmon, Ellie, and Melissa Mazmanian. "Stories of the Smartphone in Everyday Discourse: Conflict, Tension & Instability." In *Proceedings of CHI 2013*, 1051–60, 2013.

Harper, Richard. *Texture: Human Expression in the Age of Communications Overload*. Cambridge, Mass.; London: MIT Press, 2012.

Harrison, Steve, Deborah Tatar, and Phoebe Sengers, "The three paradigms of HCI." Presented at *Alt.CHI session at CHI* 2007. http://people.cs.vt.edu/~srh/Downloads/HCIJournalTheThreeParadigmsofHCI.pdf.

Heskett, John. *Toothpicks and Logos: Design in Everyday Life*. Oxford University Press, 2002.

———. *Design: A Very Short Introduction*. Vol. 136. Oxford University Press, 2005.

———. *Industrial Design*. Oxford University Press, 1980.

Hirsch, Edward A. "Contestational Design : Innovation for Political Activism." PhD diss., Massachusetts Institute of Technology, 2008. http://dspace.mit.edu/handle/1721.1/46594.

Hirsch, Tad, and John Henry. "TXTmob: Text Messaging for Protest Swarms." In *CHI 2005 Extended Abstracts*, 1455–58, 2005.

Höök, Kristina. "A Cry for More Tech at CHI!" *Interactions* 19, no. 2 (March 2012): 10–11.

Höök, Kristina, and Jonas Löwgren. "Strong Concepts: Intermediate-Level Knowledge in Interaction Design Research." *ACM Transactions Computer-Human Interaction* 19, no. 3 (October 2012): 23:1–23:18.

Höök, Kristina, Anna Staahl, Petra Sundström, and Jarmo Laaksolaahti. "Interactional Empowerment." In *Proceedings of CHI 2008*, 647–56, 2008.

Ihde, Don. *Technology and the Lifeworld: From Garden to Earth*. Indiana University Press, 1990.

"Improbabilita' -." Accessed July 7, 2015. http://www.giuseppecolarusso.it/improbabilita_.html.

Ingram, Jack, Elizabeth Shove, and Matthew Watson. "Products and Practices: Selected Concepts from Science and Technology Studies and from Social Theories of Consumption and Practice1." *Design Issues* 23, no. 2 (2007): 3–16.

"INTERROGATIVE." Accessed July 17, 2015. http://www.interrogative.org/about/.

Irani, Lilly C., and M. Six Silberman. "Turkopticon: Interrupting Worker Invisibility in Amazon Mechanical Turk." In *Proceedings CHI 2013*, 611–20, 2013.

Irani, Lilly, and M. Six Silberman. "From Critical Design to Critical Infrastructure: Lessons from Turkopticon." *Interactions* 21, no. 4 (July 2014): 32–35.

Irani, Lilly, Janet Vertesi, Paul Dourish, Kavita Philip, and Rebecca E. Grinter. "Postcolonial Computing: A Lens on Design and Development." In *Proceedings of CHI 2010*, 1311–20, 2010.

Isbister, Katherine, and Kristina Höök. "On Being Supple: In Search of Rigor Without Rigidity in Meeting New Design and Evaluation Challenges for HCI Practitioners." In *Proceedings of CHI 2009*, 2233–42, 2009.

Jarvis, Nadine, David Cameron, and Andy Boucher. "Attention to Detail: Annotations of a Design Process." In *Proceedings of NordiCHI 2012*, 11–20, 2012.

Jones, J. Christopher. *Design Methods: Seeds of Human Futures*. 1980 Ed. London: John Wiley & Sons, 1980.

Kamprani, Katerina. "The Uncomfortable." Accessed November 13, 2015. http://www.kkstudio.gr/projects/the-uncomfortable.

Kawakami, Kenji. *101 Unuseless Japanese Inventions: The Art of Chindogu*. WW Norton & Company, 1995.

———. *More Unuseless Japanese Inventions: The Japanese Art of Chindogu*. Harper Collins, London, 1997.

Kaye, Joseph"Jofish," Mariah K. Levitt, Jeffrey Nevins, Jessica Golden, and Vanessa Schmidt. "Communicating Intimacy One Bit at a Time." In *CHI 2005 Extended Abstracts*, 1529–32, 2005.

Kiem, Matthew. "When the Most Radical Thing You Could Do Is Just Stop." Medium. Accessed December 13, 2014. https://medium.com/@mattkiem/when-the-most-radical-thing-you-could-do-is-just-stop-1be32db783c5.

———. "Is a Decolonial SCD Possible? — Medium." Accessed November 13, 2015. https://medium.com/@mattkiem/is-a-decolonial-scd-possible-30db8675b82a.

Kirby, David. "The Future Is Now Diegetic Prototypes and the Role of Popular Films in Generating Real-World Technological Development." *Social Studies of Science* 40, no. 1 (February 1, 2010): 41–70.

Kolko, Jon. "Discursive Design Fiction." Accessed January 16, 2015. http://www.ac4d.com/2012/04/17/discursive-design-fiction/.

Koskinen, Ilpo, John Zimmerman, Thomas Binder, Johan Redstrom, and Stephan Wensveen. *Design Research Through Practice: From the Lab, Field, and Showroom*. 1st ed. San Francisco, CA, USA: Morgan Kaufmann Publishers Inc., 2011.

Kuutti, Kari, and Liam J. Bannon. "The Turn to Practice in HCI: Towards a Research Agenda." In *Proceedings of CHI 2014*, 3543–52, 2014.

Kuijer, Lenneke, Annelise de Jong, and Daan van Eijk. "Practices As a Unit of Design: An Exploration of Theoretical Guidelines in a Study on Bathing." *ACM Transactions on Computer-Human Interaction*. 20, no. 4 (September 2008): 21:1–21:22.

Kuznetsov, Stacey, George Noel Davis, Eric Paulos, Mark D. Gross, and Jian Chiu Cheung. "Red Balloon, Green Balloon, Sensors in the Sky." In *Proceedings of UbiComp 2011*, 237–46, 2011.

Latour, Bruno. "A Cautious Prometheus? A Few Steps toward a Philosophy of Design (with Special Attention to Peter Sloterdijk)." In *Proceedings of the Annual International Conference of the Design History Society*, 2–10, 2008.

———. Latour, Bruno. "Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern." Critical Inquiry 30, no. 2 (2004): 225–48.

Lawson, Bryan. *How Designers Think: The Design Process Demystified*. Routledge, 2006.

Lawson, Shaun, Ben Kirman, Conor Linehan, Tom Feltwell, Lisa Hopkins, and others. "Problematising Upstream Technology through Speculative Design: The Case of Quantified Cats and Dogs." In *Proceedings of CHI 2015*, 2663–2672, 2015.

Leahu, Lucian, and Phoebe Sengers. "Freaky: Collaborative Enactments of Emotion." In *Proceedings of CSCW 2015*, 17–20, 2015.

———. "Freaky: Performing Hybrid Human-Machine Emotion." In *Proceedings of DIS 2014*, 607–16, 2014.

Leshed, Gilly, and Phoebe Sengers. "'I Lie to Myself That I Have Freedom in My Own Schedule': Productivity Tools and Experiences of Busyness." In *Proceedings of CHI 2011*, 905–14, 2011.

Lim, Youn-Kyung, Erik Stolterman, and Josh Tenenberg. "The Anatomy of Prototypes: Prototypes as Filters, Prototypes as Manifestations of Design Ideas." *ACM Transactions on Computer-Human Interaction* 15, no. 2 (2008): 7.

Lindley, Joseph, and Robert Potts. "A Machine Learning: An Example of HCI Prototyping with Design Fiction." In *Proceedings of NordiCHI*, 1081–84, 2014.

Linehan, Conor, Ben J. Kirman, Stuart Reeves, Mark A. Blythe, Joshua G. Tanenbaum, Audrey Desjardins, and Ron Wakkary. "Alternate Endings: Using Fiction to Explore Design Futures." In *CHI 2014 Extended Abstracts*, 45–48, 2014.

Ljungblad, Sara, Tobias Skog, and Lars Erik Holmquist. "From Usable to Enjoyable Information Displays." In Funology, edited by Mark A. Blythe, Kees Overbeeke, Andrew F. Monk, and Peter C. Wright, 213–21. *Human-Computer Interaction Series* 3. Springer Netherlands, 2005.

Loizeau, Jimmy, and James Auger. "Audio Tooth Implant." Other, February 1, 2002. http://www.sciencemuseum.org.uk/about_us/press_and_media/press_releases/2002/06/134.aspx?keywords=Audio+tooth+implant.

Lovink, Geert. *Dark Fiber: Tracking Critical Internet Culture*. Taylor & Francis, 2002.

Löwgren, Jonas. "Annotated Portfolios and Other Forms of Intermediate-Level Knowledge." *Interactions* 20, no. 1 (January 2013): 30–34.

———. "The Need for Video in Scientific Communication." *Interactions* 18, no. 1 (January 2011): 22–25.

Löwgren, Jonas, and Erik Stolterman. *Thoughtful Interaction Design*. MIT Press Cambridge, MA, 2004.

Lukens, Jonathan, and Carl DiSalvo. "Speculative Design and Technological Fluency." International Journal of Learning and Media 3, no. 4 (September 2011): 23–40.

Mancini, Clara. "Animal-Computer Interaction (ACI): Changing Perspective on HCI, Participation and Sustainability." In *CHI 2013 Extended Abstracts*, 2227–36, 2013.

Mancini, Clara, Rob Harris, Brendan Aengenheister, and Claire Guest. "Re-Centering Multispecies Practices: A Canine Interface for Cancer Detection Dogs." In *Proceedings of CHI 2015*, 2673–82, 2015.

Mandiberg, Michael. "Oil Standard" Accessed August 2, 2015. http://archive.turbulence.org/Works/oilstandard/.

Manzini, Ezio, and Francois Jegou. "Sustainable Everyday." *Design Philosophy Papers*, no. 4 (2003).

Manzini, Ezio, and Carlo Vezzoli. "A Strategic Design Approach to Develop Sustainable Product Service Systems: Examples Taken from the 'Environmentally Friendly Innovation' Italian Prize." *Journal of Cleaner Production* 11, no. 8 (2003): 851–57.

Markussen, Thomas, and Eva Knutz. "The Poetics of Design Fiction." In *Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces*, 231–40, 2013.

Massumi, Brian. *Semblance and Event: Activist Philosophy and the Occurrent Arts*. MIT press, 2011.

———. *Parables for the Virtual: Movement, Affect, Sensation*. Duke University Press, 2002.

Mayer-Schönberger, Viktor. *Delete the Virtue of Forgetting in the Digital Age*. Princeton [N.J.]: Princeton University Press, 2009.

Mazé, Ramia, Lisa Olausson, Matilda Plöjel, Johan Redström, and Christina Zetterlund. *Share This Book: Critical Perspectives and Dialogues about Design and Sustainability*. Stockholm: Axl Books, 2013. Accessed January 6, 2014. http://umu.diva-portal.org/smash/get/diva2:646689/FULLTEXT01.pdf

Mazé, Ramia, and Johan Redström. "Difficult Forms: Critical Practices of Design and Research." In *Proceedings of IASDR 2007*, 2007. Accessed January 6, 2014. http://redstrom.se/johan/papers/difficult.pdf.

———. "Switch! Energy Ecologies in Everyday Life." *International Journal of Design* 2, no. 3 (2008): 55–70.

McDonough, William, and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*. MacMillan, 2010.

"Metahaven." Accessed July 6, 2015. http://metahaven.net/Site/Metahaven.html.

Michael, Mike. "'What Are We Busy Doing?' Engaging the Idiot." *Science, Technology & Human Values* 37, no. 5 (2012): 528–54.

Mitcham, Carl, "Types of Technology." *Research in Philosophy and Technology* no. 1(1978): 229-294. JAI Press.

Morozov, Evgeny. "The Mindfulness Racket." *The New Republic*, February 23, 2014. Accessed December, 11, 2014. http://www.newrepublic.com/article/116618/technologys-mindfulness-racket.

———. *To Save Everything, Click Here: The Folly of Technological Solutionism*. PublicAffairs, 2013.

Mouffe, Chantal. "Deliberative Democracy or Agonistic Pluralism?" *Social Research*, 1999, 745–58.

Nelson, Harold G, and Erik Stolterman. *The Design Way Intentional Change in an Unpredictable World*. Cambridge, Massachusetts: MIT Press, 2012.

Neustaedter, Carman, and Phoebe Sengers. "Autobiographical Design in HCI Research: Designing and Learning Through Use-It-Yourself." In *Proceedings of DIS 2012*, 514–23, 2012.

Norman, Donald A. "Affordance, Conventions, and Design." *Interactions* 6, no. 3 (1999): 38–43.

———. *The Design of Everyday Things: Revised and Expanded Edition*. Basic books, 2013.

Odom, William. "Understanding Long-Term Interactions with a Slow Technology: An Investigation of Experiences with FutureMe." In *Proceedings CHI 2015*, 575–84, 2015.

Odom, William, Richard Banks, David Kirk, Richard Harper, Siân Lindley, and Abigail Sellen. "Technology Heirlooms?: Considerations for Passing Down and Inheriting Digital Materials." In *Proceedings of CHI 2012*, 337–46, 2012.

Odom, William, Mark Selby, Abigail Sellen, David Kirk, Richard Banks, and Tim Regan. "Photobox: On the Design of a Slow Technology." In *Proceedings of DIS 2012*, 665–68, 2012.

Odom, William T., Abigail J. Sellen, Richard Banks, David S. Kirk, Tim Regan, Mark Selby, Jodi L. Forlizzi, and John Zimmerman. "Designing for Slowness, Anticipation and Re-Visitation: A Long Term Field Study of the Photobox." In *Proceedings of CHI 2014*, 1961–70, 2014.

Odom, William, John Zimmerman, and Jodi Forlizzi. "Teenagers and Their Virtual Possessions: Design Opportunities and Issues." In *Proceedings of CHI 2011*, 1491–1500, 2011.

Odom, William, Richard Banks, Abigail Durrant, David Kirk, and James Pierce. "Slow Technology: Critical Reflection and Future Directions." In *Proceedings of DIS 2012*, 816–17, 2012.

"Oil Standard - Odd Extension." Firefox Facts. Accessed August 5, 2015. http://www.firefoxfacts.com/2007/01/10/oil-standard-odd-extension/.

Oliveira, Pedro. "Cheat Sheet for a Non (or Less) Colonialist Speculative Design." Medium. Accessed September 22, 2014. https://medium.com/@pedroliveira_/cheat-sheet-for-a-non-or-less-colonialist-speculative-design-9a6b4ae3c465.

Overbeeke, Kees CJ, and Stephan SAG Wensveen. "From Perception to Experience, from Affordances to Irresistibles." In *Proceedings of the 2003 International Conference on Designing Pleasurable Products and Interfaces*, 92–97, 2003.

Papanek, Victor. *The Green Imperative: Natural Design for the Real World*. Thames and Hudson, 1995.

Papanek, Victor. *Design for the Real World. Thames and Hudson London*, 1972.

Pargman, Daniel, and Barath Raghavan. "Introduction to LIMITS '15: First Workshop on Computing within Limits." *First Monday* 20, no. 8 (July 31, 2015).

Paulos, Eric, and Elizabeth Goodman. "The Familiar Stranger: Anxiety, Comfort, and Play in Public Places." In *Proceedings CHI 2004*, 223–30, 2004.

Paulos, Eric, R. Honicky, and Ben Hooker. "Citizen Science: Enabling Participatory Urbanism." *Urban Informatics: Community Integration and Implementation*, 2008.

Paulos, Eric, and Tom Jenkins. "Urban Probes: Encountering Our Emerging Urban Atmospheres." In *Proceedings of CHI 2005*, 341–50, 2005.

Pierce, James. "Material Awareness: Promoting Reflection on Everyday Materiality." In *Extended Abstracts of CHI 2009*, 4459-4464, 2009.

———. "Undesigning Technology: Considering the Negation of Design by Design." In *Proceedings of CHI 2012*, 957–66, 2012.

———. "Undesigning Interaction." *Interactions* 21, no. 4 (2014): 36–39.

———. "On the Presentation and Production of Design Research Artifacts in HCI." In *Proceedings of DIS 2014*, 735–44, 2014.

Pierce, James, Chloe Fan, Derek Lomas, Gabriela Marcu, and Eric Paulos. "Some Consideration on the (in)Effectiveness of Residential Energy Feedback Systems." In *Proceedings of CHI 2010*, 244–47, 2010.

Pierce, James, Diane J. Schiano, and Eric Paulos. "Home, Habits, and Energy: Examining Domestic Interactions and Energy Consumption." In *Proceedings of CHI 2010*, 1985–94, 2010.

Pierce, James, Will Odom, and Eli Blevis. "Energy Aware Dwelling: A Critical Survey of Interaction Design for Eco-visualizations." In *Proceedings of OZCHI 2008*, 1-8, 2008.

Pierce, James, and Eric Paulos. "Materializing Energy." In *Proceedings of DIS 2010*, 113–22, 2010.

———. "Designing for emotional attachment to energy." Paper presented at the *2010 Conference on Design and Emotion*, 2010.

———. "Second-hand Interactions: Investigating Reacquisition and Dispossession Practices around Domestic Objects." In *Proceedings of CHI 2011*, 2385-2394, 2011.

———. "A Phenomenology of Human-Electricity Relations." In *Proceedings of CHI 2011*, 2405–8, 2011.

———. "Beyond Energy Monitors: Interaction, Energy, and Emerging Energy Systems." In *Proceedings of CHI 2012*, 665–74, 2012.

———. "The Local Energy Indicator: Designing for Wind and Solar Energy Systems in the Home." In *Proceedings of DIS 2012*, 631-634, 2012.

———. "Designing Everyday Technologies with Human-Power and Interactive Microgeneration." In *Proceedings of DIS 2012*, 602–11, 2012.

———. "Counterfunctional Things: Exploring Possibilities in Designing Digital Limitations." In *Proceedings of DIS 2014*, 375–84, 2014.

———. "Electric Materialities and Interactive technology." In *Proceedings of CHI 2013*, 119–128, 2013.

———. "Some Variations on a Counterfunctional Digital Camera." In *Proceedings of DIS 2014*, 131–40, 2014.

———. "Obscura 1C Digital Camera," In *Proceedings of the 2015 Conference on Research through Design*, 2015.

———. "Making Multiple Uses of the Obscura 1C Digital Camera: Reflecting on the Design, Production, Packaging and Distribution of a Counterfunctional Device." In *Proceedings CHI 2015*, 2103–12, 2015.

Pierce, James, Phoebe Sengers, Tad Hirsch, Tom Jenkins, William Gaver, and Carl DiSalvo. "Expanding and Refining Design and Criticality in HCI." In *Proceedings of CHI 2015*, 2083–92, 2015.

Pierce, James, Yolande Strengers, Phoebe Sengers, and Susanne Bødker. "Introduction to the Special Issue on Practice-Oriented Approaches to Sustainable HCI." *ACM Transactions on Computer-Human Interaction* 20, no. 4 (September 2008): 20:1–20:8.

Pierce, James, Hronn Brynjarsdottir, Phoebe Sengers, and Yolande Strengers. "Everyday practice and sustainable HCI: understanding and learning from cultures of (un) sustainability." In *Extended Abstracts of CHI 2011*, 9-12, 2011.

Pousman, Zachary, Mario Romero, Adam Smith, and Michael Mateas. "Living with Tableau Machine: A Longitudinal Investigation of a Curious Domestic Intelligence." In *Proceedings of UbiComp 2008*, 370–79, 2008.

Prado, Luiza and Pedro Oliveira. "Questioning the 'critical' in Speculative & Critical Design." Medium. Accessed December 13, 2014. https://medium.com/@luizaprado/questioning-the-critical-in-speculative-critical-design-5a355cac2ca4.

Prost, Sebastian, Elke Mattheiss, and Manfred Tscheligi. "From Awareness to Empowerment: Using Design Fiction to Explore Paths Towards a Sustainable Energy Future." In *Proceedings of CSCW 2015*, 1649–5, 2015.

Raley, Rita. *Tactical Media*. Minneapolis: University Of Minnesota Press, 2009.

Ratto, Matt. "Critical Making: Conceptual and Material Studies in Technology and Social Life." *The Information Society* 27, no. 4 (2011): 252–60.

Reckwitz, Andreas. "Toward a Theory of Social Practices A Development in Culturalist Theorizing." *European Journal of Social Theory* 5, no. 2 (2002): 243–63.

Redström, Johan. "Form-Acts: A Critique of Conceptual Cores," 2013. In *Share this Book: Critical Perspectives and Dialogues about Design and Sustainability*, edited by Ramia Mazé, Lisa Olausson, Matilda Plöjel, Johan Redström, Christina Zetterlund, 17-48. Stockholm: Axl Books, 2013

———. "On Technology as Material in Design." *Design Philosophy Papers* 3, no. 2 (2005): 39–54.

———. "RE: Definitions of Use." *Design Studies* 29, no. 4 (2008): 410–23.

———. "Designing Everyday Computational Things." PhD diss., Göteborg, 2001. https://gupea.ub.gu.se/handle/2077/916.

Reeves, Stuart. "Envisioning Ubiquitous Computing." In *Proceedings of CHI 2012*, 1573–82, 2012.

Schatzki, Theodore R. *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*. Cambridge University Press, 1996.

Schwartz, Barry. *The Paradox of Choice: Why More Is Less*. Ecco New York, 2004.

Seago, Alex, and Anthony Dunne. "New Methodologies in Art and Design Research: The Object as Discourse." *Design Issues*, 1999, 11–17.

Sengers, Phoebe. "What I Learned on Change Islands: Reflections on IT and Pace of Life." *Interactions* 18, no. 2 (March 2011): 40–48.

———. Sengers, Phoebe. "Anti-Boxology: Agent Design in Cultural Context." PhD diss., Carnegie Mellon University,1998. http://reports-archive.adm.cs.cmu.edu/anon/1998/abstracts/98-151.html

Sengers, Phoebe, Kirsten Boehner, Shay David, and Joseph"Jofish" Kaye. "Reflective Design." In *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility*, 49–58, 2005.

Sengers, Phoebe, and Bill Gaver. "Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation." In *Proceedings DIS 2006*, 99–108, 2006.

Sharma, Sarah. *In the Meantime: Temporality and Cultural Politics*. Duke University Press, 2014.

Shepard, Mark. "Sentient City Survival Kit." Accessed July 6, 2015. http://survival.sentientcity.net/umbrella.html.

Shepard, Mark, ed. *Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space*. The MIT Press, 2011.

Shove, Elizabeth. *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Berg Oxford, 2003.

———. *The Design of Everyday Life*. Berg, 2007.

Shove, Elizabeth, and others. "Beyond the ABC: Climate Change Policy and Theories of Social Change." *Environment and Planning* 42, no. 6 (2010): 1273.

Shove, Elizabeth, Mika Pantzar, and Matt Watson. *The Dynamics of Social Practice Everyday Life and How It Changes*. Los Angeles: SAGE, 2012.

Simon, Herbert A. *The Sciences of the Artificial*. MIT Press, 1996.

Steacy, Will, and Lyle Rexer. *Photographs Not Taken*. [New York]: Daylight, 2012.

Sterling, Bruce. *Shaping Things*. Mediaworks Pamphlets, 2005

———. "Design Fiction." Interactions 16, no. 3 (2009): 20–24.

———. "Patently Untrue: Fleshy Defibrillators and Synchronised Baseball Are Changing the Future (Wired UK)." *Wired UK*. Accessed August 3, 2015. http://www.wired.co.uk/magazine/archive/2013/10/play/patently-untrue.

Stolterman, E. "The Nature of Design Practice and Implications for Interaction Design Research." *International Journal of Design* 2, no. 1 (2008): 55–65.

Stolterman, Erik, and Mikael Wiberg. "Concept-Driven Interaction Design Research." *Human–Computer Interaction* 25, no. 2 (2010): 95–118.

Strengers, Yolande A.A. "Designing Eco-Feedback Systems for Everyday Life." In *Proceedings of CHI 2011*, 2135–44, 2011.

———. *Smart Energy Technologies in Everyday Life: Smart Utopia?* Palgrave Macmillan, 2013.

Sundström, Petra, Alex Taylor, Katja Grufberg, Niklas Wirström, Jordi Solsona Belenguer, and Marcus Lundén. "Inspirational Bits: Towards a Shared Understanding of the Digital Material." In *Proceedings of CHI 2011*, 1561–70, 2011.

Swan, Laurel, and Alex S. Taylor. "Photo Displays in the Home." In *Proceedings of DIS 2008*, 261–70, 2008.

Tanenbaum, Joshua. "What Is Design Fiction? - Quora." Accessed November 13, 2015. https://www.quora.com/What-is-design-fiction.

Tanenbaum, Joshua, Karen Tanenbaum, and Ron Wakkary. "Design Fictions." In *Proceedings TEI 2012*, 347–50, 2012.

———. "Steampunk As Design Fiction." In *Proceedings of CHI 2012*, 1583–92, 2012.

Taylor, Alex S., Susan P. Wyche, and Joseph "Jofish" Kaye. "Pottering by Design." In *Proceedings of NordiCHI 2008*, 363–72, 2008.

"TBD Catalog." Accessed July 4, 2015. http://tbdcatalog.com/.

Telier, A., Thomas Binder, Giorgio De Michelis, Pelle Ehn, Giulio Jacucci, and Ina Wagner. *Design Things*. The MIT Press, 2011.

Thackara, John. *In the Bubble: Designing in a Complex World*. MIT press, 2006.

———."Republic of Salivation (Michael Burton and Michiko Nitta)." *Design and Violence*. Accessed September 22, 2014. http://designandviolence.moma.org/republic-of-salivation-michael-burton-and-michiko-nitta/.

———.Thackara, John. "Beyond the Object in Design," 11–34, in *Design after Modernism*, Thames and Hudson, 1988.

Tharp, Bruce M., and Stephanie M. Tharp. "Discursive Design Basics: Mode and Audience." *Nordes* 1, no. 5 (2013).

Thompson, Nato. *Living as Form: Socially Engaged Art from 1991-2011*. MIT Press, 2012.

Tonkinwise, Cameron. "How We Intend to Future: Review of Anthony Dunne and Fiona Raby, Speculative Everything: Design, Fiction, and Social Dreaming." *Design Philosophy Papers* 12, no. 2 (2014): 169–87.

"Vacated - Justinblinder.com." Accessed July 6, 2015. http://projects.justinblinder.com/Vacated.

Vallgårda, Anna, and Johan Redström. "Computational Composites." In *Proceedings CHI 2007*, 513–22, 2007.

Verbeek, Peter-Paul. *Moralizing Technology: Understanding and Designing the Morality of Things*. Chicago; London: The University of Chicago Press, 2011.

———. *What Things Do: Philosophical Reflections on Technology, Agency, and Design*. Penn State University Press, 2005.

Wakkary, Ron, Audrey Desjardins, and Sabrina Hauser. "Unselfconscious Interaction: A Conceptual Construct." *Interacting with Computers,* July 17, 2015.

Wakkary, Ron, Audrey Desjardins, Sabrina Hauser, and Leah Maestri. "A Sustainable Design Fiction: Green Practices." *ACM Transactions on Computer-Human Interaction*. 20, no. 4 (September 2008): 23:1–23:34.

Wakkary, Ron, William Odom, Sabrina Hauser, Garnet Hertz, and Henry Lin. "Material Speculation: Actual Artifacts for Critical Inquiry." *Aarhus Series on Human Centered Computing* 1, no. 1 (2015): 12.

Wakkary, Ron, Markus Lorenz Schilling, Matthew A. Dalton, Sabrina Hauser, Audrey Desjardins, Xiao Zhang, and Henry W.J. Lin. "Tutorial Authorship and Hybrid Designers: The Joy (and Frustration) of DIY Tutorials." In *Proceedings of CHI 2015*, 609–18, CHI 2015.

Walker, John Albert. ed. *Design History and the History of Design*. Pluto Press (UK), 1989.

———. "Defining the Object of Study." In Design Studies: A Reader, edited by Hazel Clark and David Brody, 42-48. Berg Oxford, 2009.

Wensveen, Stephan AG, Johan Partomo Djajadiningrat, and C. J. Overbeeke. "Interaction Frogger: A Design Framework to Couple Action and Function through Feedback and Feedforward." In *Proceedings of DIS 2004*, 177–84, 2004.

Whiteley, Nigel. *Design for Society*. London: Reaktion Books, 1997.

Wilde, Danielle, Jenny Underwood, and Rebecca Pohlner. "PKI: Crafting Critical Design." In *Proceedings of DIS 2014*, 365–74, 2014.

Wilkie, Alex, Mike Michael, and Matthew Plummer-Fernandez. "Speculative Method and Twitter: Bots, Energy and Three Conceptual Characters." *The Sociological Review* 63, no. 1 (2015): 79–101.

———. "Speculative Method and Twitter: Bots, Energy and Three Conceptual Characters." *The Sociological Review* 63, no. 1 (February 1, 2015): 79–101.

Willis, Anne-Marie. "Ontological Designing." *Design Philosophy Papers* 4, no. 2 (2006): 69–92.

Winograd, Terry, and Fernando Flores. *Understanding Computers and Cognition: A New Foundation for Design*. Intellect Books, 1986.

Woodruff, Allison, Jay Hasbrouck, and Sally Augustin. "A Bright Green Perspective on Sustainable Choices." In *Proceedings of CHI 2008*, 313–22, 2008.

Woodward, Ian. *Understanding Material Culture*. Sage, 2007.

Wyche, Susan P., Alex Taylor, and Joseph Kaye. "Pottering: A Design-Oriented Investigation." In *CHI 2007 Extended Abstracts*, 1893–98, 2007.

Zareipour, H., K. Bhattacharya, and C. A. Canizares. "Distributed Generation: Current Status and Challenges." In *Annual North American Power Symposium (NAPS)*, 1–8, 2004.

Zimmerman, John, Jodi Forlizzi, and Shelley Evenson. "Research Through Design As a Method for Interaction Design Research in HCI." In *Proceedings of CHI 2007*, 493–502, 2007.

Zimmerman, John, Erik Stolterman, and Jodi Forlizzi. "An Analysis and Critique of Research Through Design: Towards a Formalization of a Research Approach." In *Proceedings of DIS 2010*, 310–19, 2010.

Appendix A

Counterfunctional Camera Design Proposals

The work that follows has been previously published in Pierce and Paulos, "Some Variations on a Counterfunctional Digital Camera."

Some Variations on a Counterfunctional Digital Camera

James Pierce, 2011

Introduction

This design booklet takes a different look at digital cameras and photos. It frames this look within a counterfunctional design perspective. This approach involves first identifying common positive features of a certain technology and then designing around the absence or restriction of these features. The selected concepts presented here depict an array of counterfunctional camera variants. These variants can be read as concepts worthy of further articulation or design directions worthy of future exploration (or else ideas best left unpursued in their present form). Whatever the case, the larger proposal is that these counterfunctional concept variants offer a useful (counter)perspective on cameras, photos, images, digital media and interactive techology. While cameras and photos are the ostensible thematic focus, these technologies are also a focusing device for a broader conceptual theme: designing digital limitations.

This work can be read as a companion piece to the DIS Paper "Counterfunctional Things: Exploring Possibilities in Designing Digital Limitations" (Pierce & Paulos, 2014). But this booklet may also be read independently of that paper.[1] This work is not a process documentation or a tool used within a design process (although it can be traced to such documents).[2] Rather the current document is presented as a type of visual-textual design artifact (one with a schematic visual character). We see it as a means to present new concepts composed of both the textual-theoretical and visual-designerly varieties.

The concepts that follow pivot around 6 thematic counterfeatures, which contrast with common features of current digital photographic technologies. Placed within a historical context [3], some of these counterfeatures recall earlier technologies (and nostalgic sentiments), while others introduce distinctly digital counterdirections.

Unviewable Digital Images

Single-Impression Digital Cameras

Immutable Digital Images

Inaccurate & Imprecise Digital Photography

Ephemeral Digital Images

Absent Digital Images

---

1. The academic paper and design booklet companion format parallels Aipperspach, Hooker, and Woodruff's companion publications exploring The Heterogeneous Home (Aipperspach et al., 2007; Aipperspach et al., 2008).

2. While this work exhibits similarities with the design workbooks described by Gaver (Gaver, 2011), it is offered here as an "end product" of a design process rather than a practical design tool or penultimate outcome.

3. 1837 - The Daguerreotype is the first publicly announced photographic process, utilizing light sensitive metal plates to capture single images. **1900** - The Kodak Brownie sells for $1 under the slogan "you press the button, we do the rest", giving rise to amateur photography. **1947** – Polaroid introduces the SX-70 model, a simplified "instant camera" that produces viewable images within seconds. **1969** – The charged-coupled device (CCD) is invented, enabling digital cameras, which find an initial market with photojournalists. **2014** – Smart phones with hi-resolutions cameras have provided a platform for "photo apps" like Instagram.

The oldest surviving photograph: "View from the Window at Le Gras", by Nicéphore Niépce, 1826 or 1827.

(More accurately, a digital photograph of the original pewter plate coated with a naturally occurring asphalt, Bitumen of Judea, that hardens in proportion to its exposure to light.)

Unviewable Digital Images
"Images" that exist as data, but cannot be displayed as images.

Write-Only Camera
The camera can write image files to digital memory, but they cannot be read, displayed or seen.[1]

Smash Camera
You need to break the camera apart to access the images. [2]
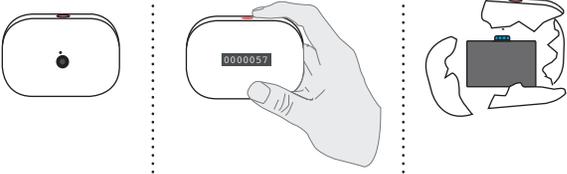
Prior Image Camera
Instead of displaying the image just taken, the camera displays a prior image taken.[4]
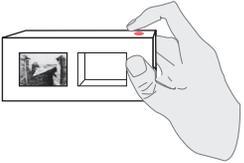
Time & Place Camera
You can only view the images while at the place or date they were originally taken.
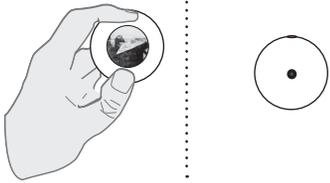
Restricted Viewing
Images that cannot be viewed anytime, anyplace, with a click-of-a-button. [3]

1. Write-Only Camera. An LED would blink with each click of the button to assure the user the image has been written to memory. Still, do the images in fact digitally exist (as bits stored in floating-gate transistors)? Perhaps a skilled user could disassemble the camera and reverse engineer the data to produce visible pixel-based images. Or perhaps the camera has a small numerical display that shows the bitmap data structure one element at a time. With a great deal of time and patience, the numerical data could be converted to an image.

2. Smash Camera. In this variation, the shell is to be constructed of porcelain. The numerical display counts up rather than down each time a photo is taken: 00001, 00002, 00003,... The user must decide when is the right moment to shatter the camera and retrieve the images (after 10 photos? 100? 1000?). The smash camera references a few familiar objects: disposable film cameras, ceramic piggy banks, and time capsules.

3. Restricted Viewing. Technologies built around themes of serendipity, randomness and reflection may employ restricted viewing. See, for example, Odom et al. on the design of Photobox (Odom et a., 2012).

4. Prior Image Camera. A variation on this concept is a Related Image Camera. Each time you take a photo, the camera displays an image with a similar attribute, e.g., color, composition, tone, etc.

Single-Impression Digital Camera[1]
You can take only one digital image.[2]

1-Shot Camera [3]
You can only take one image at a time. To take another image, you have to manually download the previously taken image.
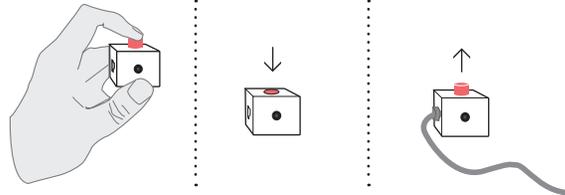
Multi-Angle Variation [4]

---
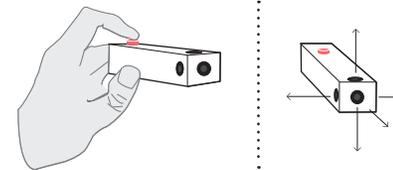
1. Single-Impression Digital Camera. The earliest cameras could take only 1 impression at a time. In order to take another photograph you had to manually load a new plate. The long exposure times neceessary for these earliest cameras further required subjects to stand still for extended periods of time (hence the use of pedestals in portrait photography for models to lean against). The introduction of the Kodak Brownie and other cheap, mass market cameras enabled multiple "snapshots" on a single roll of film. Current camera phones continue this trajectory, enabling snapping off hundreds of shots per minute.

In a digital era Henri Cartier-Bresson's "decisive moment"—"the creative fraction of a second when you are taking a picture"—is still an applicable perspective and technique. But why not capture the second before and after, just in case? Why take just one photo when you can take 10 or 100 and then select the best?

2. You can only take one image at a time. The desire for new limits on the practically unrestricted speed, amount and ubiquity of digital photography is suggested in the persistance of Polaroid Cameras (old and new) and Photobooths. (It is also suggested by the photo app Snapchat; see Transient Digital Images, footnote 1, p. 7). Yet taking only one photo because it is a strict, unavoidable limitation is different from

voluntarily refraining from taking more than one photo. Would not the single photo taken out of self-restraint and the one taken within camera-constraint be different photos? Self-imposed constraints are practically and experientially different than those that are technologically-imposed. To what extent is taking just one photo even a possibility today? (And to what extent could it be desirable to do so?)

3. 1-Shot Camera. The 1-Shot Camera proposes to give back the option to only take 1 single photo. It also proposes to give back the possibility of viewing and appreciating an only photo taken. A problem with this proposition is that the resulting "1-Shot" image would not look any different than any other digital image. In contrast, a Polaroid photo visually testifies to its slower, more limited, non-digital form of production. The Polaroid picture announces that it was 1 of but a few (rather than countless) images taken and take-able at a given time and place by a given camera and person holding it.

4. 1 Multi-Angle Shot Camera. This variation tries to entice the user to adopt a 1-shot mentality and practice with a new positive feature. (See also: Peripheral Camera, p. 6).

Immutable Digital Images
Digital images that cannot be digitally transferred, copied, or edited.[1]

Restricted Transformation
Limited ability to digitally transfer, copy, or edit.

Cabinet Camera
You cannot transfer the photos to another device. You cannot share the photos online. You cannot edit the photos. You cannot delete the photos.
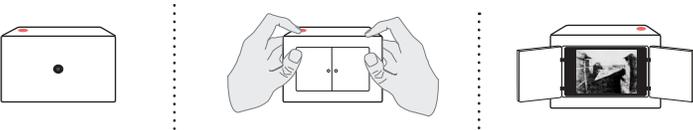
You can view and enjoy the photos on the camera display. But the photos live only in the camera and on the display.[2]

Deletable Cabinet Camera [4]
You can delete images, but they leave an indelible visual void.

Cabinet Camera Image Capacity [3]

| 1 | 10 | 100 | 1000 |
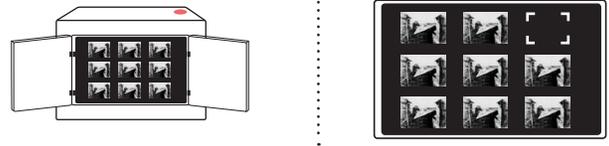
Daily Cabinet Camera [5]
You can remove only 1 image per day.

---

1. Immutable digital images. New media theorists have located the "newness" of digital media in its basic technical operations: selecting, compositing, copying, sampling, deleting, ctrl-z-ing,… (see, e.g., Lunenfield, 2000; Manvoich, 2001). What if a digital technology restricts these basic, "essential" operations? And in what sense are they truly basic or "essential"?

2. Cabinet Camera. The Cabinet Camera removes the technical options for digital post-production of images, along with the more basic abilities to transfer, copy or delete an image. This restriction recalls the earliest American Daguerrotypes. These cameras produced images without negatives, thus creating a truly unique image. More familiarly, the Cabinet Camera recalls the printed photo album.

3. Cabinet Camera Image Capacity. Image capacity substantialy affects the suggested usage of the device. A capacity of 10 or 100 images suggests reserving the photos for special events. A capacity of 1,000 or

10,000 image suggests capturing more prosaic moments.

4. Deletable Cabinet Camera. Impressions taken on rolls of camera film cannot be deleted prior to being developed. Yet these accidental and poorly composed snapshots can vividly portay a sense of time and place, especially when viewed years later: the corner of a room and some carpet from an old apartment, part of an ex's out-of-focus face, a shaky scene from a party. Such photos are typically deleted or disregarded if taken digitally. Inhibiting deletion could re-enable appreciation for "bad photos".

5. Daily Cabinet Camera. This variation would discourage transfering photos without strictly prohibiting it. This would encourage keeping and viewing photos only on the camera while allowing one to take a photo without worrying that it could never be digitally shared or edited.

Inaccurate & Imprecise Digital Photography [1]

Peripheral ← → **Camera** [2]

Ultra Low-Resolution Cameras [3]

0x0 pixel [4]

1x1 pixel

2x2 pixel

4x4 pixel

8x8 pixel

16x16 pixel

Thumbnail Camera

Low-res, mis-taken, un-focus-able,...

---
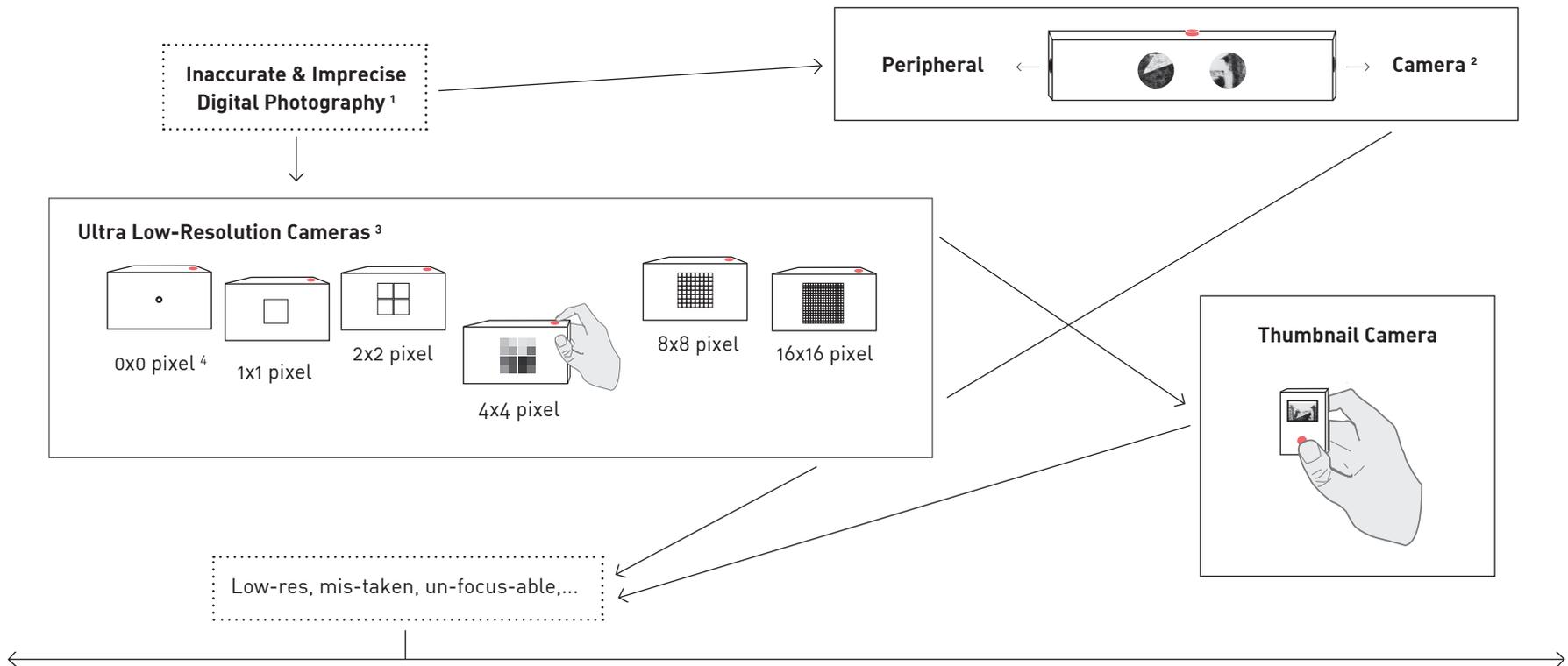
1. Inaccurate and Imprecise Digital Photography. The first cameras originated from a desire to fix the transient image projected onto a plane by the camera obscura. Accurate and precise reproduction was thus an original aim of photography. Yet as media theorists and art photographers remind us, photographs are made, material things. This idea makes sense to anyone that uses Instagram filters, Photoshop, or apps that automatically make you more beatiful by subtly altering your face. Manipulations of this sort don't make the image more accurate or precise, they make the image (and reality) more like we want it to be. Are "abstract" or "pictorialist" photos more or less truthful or revealing than "straight" photographs?

2. Peripheral Camera. Or Up-and-Down if you turn it 90 degrees. (Or Forward-and-Backward.)
See also: 1 Multi-Angle Shot Camera, p. 4.

3. Ultra Low-Resolution Camera. In a world of higher and higher resolution digital images, could low-resolution images be seen as unique and significant? With custom low-resolution displays, low-resolution digital images can be seen as novel rather than reduced forms. This can be seen in the distinctly low-resolution displays pictured below (see image credits).

4.0x0 Pixel Camera. See also: Write-Only Camera, p. 3.

Reverse Polaroid Camera

Photos appear instantly but pixelate with each second they are displayed. You can suspend the pixelation at any time by not displaying the image.
You thus have two antithetical options: You can maintain the image when not displaying it; or you can view the image when dissipating it.[2,3]

| 0 seconds | 5 seconds | 10 seconds | 30 seconds | 45 seconds | 60 seconds |
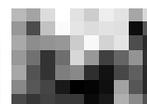
1. Ephemeral Digital Images. The novel possibilities that lie in transient digital imagery is exemplified by the popular photo app Snapchat. Snapchat allows you to take, annotate and send photos to your friends using your smart phone. Upon receiving a photo you can choose to open and view it. But once you open and display the image it disappears permanently after 1-10 seconds. Snapchat can be seen to function in certain ways as a tele camera obscura device. In practice, it is used for chatting through imagery, as the name suggests. The precise, imposed destruction of the image allows one to send risqué, ridiculous and what might otherwise be uninteresting photos with lessened inhibitions.
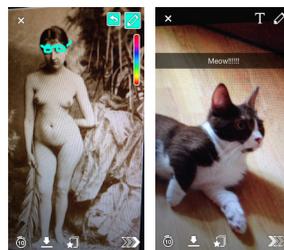
2. Reverse Polaroid. The variation depicted has a similar interface to the basic iPhone or Android camera and photo gallery app. Once you take a photo it can be seen as a thumbnail preview in the photo gallery. You can select a thumbnail to view the full-scale image. However, there is tradeoff to displaying and viewing the image: the resolution deteriorates with each second that it is displayed. You can suspend the deterioration by returning to the thumbnail view (the thumbnail resolution updates accordingly). If an image fully deteriorates, you are left with a single color: the pixel-averaged value of the original image. The Reverse Polaroid can be seen as the personal counterpart to the social app Snapchat.

3. Digital dissipation. The Reverse Polaroid foregrounds a unique feature of digital technology: the ability to precisely control the deterioration and destruction of digital media. A photo can be digitally captured and viewed in an instant. Likewise, it can be destroyed with precision, in an instant or over time. Printed photographs have their own ephemerality, but it is of a different sort than digital ephemerality.

Absent Images
Capturing, keeping and viewing void images.

Metadata-only Camera [1]
Captures metadata without image.

3:36
03/20/2014
37.770829, -122.449437

StopCam [2]
StopCam is constantly taking pictures, unless you stop it by pressing and holding the Stop button. [3] Stopping creates an image-void in the perpetual time series of photographs.

STOP

---
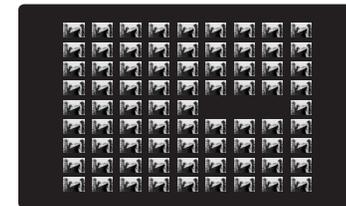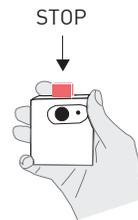
1. Metadata-Only Camera. This camera is related to Matt Richardson's Descriptive Camera. Instead of producing an image, the Descriptive Camera outputs a text description of the image using crowdsourcing.

2. StopCam. StopCam is a propositional counterpoint to Microsoft's SenseCam. SenseCam is a wearable wide-angle lens digital camera that automatically takes pictures (e.g., every 30 seconds). "Originally conceived as a personal 'Black Box' accident recorder, it soon became evident that looking through images previously recorded tends to elicit quite vivid remembering of the original event" (Senscam website).

Yet the fullfillment of the desire to record everything gives rise to counter-desires: refraining, deleting and forgetting recorded imagery. "If everything that existed were continually being photogaphed, every photograph would become meaningless." (Berger, 1980). SenseCam brings us closer to fulfilling this ultimate photographic scenario: of recording everything and rendering everything viewable. While the collection of photos produced by SenseCam are far from meaningless, SenseCam suggests how the absence of a photo could become meaningful, and how we could desire and be able to remember an image of nothing amidst images of everything else. An image-void would be a digital record of there being no photographic record.

3. Stop Button. If everything that existed was continually being photographed, when would you hit the Stop Button to take a photo-void? A trip to the Grand Canyon? A birthday party? A gathering with friends? A private moment? A bout of extreme joy, or pain? At random?

Descriptive Camera™, Matt Richardson   SenseCam. Microsoft Research.

Designing Limitations and Counterfunctional Things
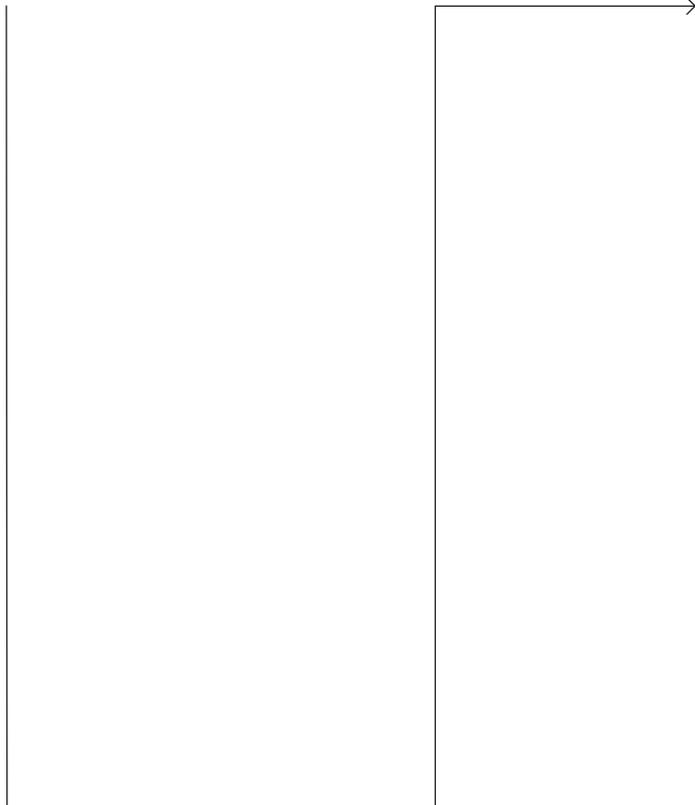
Conclusion
What is one to make of these counterfunctional camera variants? An operational camera, perhaps? Or a photographic image of such a camera? Or perhaps nothing at all, but rather something abstract and conceptual. The schematic character of this work is intended to leave things open to different interpretations, applications or other future developments. As a visual-textual artifact, the intended "use" or "function" can have a productive ambiguity rather than definitive articulation. A few useful directions to consider, however, are verbal concepts, visual proposals, and operational prototypes. (See Appendix.)

The concepts presented here have focused on new ways of seeing, using and designing camera and photo technologies. Yet these camera variants have been designed to also bring into focus a broader perspective: designing digital limitations. Digital technologies are celebrated for their new, exciting possibilities. But if digital technologies can do "anything", perhaps they are limited by their possibilities. Our latent needs and desires for limitations are highlighted by scholars [1], artists and personal anecdote (have you ever felt the urge to turn off your computer, phone, or camera?; did you ever feel a desire for a limited camera when reading this?). Critical issues of social equity and environmental sustainability further bring into focus the importance of not simply working within constraints, but designing and offering limitation as experientially positive and practically enabling features and qualities.

On multiple levels, designers understand the necessity and value of working within constraints. Yet the positive value of limitation is a conceptual design space whose limits have yet to be fully explored.

---

1. Sources on "limitations". Within HCI see recent writings on busyness and overwork (Leshed & Sengers, 2011), simple living (Sengers, 2011; Håkansson & Sengers, 2013), conflicting cultural discourse surrounding the smart phone (Harmon and Mazmanian, 2013), voluntary non-use and removal of technologies such as email (Mark, Voida, & Cardello, 2012) and Facebook (Baumer et al., 2013), the design of slow technologies (Hallnäs & Redström, 2001; Odom et al., 2013), and non-use and negation as research and design perspectives (Satchell & Dourish, 2009; Baumer & Silberman, 2011; Pierce, 2012).

From areas adjacent to HCI see, for example, writings on the significance of photographs not taken (Steacy, 2012), the value of simple communication tools in an age of communication overload (Harper, 2012), the benefits of deleting and forgetting digital content in an age where Facebook and Google remember everything (Mayer-Schönberger, 2009), the literal and metaphorical lack of sleep amidst a 24/7 culture (Crary, 2013), and the critical and counter functions of design as a catalyst for reflection and debate (DiSalvo, 2013; Dunne & Raby, 2014).

APPENDIX: SUGGESTED USES
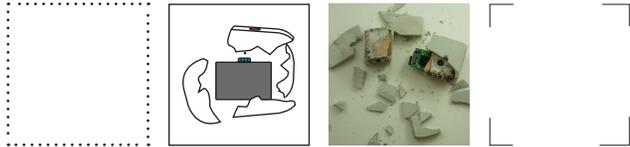
IMAGE CAPTIONS AND CREDITS

[p. 2] ̈View from the Window at Le Gras ̈, 1826 or 1827, by Joseph Nicéphore Niépce, used under CC BY.

[p. 6] ̈Drive ̈, by Jim Campbell, 2005. 15 1/2 x 11 3/4 x 2 1/2 inches. Custom electronics, 192 RGB LEDs, treated Plexiglas. Image courtesy Jim Campbell.

[p. 6] ̈Wooden Mirror ̈, by Daniel Rozin, 1999. Pieces of wood, servo motors, control electronics, video camera, computer, wood frame. Image courtesy Bitforms gallery and ITP NYU.

[p. 6] Playskool Showcam™. Image courtesy Michelle Yozzo.

[p. 6] 10x10 Ultra Low-Resolution Display. (See Pierce & Paulos, 2014.) ©James Pierce.

[p. 7] Snapchat photo. Used under CC BY.

[p. 7] Snapchat photo. Used under CC BY.

[p. 8] ̈Descriptive camera™ ̈, by Matt Richardson, 2012. Image courtesy Matt Richardson.

[p. 8] Microsoft SenseCam. Image courtesy Microsoft Research.

[p. 10] Capsule Camera prototype. (See Pierce & Paulos, 2014.) ©James Pierce.

[p. 1 - 10] All other images /diagrams ©James Pierce.

REFERENCES

Aipperspach, R., Hooker, B. & Woodruff, A. 2008. The heterogeneous home. Proc. Ubicomp '08.

Aipperspach, R., Hooker, B. & Woodruff, A. June 2007. The Heterogeneous Home.
PDF available: http://benhooker.com/heterogeneoushome/

Baumer, E. & Silberman, S. 2011. When the implication isnot to design (technology). Proc. CHI '11.

Baumer, E., Adams, P., Khovanskaya, V., Liao, T., Smith, M., Sosik, V. & Williams, K. 2013. Limiting, leaving, and (re)lapsing: an exploration of facebook non-use practices and experiences. Proc. CHI '13.

Berger, J. 1980. Understanding a photograph. In A. Trachtenberg (Ed.), Classic essays on photography. New Haven, CT: Leete's Island Books.

Crary, J. 2013. 24/7: Late Capitalisms and the Ends of Sleep. Verso.

DiSalvo, C. 2012. Adversarial Design. MIT Press.

Dunne, A. & Raby, F. 2014. Speculative Everything: Design, Fiction and Social Dreaming. MIT Press.

Gaver W. 2011. Making spaces: how design workbooks work. Proc. CHI '11.

Håkansson, M. & Sengers, P. 2013. Beyond being green: simple living families and ICT. Proc. CHI '13.

Hallnäs, L. & Redström, J. 2001. Slow Technology: Designing for Reflection. P. Ubi. Comput. 5(3): 201-21

Harmon, E. & Mazmanian, M. 2013. Stories of the Smartphone in everyday discourse: conflict, tension and instability. Proc. CHI '13.

Harper, R. 2012. Texture: Human Expression in the Age of Communications Overload. MIT Press.

Leshed, G. & Sengers, P. 2011. ̈I lie to myself that I have freedom in my own schedule ̈: productivity tools and experiences of busyness. CHI '11.

Lunenfield, P. 2000. Snap To Grid: A User's Guide to Digital Arts, Media, and Cultures. MIT Press.

Manovich, L. 2002. The Language of New Media. MIT Press.

Mark, G., Voida, S. & Cardello, A. 2012. ̈A pace not dictated by electrons ̈: an empirical study of work without email. Proc CHI '12.

Mayer-Schönberger, Viktor. 2009. Delete the Virtue of Forgetting in the Digital Age. Princeton [N.J.]: Princeton University Press.
Odom, W., Selby, M., Sellen, A., Kirk, D., Banks, R. & Regan, T. 2012. Photobox: on the design of a slow technology. Proc. of DIS '12, 665-668.

Pierce, J. & Paulos, E. 2014. Counterfunctional Things: Exploring Possibilities in Designing Digital Limitations. Proc. DIS '14.

Pierce, J. 2012. Undesigning technology: considering the negation of design by design. CHI '12.

Satchell, C. & Dourish, P. 2009. Beyond the user: use and non-use in HCI. OZCHI '09.

Sengers, P. 2011. What I learned on Change Islands: reflections on IT and pace of life. interactions, 18(2)

SenseCam Website. http://research.microsoft.com/en-us/um/cambridge/projects/sensecam/

Steacy, W. 2012. Photographs Not Taken. Ed. W. Steacy. Daylight Books.

ADDITIONAL SOURCES

Benjamin, W. 1977. ̈A Short History of Photograpy ̈. Trans. P. Patton, reprinted from Artforum, vo. 15, Feb. 1977. In A. Trachtenberg (Ed.), Classic essays on photography. New Haven, CT: Leete's Island Books.

Cartier-Bresson, H. 1952. The Decisive Moment. New York: Simon and Schuster.

Shove, E., Pantzar, M. & Watson, M. 2012. The Dynamics of Social Practice Everyday Life and How It Changes. Los Angeles: SAGE.

TYPEFACE → FF DIN

Appendix B

Counterfunctional Camera Design Studies

Here I present two studies in designing counterfunctional digital photo technologies which informed the design and production of the Obscura 1C.[1] The first study experiments with new material interactive forms. The second study focuses on a broader range of camera prototypes that are presented to research study participants.

Design Study 1: Material Form Experiments

Ultra Low Resolution Digital Displays
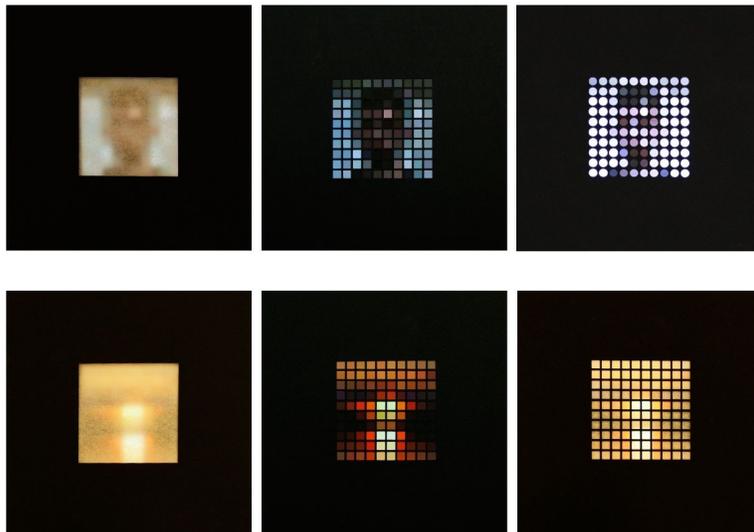
Ultra-low Resolution displays, 10x10 variations displaying an image of a face and a sunset over water. Different forms of light diffusion and tangible grid overlays are employed.

---

[1] Portions of this appendix have been previously published in Pierce and Paulos, "Counterfunctional Things: Exploring Possibilities in Designing Digital Limitations"

Ultra Low Resolution Digital Displays are design experiments working in opposition to the trend of increasingly higher resolution displays. The aim was to explore interesting and possibly useful forms that might emerge based on this opposition. A result of these experiments was the observation that an outline of face could begin to be made out at around the 10x10 resolution of my experiments, and specific faces could be made out at around our 30x30 resolution. My lowest resolution experiments (1x1, 2x3, 4x4) obviously appeared abstract and unable to communicate basic shapes and familiar things without prior knowledge of what was depicted. One application concept that emerged with these experiments was a series of Pixelated Telepresence devices that could preserve privacy while providing a playful and provocative portal into another location. These Ultra Low Resolution experiments exhibit clear similarities with prior works of experimental and conceptual art and design. Among these, Jim Campbell's portfolio of Low Resolution Works (2000-2011) and Daniel Rozin's Wooden Mirror (1999) stand out.[2] Within HCI, the 1-Pixel displays a likeness to HCI design exemplars such as Kaye et al's 1-bit communication device[3] and Interaction Research Studio's Light Collector. [4]

A theme running throughout these works is new forms of expressivity counterintuitively based on lower resolution displays. By setting themselves in opposition to high-resolution digital images, things like Campbell's low resolution images and the Wooden Mirror stand out as differentiated against the new norm of high-resolution digital imagery. In the case of things like the Light Collector, 1-bit communication devices, and my Ultra-Low Resolution Cameras, the counterforms of ultra-low resolution displays offer new design potentials.

Seen in the light of these low resolution works, these experiments conceptually and materially depict a trajectory running counter to the conventional trend in digital display design and engineering. Ultra Low Resolution displays depict a trajectory culminating in the ultimate case of the 0x0 Pixel Display. As proudly useless experiments, these designs display a counterfunctional technique for designing digital limitations. Ultra Low Resolution displays resist being seen like conventional displays. From a conventional perspective they distort, abstract, and render unviewable the images they display. However distortion, abstraction, and even un-

---

[2] Yet another example is John Hilliard's photographic work, A Camera Recording Its Own Condition (7 aperatures, 10 speeds, 2 mirrors) (1971).

[3] Kaye et al., "Communicating Intimacy One Bit at a Time."

[4] Gaver et al., "Indoor Weather Stations: Investigating a Ludic Approach to Environmental HCI Through Batch Prototyping."

viewability can also be compelling. They might even be useful. The low-resolution Playskool Showcam™ toy camera displays this potential at work. The minimal, low resolution communication of the Facebook Poke feature, the app Yo which limits text messages to the word "yo," and the practice of sending a single emoji in a text message further suggest the deign potentials that extend outward from a proudly useless 1x1 pixel display.
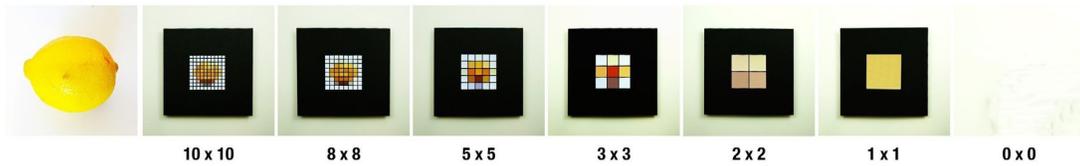

A high-resolution image of a lemon presented on several Ultra-low Resolution LCD Displays.

Inaccessible Digital Camera Enclosures
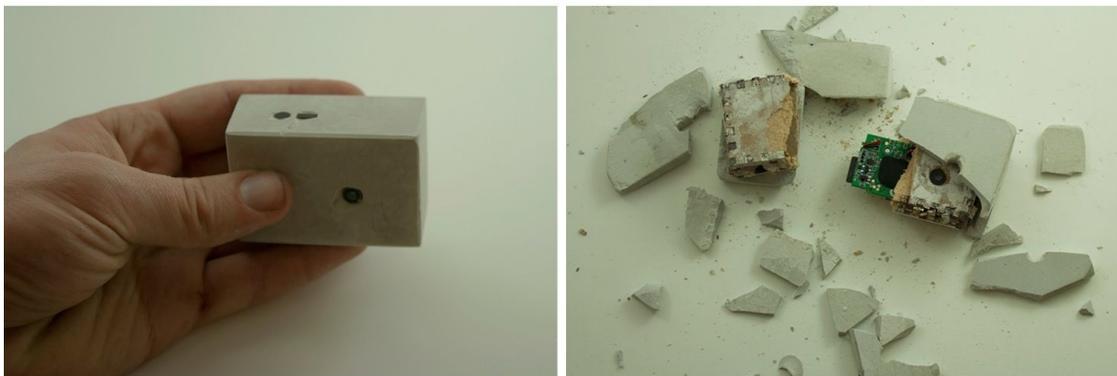
An Inaccessible Digital Camera with a concrete enclosure.

An Inaccessible Digital Camera with a wooden enclosure.

An early experiment with concrete camera enclosures.

A second set of design experiments I conducted was based on the idea of inhibiting access to digital images. Digital cameras allow for the instantaneous capture and viewing of images. I wanted to explore cameras that allow for capturing digital images instantaneously but inhibit immediately viewing those images, thus sharing similarities with older film cameras. The ultimate form of this concept is the Unviewable Image Camera: Images can be instantly stored as digital data on the camera, but there is no feature that allows for viewing the images. Perhaps the only hope of accessing the images is to perform a skilled technical act of reverse engineering.

Several more conceptually and materially accessible versions of the Unviewable Image Camera were then designed around the concept of requiring the user to physically break apart the camera in order to access the digitally stored images. A selection of experiments designing Inaccessible Digital Cameras with different materials is depicted above. The images depict ways of interacting with the cameras in order to access the images, for example, cutting open the enclosure with a saw or smashing it apart. Destructive interactions of this sort with electronic products are atypical, and these exaggerated interactions are likely to evoke affects of surprise, even absurdity. However these experiments also share similarities with more familiar things

such as disposable film cameras, time capsules, and ceramic piggy banks. In the following sections of this chapter I will present versions of a related design concept, the Capsule Camera. This camera builds on these experiments and seeks to more clearly recall elements of film cameras, time capsules, and piggy banks and the related experiences of patience, anticipation, delayed gratification, and surprise. A camera that captures images that literally can never be seen appears unlikely to find an enthusiastic audience outside of artists, philosophers, and design researchers. However, a camera the resists access in order to function like a time capsule offers a great deal less resistance.

Design Study 2: Counterfunctional Camera Variants Study

The second design study aims to explore a greater breadth of counterfunctional camera concepts and to then solicit feedback and discussion with participants. The goal of the empirical portion of this study was to investigate participants' initial reactions to counterfunctional camera prototypes and the underlying themes of counterfunctionality and new possibilities based on technological limitations (without explicitly naming them to participants in the study).

I eventually settled on 10 concepts that were refined and presented to participants as prompts for conversation. Descriptions of these 10 designs are presented below together with a selection of participant responses. Drawings were created for each camera concept variant. For 5 of these concepts I produced physical prototypes. The operational function of these prototypes varied. The Cabinet Camera allowed for capturing and viewing images. The Capsule Camera and Non-Stop Camera could not take photos but had working digital display elements. The Single-Shot Cameras were non-digital form prototypes.

This approach allowed me to present more polished forms alongside more open-ended visual ones. It also lowered the production costs of time and resources compared to developing 10 fully formed and functional prototypes. This strategy was especially well suited given I expected some cameras were unlikely to be "interesting to actually use" but would nonetheless prompt useful discussions regarding functional opposition and limiting features of technology.

Involving Participants with Camera Variants

The use of user studies to validate design prototypes may be considered a norm within HCI. While a user study is not necessary to communicate the main ideas in this paper, I found it

valuable to be able to ground my conceptual studies by soliciting reactions from outside participants. My hope was that a study involving participants would both lend some empirical support to my conceptual explorations while also surfacing new issues, criticisms and design inspiration.

I deployed the prototypes as prompts for conversation rather than products to evaluate. 8 participants were recruited through San Francisco Bay Area Craigslist. Participants were selected based on diversity in age (19-56), gender, race and occupation. 4 were college students. The other 4 were working professionals. Each interview session lasted approximately an hour and was conducted in a comfortably furnished area of the Invention Lab at UC Berkeley.

The structure of these sessions is outlined as follows: (1) Study Introduction. During this time I asked about participants' use of various photo technologies. (2) Prototype introduction and discussion. I introduced each of the form prototypes and then discussed each. I then did the same for the visual paper prototypes. For each participant, I initially presented a well-defined variation of each camera, but later offered and encouraged participants to consider slightly different variations. (3) Card sorting. I created cards with images of each of the 10 prototypes and had participants sort them into semantically opposed categories, e.g., "useful vs. useless", "conventional vs. unconventional." Participants were asked to say the reasoning behind each categorization. (4) Camera app vs. stand-alone camera comparison. I described versions of the prototypes that were smart phone apps instead of stand-alone devices, and then discussed these versions with participants. (5) "Limitations". I revealed and asked participants to reflect on the theme of "limitations" as product features, which I had not previously made explicit. (6) Keep a camera? I concluded by asking which, if any, camera they would want to keep and why. After each interview, notes were reviewed and reflective notes added. I selectively transcribed audio recordings of each interview guided by timestamps from interview notes.

In one sense it is a limitation of this work that I present participants with "partially functional" prototypes and do so within the confines of a laboratory setting. A limitation of a visual proposal or non-interactive form prototype is that it cannot actually be used. A limitation of a lab study is the context and duration of the study does not allow use to evolve over time in an everyday environment. A corresponding benefit, however, is that this approach allowed me to gauge open-ended initial reactions across a breadth of design concepts. Given the incomplete aesthetic of these prototypes, I anticipated that participants would be more open to criticizing the design concepts, including openly expressing confusion or distaste. The empirical question I investigate, then, is not how are these products experienced within use or practice (which participants can of course only speculate on.) Rather the questions are, what are participants' initial thoughts about these things? How do they envision using or not using these things?

Would they consider adopting such things? What similarities and differences are noted across these things?

Several counterfunctional camera prototypes, here displayed as I presented them to study participants.

Visual counterfunctional proposals (left) and card-sorting exercise conducted with participants (right).

Prototypes and Participant Reactions

Findings from this study have been organized around each of the counterfunctional camera prototypes. Two straightforward observations are worth noting upfront. First, the 5 younger

participants (19-23) in the study tended to view the cameras more favorably than the 3 older participants (35, 43, 56). Second, there was a great deal of variation within and across participants in terms of camera preferences. Yet two cameras stood out as the most and least favored. The Capsule Camera was the favorite of 4 participants, while no participant wanted to use the Reverse Polaroid Camera.

Each of the following camera subsections begins with a verbal description similar to that given to participants. The naming and descriptions of these cameras was intended to initially constrain the space of discussion.

The prototypes were not described to participants as "counterfunctional devices", nor were "limitations" mentioned except at the very end of the interviews. The prototypes were however introduced as the "Capsule Camera", "Reverse Polaroid Camera", and so on. Introducing the cameras as such thus set constraints around the expected functionality. Although in each case the descriptions were only starting points. I offered and encouraged participants to consider variations on each prototype throughout our discussions. I devote greater space to the Capsule Camera and Reverse Polaroid because they were the most and least popular cameras respectively.

The Capsule Camera

The Capsule Camera prototype as presented to participants.

The Capsule Camera was introduced as follows:

This is the Capsule Camera. You can take lots of pictures with it, like this. The numerical display always shows the total number of images that have been taken. But you can't view the images right away. If you want to access the digital images stored in memory, you'd have to literally break the porcelain camera open...

My intention behind the Capsule Camera was to create a digital camera experience based on patience, suspense, and surprise. I also wanted to explore the idea of meaningfully possessing

images that cannot yet been seen. This led me to create an atypical digital camera display in which the total number of pictures taken was displayed rather than the images themselves. The origins of the Capsule Camera can be traced to one of my more extremely counterfunctional concepts, The Unviewable Image Camera. With this camera you can take pictures, but they can never be viewed (unless, perhaps, you take it apart and reverse engineer it). The design of the Capsule Camera further builds on the Inaccessible Camera experiments.

Participants tended to be very drawn to the Capsule Camera. 5 participants expressed a strong desire to use it, and it was the favorite choice of 4 participants. The other participants, however, were much less favorable toward the camera. The initial variation I presented could store up to 9999 images. However, one could break apart the camera to view the images at any point. I had envisioned that people might take photos of mundane events as well as special ones, similar to placing mundane objects in a time capsule anticipating that they might take on significance when encountered in the future. However, these participants all envisioned using the Capsule Camera primarily for special events such as trips, weddings, and family gatherings.

As with all of the prototypes, I prompted participants to consider different variations on the camera. Variations on the number of images yielded particularly interesting discussions. I asked participants, What if it could only hold 10 images? 100 images? 1000? Participants tended to settle on about 100 images as optimal, rather than 10 or 1000 or more. I was somewhat surprised to find that participants clearly expressed that they wanted a limit, and this limit was less than I originally suggested. There were two main reasons stated for this preference. The first was a desire to avoid being overwhelmed by having to look through 1000s of images upon breaking open the camera. The second was a desire to be more thoughtful and judicious in the process of capturing photos. Participants wanted to be able to reserve these images for special moments; they wanted to not be able squander them on unimportant moments. As one participant puts it, "I'll [currently] snap a thousand photos in 3 days [when I use my camera phone]... taking less photos would make them more meaningful" (Scott, age 20). It's always worth noting that it's possible this participant overestimated the number of photos they actually take, a not uncommon occurrence in retrospective accounts.

I had expected that at least some participants would want to use the Capsule Camera and would appreciate it for what it can and does not do. It was encouraging to find out that these expectations held true. However these initial findings raise many empirical questions that can only be answered through a longer-term field study of a more developed prototype: Is 100 the "right" number? Would 1000 images be overwhelming? In practice, would the Capsule Camera counterfunction as well as participants envision against camera phones, digital SLRs and Instagram?

The Reverse Polaroid Camera
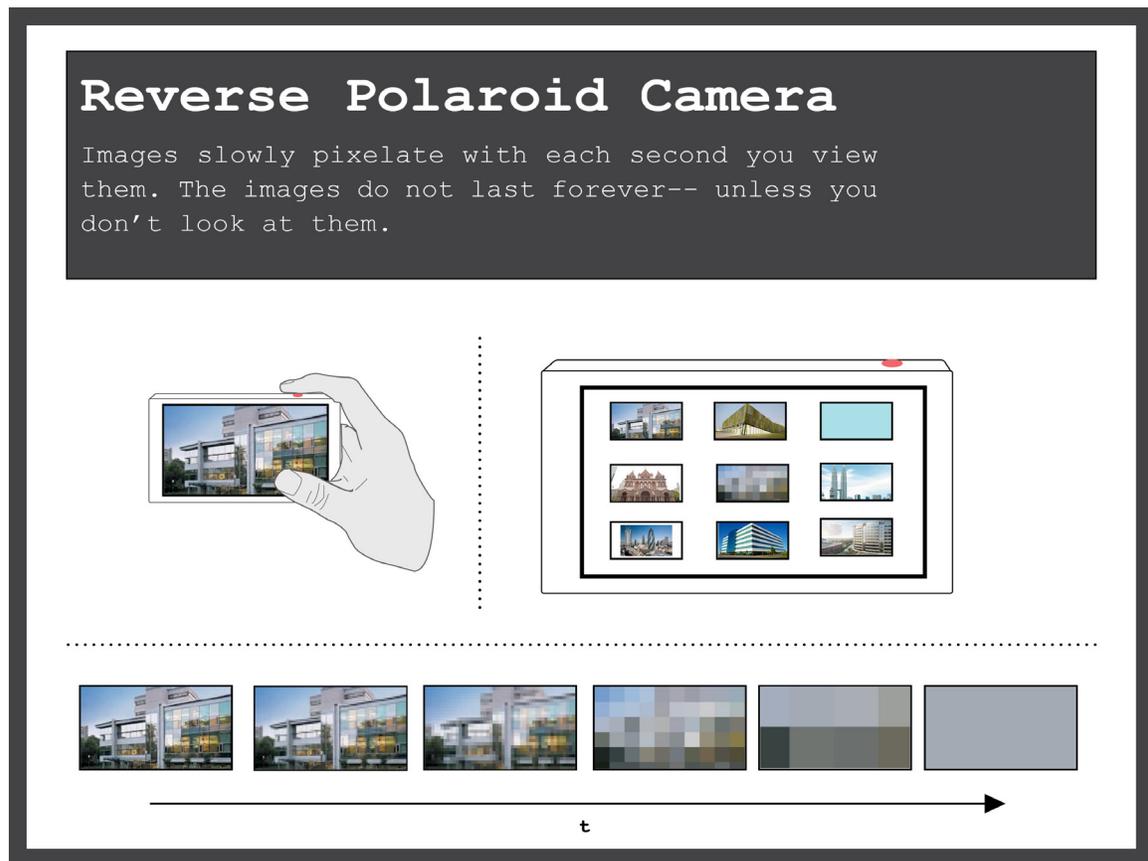
The Reverse Polaroid Camera proposal presented to participants.

I introduced the Reverse Polaroid Camera as follows:

This is the Reverse Polaroid Camera [showing the visual prototype]. You can take pictures with it, and similar to your camera phone it stores the pictures in a gallery mode. You can tap on the image to see it in picture mode. However, for each second that you view the image in picture mode, it begins to pixelate and degrade. If you view it for too long, it degrades to the point where it is just a solid color—1 pixel. But when you are not viewing the image in picture mode, the image stays as it is and doesn't degrade. So: you can't see the image unless you destroy it a little bit, and you can't keep the image safe unless you don't see it.

My intention here was to create a tension between viewing an image that you cannot maintain and maintaining an image that you cannot view. I wanted to explore appreciation for a photograph as either fleeting or else permanent but unviewable. I also wanted to play with a photographic possibility that appeared uniquely digital: precise control of the destruction of a photograph.

While 5 of the participants wanted to use the Capsule Camera, no participant wanted to use the Reverse Polaroid Camera. The Reverse Polaroid was unanimously suggested to be useless. This was not altogether surprising to me. I had in fact included the Reverse Polaroid in the final selection of prototypes because it struck me as interesting conceptually but perhaps less likely to be used and appreciated in actual practice or imagined practice. Yet what appealed to me conceptually as a design researcher did not resonate with the participants: "But we take pictures so we can keep them!" (Scott, age 20); "That makes me really sad" (Jen, age 23); I don't want to lose my pictures!"(Lea, age19).

Why were the limitations of the Reverse Polaroid seen as useless, whereas the limitations of the Capsule Camera and other counterfunctional cameras were appreciated and embraced? I consider a few explanations, setting aside the non-trivial issue that my presentation of this camera was limited to a small set of visual depictions and verbal descriptions.

The Reverse Polaroid seems to counter what lies at the essence of photography: visually capturing something so it can remain to be seen. The Reverse Polaroid offers itself as a camera for capturing, keeping, and viewing images. However viewing the images slowly destroys them. What is the purpose of keeping a photo you cannot see, or seeing a photo that will not keep?

Compared to other counterfunctional cameras, the Reverse Polaroid also does not counter functionality so as to readily recall older photographic technologies and experiences. Destroying an image appears antithetical to every preceding photographic technology. Instead this counterfunctionality has similarities with naked visual perception of our environment: We can try to fix our field of vision, but we cannot fix what occurs within it. Photographs allow us to approximate completely capturing and fixing in space and time what we see before us in an instant.

However the Reverse Polaroid is reminiscent of the recent and popular app Snapchat, as two participants noted. Snapchat allows you to send photos to your friends using your smart phone. Upon receiving a photo you can choose to open and view it. But once you open the image it disappears permanently after 1-10 seconds. According to one participant, "[The Reverse

Polaroid Camera] reminds me of Snapchat, but pointless" (Paul, age 20).

Interestingly, this participant describes Snapchat as less of a photo app and more of a chat app. While the Reverse Polaroid was apparently seen as a device for destroying photos, Snapchat was described as an app for chatting, with photos. The inability to keep an image with Snapchat is a "negative affordance" that enables one to treat images less as photographic objects and more as spoken words. You can send risky, inappropriate, silly, unsophisticated, and what might otherwise be uninteresting images precisely because you can not send images that are easily kept.

While the 8 participants unanimously determined that the Reverse Polaroid design concept was very unlikely to be interesting to actually use, or even to think about using, it is interesting to think about why this was the case. In this way designing and making things that are likely to be "useless to use" can nonetheless have practical-conceptual utility.

The Cabinet Camera

The Cabinet Camera prototype as presented to participants.

This is the Cabinet Camera. You can take pictures and view the pictures whenever you want, like this. However you can never transfer the pictures off of the camera; they "live" on this camera display forever. So you can't put them on your computer, or edit them, or post them to Facebook…

4 participants were very drawn to the Cabinet Camera and wanted to use it. It was likened to both a traditional photo album and a digital photo frame. Similar to the Capsule Camera, it tended to be envisioned for special pictures: "I'd take pictures of things I'd wanna keep… weddings, family gathering…" (Scott, age 20); "It'd be convenient as a safe…for precious memories… like an album" (Laura, age 21); "I would have to really think about the pictures [I take]" (Tanya, age 22). Others saw little value in it: "The only bad part is that [the images] can't be pulled off… I can't see using it as a better option… there's no benefit." (Tom, age 43).

The Non-Stop Camera

The Non-Stop Camera prototype as presented to participants.

This is the Non-Stop Camera. You can set it down so the lens is aiming in the direction you want, but you cannot control when it takes a photo. It randomly takes photos and it lights up to show you when it is taking a photo. In fact, you can never turn it off. It recharges itself with these solar panels...

As expected, many were drawn to its unique form and the functionality of the solar panels, rather than its intended negative function of not being able to turn it off or control when it snaps photos. Most participants were not particularly drawn to this camera. However, to my surprise, this was the only camera that one participant expressed a desire to actually use. For this participant, "The randomness is a positive... I wouldn't perceive it as a limit" (Tom, age 43). This example highlights the diversity in participants' thoughts and preferences for the cameras.

The Single-Shot Cameras (Single-Angle and Multi-Angle)

The Capsule Camera prototype as presented to participants.

These are the Single-Shot Cameras. You can only take one shot at a time with these cameras. The single-angle version has just one lens; the multi-angle version takes pictures in 5 different directions. Let's start by imagining you can only take one picture per month with these cameras...

All but one participant did not find much or any value in limiting the number of photos that could be taken. But the one participant did express significant interest in using the Multi-Angle Single Shot Camera: "It'd be like an experience... With only 1-shot, I would not feel pressure to take pictures...I'd take casual shots and see how things have changed" (Shen, age 19).

The Prompt Camera
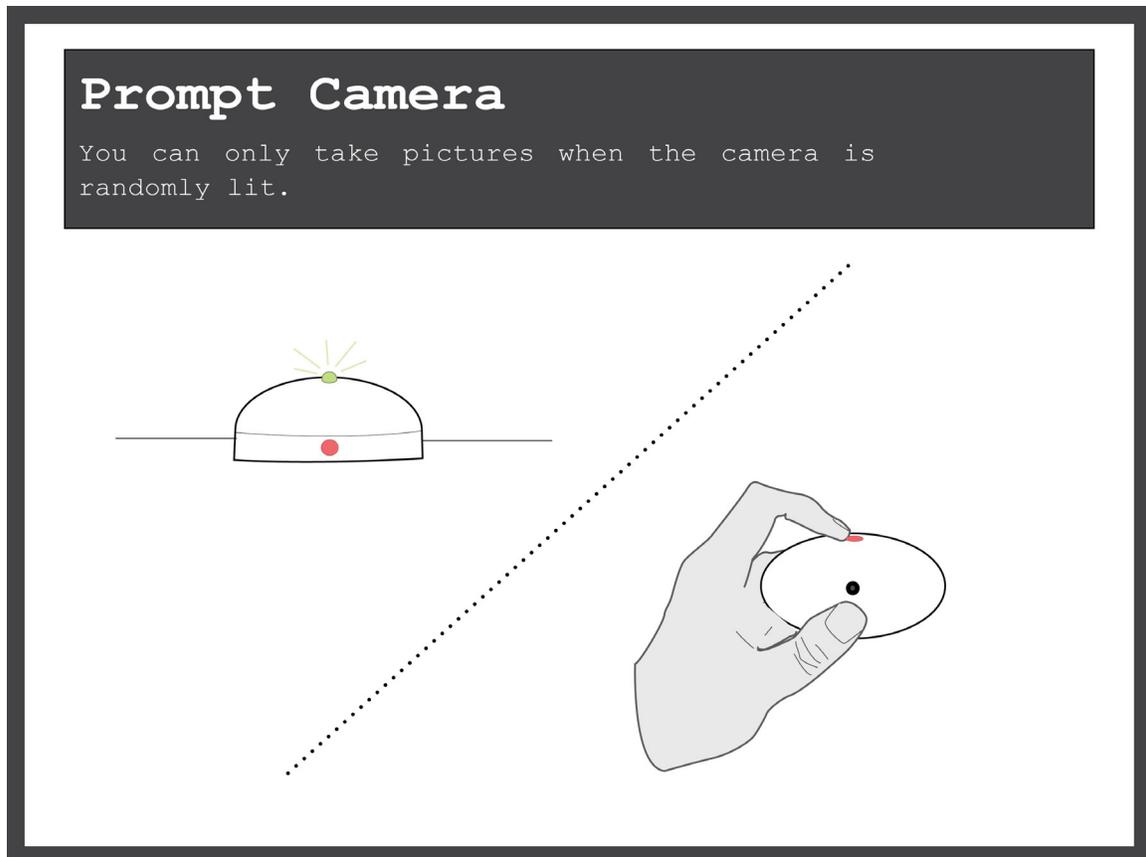
The Prompt Camera proposal presented to participants.

This is the Prompt Camera. You cannot take pictures whenever you want with it. You can only take pictures when it lights up, prompting you to take a picture...

While it was no participant's favorite, preferences were somewhat varied on this camera. One participant liked "the idea" but didn't know "where to use it":

I do like the idea [emphasis added] of taking pictures when you're not ready. Because, you know, for every single picture we do try to dress up, do our hair, do our makeup, make a pretty face [laughs]. I do like the idea, I just don't know where to use it, where to put it [emphasis added]. Maybe at the workplace, to take a picture with coworkers at random moments? (Shen, age 19).

The Time and Place Camera
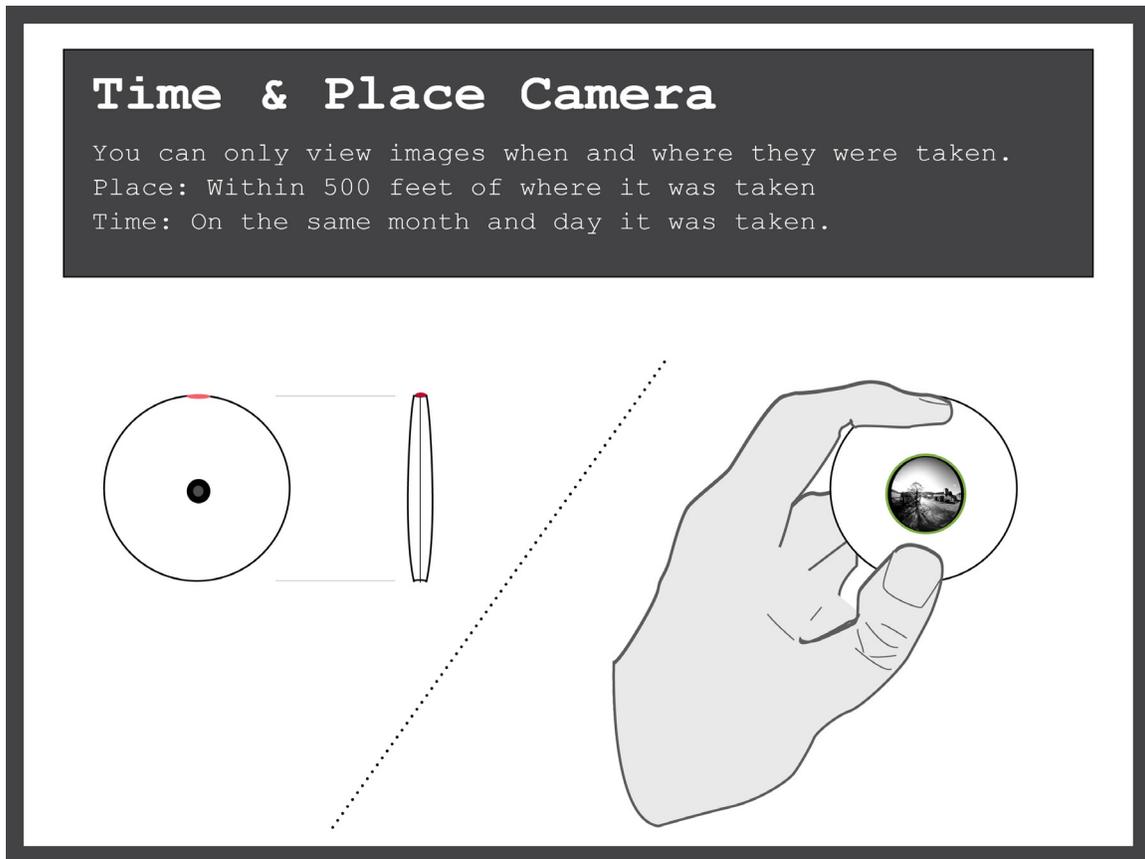
The Time and Place Camera proposal presented to participants.

> This is the Time and Place Camera. You can only view the pictures near the same calendar day or geographic location they were taken. So, one way to view an image is to go back to the place it was taken. The other way is to wait for the yearly anniversaries of when it was taken…

Several participants readily identified and appreciated the counterfunctionality of this camera: "It'd be a bummer… but the wait would be worth it" (Scott); "It's really interesting… that restriction is an okay thing for me" (Jen); "I like this one… it's a good feeling to be expecting something" (Shen).

Discussion

As a way of approaching design, counterfunctionality encapsulates the notion that functional oppositions can create new types of useful and desirable functionality. I have articulated this general application through a series of design studies using digital photography as a medium. Schematically this process involved identifying positive features of technology and redesigning around the removal and absence of these features. Reflecting upon my design studies, I draw out

three key dimensions to consider with respect to designing counterfunctional things and functional oppositions more generally.

Interesting to Actually Use versus Interesting to Think about Using. This study investigated the distinction between counterfunctional devices that are "interesting to think about using" versus ones that may be "interesting to actually use." In my design studies several participants were drawn to the Capsule Camera and Cabinet Camera as things they would want to adopt, use, and potentially embed within their everyday lives. In other cases participants found the proto-types interesting conceptually but difficult to imagine using in practice. For example, one participant liked Prompt Camera to the extent that they liked "the idea of taking pictures when you're not ready. Because...for every single picture we do try to dress up...make a pretty face." But in practice, the Prompt Camera did not appear useful to this participant: "I do like the idea, I just don't know where to use it, where to put it." Other cameras were thought to be interest-ing and useful to me as a designer and researcher but did not resonate in these ways with participants. The key example of this I discussed is the Reverse Polaroid camera, which appealed to me, as well as colleagues, conceptually but seemed confusing and absurd to participants as I presented it to them.

This distinction between "interesting to actually use" and "interesting to think about using" complicates more traditional notions of usefulness and usability. And it represents an issue that demands stronger consideration in future work, particularly as it relates to the functions of design research artifacts and alternative and oppositional designs in particular.

Adding New Features along with Removing Existing Ones. This study also revealed the impor-tant of considering the extent to which a counterfunctional redesign introduces new positive forms and functions along with the removal of desired and familiar ones. Each of the designs I have presented is based on the absence of familiar technological features. To varying degrees, many of these designs also introduce some novel forms. For example, the Innaccessible Cameras introduce the materials of concrete and wood which are unconventional for digital technolo-gies, while the Single-Shot Cameras introduce smaller form factors and multiple angle shots. Adding new features can serve to counterbalance an introduced absence by drawing attention away from it. If too pronounced though, new forms can overshadow or obscure the new counterfeatures. For example, many participants focused on the new and unconventional features of the cameras such as the solar powered elements of the Non-Stop Camera rather than the counterfeature of not being able to control when is captures images. Conversely, adding new forms along with removing existing ones can also serve to support and amplify the newly intended counterfunction. For example, the Capsule Camera seemed to succeed in part because

the new form factor and materials helped communicate that the inability to immediately view images was a defining positive feature of the device.

Recalling Older Technologies. A final design consideration that surfaced in this study is the extent to which a counterfunctional redesign recalls features of older technologies. Many of the camera prototypes recalled elements of preceding camera technologies. For example, participants described the Cabinet Camera as similar to a photo album. On the other hand, a design concept like the Reverse Polaroid appears to exhibit a more radical break with the entire trajectory of camera technologies. Instead it opposes a long held tradition in photography: the desire to permanently fix an image. Snapchat, the ephemeral image-based chat app, has been widely popular yet it is worthwhile to note that is marketed as social chat product, not a better digital camera. The extent to which a counterfunctional thing recalls earlier technologies appears to be a crucial part of how it is experienced. As one participant remarked when asked about whether she perceived the cameras as limited: "Maybe I'm more okay with [the limitation of the Cabinet Camera] because that was what it was like before [with photo albums]. And you know, like, breaking this [Capsule Camera], is like breaking a piggy bank" (Jen, age 23). These studies strongly suggest that recalling older technologies is a critical design dimension to consider and a conceptual thread worthy of continued investigation.

Appendix C

Additional Obscura 1C Design, Production, and Distribution Details

This appendix presents additional details about the design, production, and distribution process for the Obscura 1C digital camera.[1]

Batch Producing the Obscura 1C

Following Gaver et al, I adopted a batch-prototyping production process.[2] The ability to batch-produce the cameras at low-cost was a primary consideration in the design. The total cost of materials for each camera is approximately $20. Early operational prototypes included a display that counted up with each image taken ("0001", "0002", etc.). Plans were also made to include a viewfinder. While I have successfully built and continue to develop versions with displays, I ended up proceeding with a simpler version for batch production. This version makes use of an inexpensive digital camera costing approximately $10. To produce the Obscura 1C, the camera electronics are removed and sealed in protective thermoplastic (HMA) and acrylic support pieces. This is then cast in Rocktite™ patching cement using a custom mold. (Technically, the Obscura 1C is cast in cement, not concrete.) The cast forms are then roughly sanded only to deburr the sharp edges, leaving a distinctly hand-cast look and feel. Next, laser-cut button assemblies are installed. Finally, the cameras are tested prior to physically removing the data pins from the USB charging port—effectively sealing off access to the SD memory card buried inside. The Obscura 1C cameras currently take several hours each to construct. However, I am developing ways to streamline this process.

Cost, ease of production, and robustness of the end product were the main reasons I opted for a version that did not include a numerical display or viewfinder. This also required me to rely on

---

[1] Portions of this appendix have been previously published in Pierce and Paulos, "Making Multiple Uses of the Obscura 1C Digital Camera: Reflecting on the Design, Production, Packaging and Distribution of a Counterfunctional Device."

[2] See Gaver et al,, "Indoor Weather Stations," 3454, 3458, and passim.

a low-quality image sensor producing grainy images reminiscent of security camera videos.

While these decisions were initially viewed as worthwhile tradeoffs, they were quickly reconstituted as additional counterfunctional features and advertised as such in the product packaging. The lack of a display and viewfinder added elements of uncertainty and surprise, while the lower resolution camera created images perceptually distinct from normal digital.

"5mp Hd Smallest Mini Dv Spy Hidden Digital Camera Recorder Camcorder Webcam DVR (Black)" (approximately $10 from Amazon.com). The electronics from these small, inexpensive, low resolution digital camera were used in the Obscura 1C.
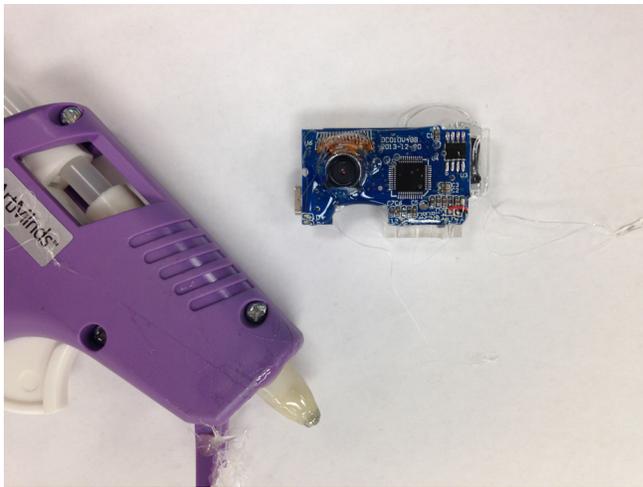
Prepping the camera electronics for casting.
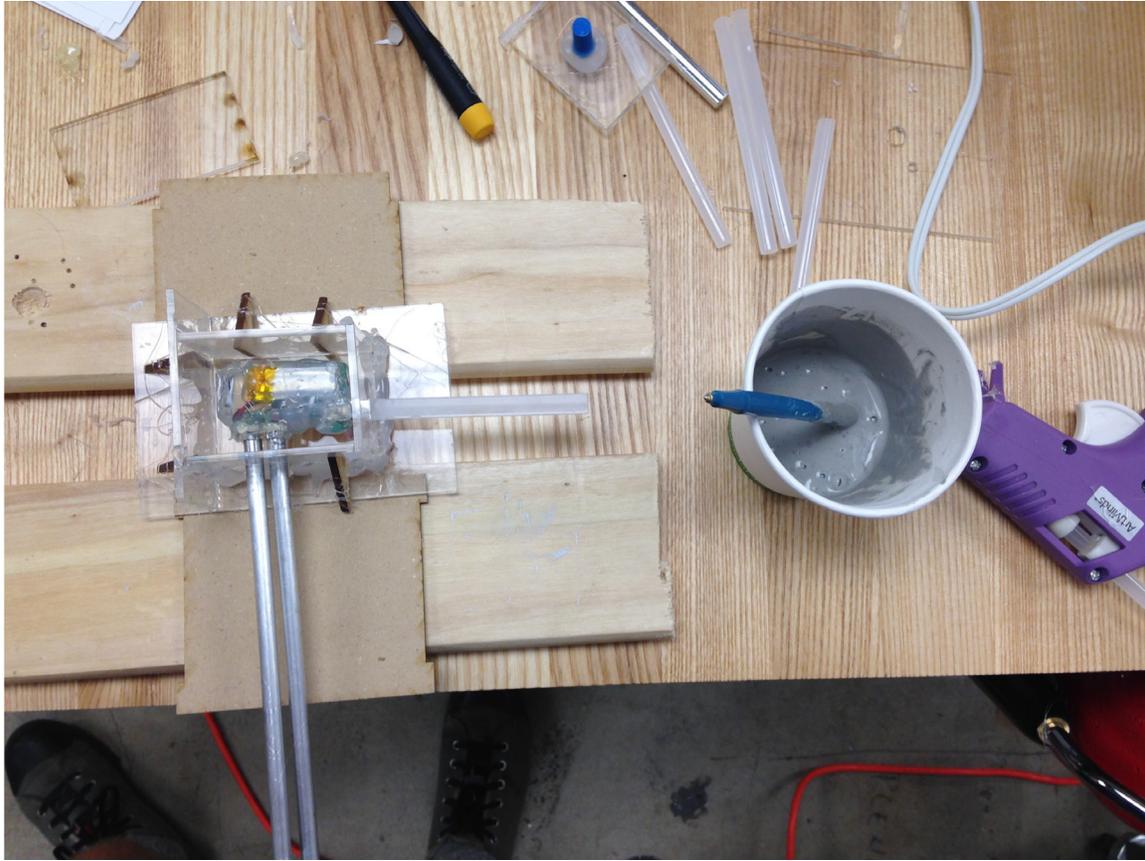
Casting the Obscura 1C.
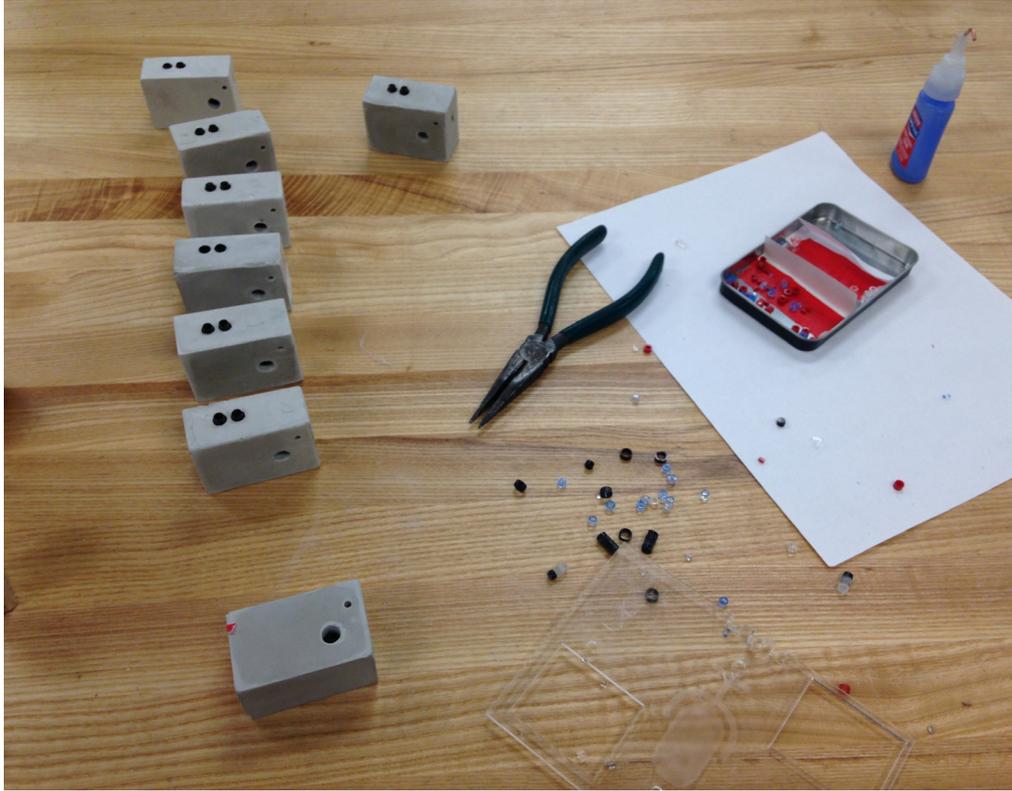
Assembling the Obscura 1C camera buttons.
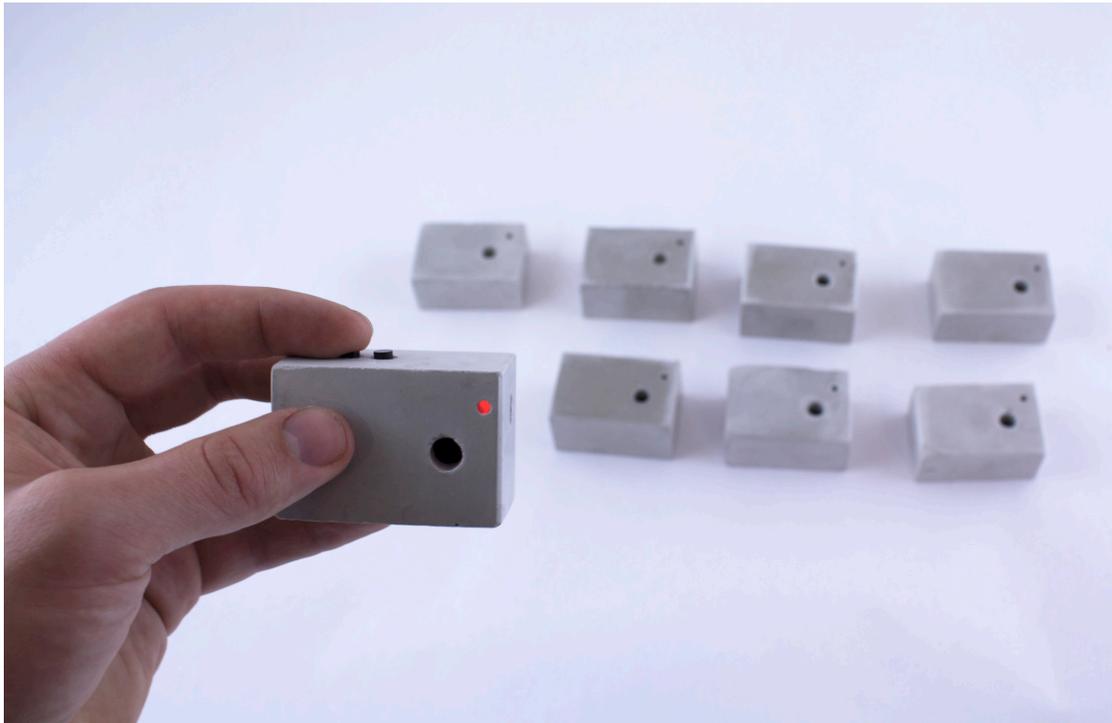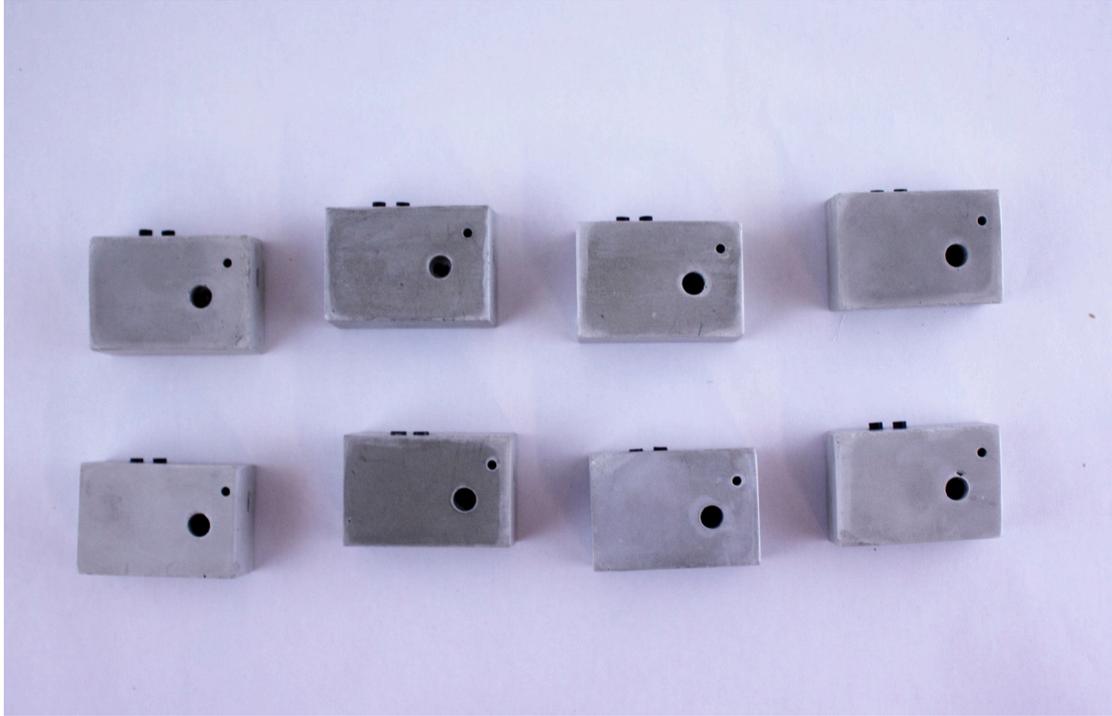
Completed Obscura 1C cameras.

Obscura 1C Package Distribution and Exchange

To date 10 complete Obscura 1C packages have been distributed to non-acquaintances. The primary goal has been to experiment firsthand with different forms of distribution and exchange. This was approached as both exploratory prototyping (with ties to packaging and service design) and as a means of demonstrating "proof of distribution concept". To be clear, distribution was explicitly not for data collection, although some revealing empirical observations that have been inadvertently gleaned are offered below.

Assembling the Obscura 1C packages.

Craigslist Ads. Initial distribution was through San Francisco Bay Area Craigslist classified ads posted to the "Free" and "For Sale, Photo+Video" sections. (A one-time posting of each ad received 20 and 2 responses, respectively; several "Free" respondents offered to purchase cameras.) Ads included images of the Obscura 1C package and contents.

Image of Craigslist "Free" ad.

Text from Craigslist "For Sale, Photo+Video" ad:

> We are offering a limited number of unique digital cameras as part of an experimental design program. Our aim is to create and distribute unconventional, alternative consumer products.
>
> The "Obscura IC Digital Camera" is the product being offered here. The Obscura 1C captures photo, video and audio recordings. In order to access the media files recorded, you must physically break apart the concrete enclosure to reveal the micro SD memory card buried inside. Obscura inhibits access to its contents to offer a digital experience based on uncertainty, patience, delayed gratification and surprise.
>
> The Obscura 1C comes with operating instructions, USB charger, and micro SD card adapter. Also included is a pamphlet of additional devices we have created.
>
> Because our devices are produced on very limited scales and with non-profit-driven goals, we distribute them on an ad hoc basis. Ordinarily we sell this model for $20 - 50 (to recuperate material and labor costs). [Alternative text for For Sale ad: We are selling a limited number here for $20 each (less than the per unit cost of production).
>
> But here we are offering a very small number for free!
>
> If you'd like to acquire an Obscura 1C, send us a message with a few words telling us why you'd like to have one of these devices. Products will be given away on a first come, first serve-ish basis to individuals that seem like they really want one. Limit one device per person.

6 Obscura 1C packages were distributed to people each of whom indicated an envisioned use that I anticipated or else found surprising. Some Obscura 1C were delivered in-person (3 were sold for $20 each). Others were anonymously mailed or left at home addresses. Below are inquiries from some individuals we then offered cameras to:

> Hi, I'm super interested in buying one of these cameras. I love film photography so the idea of something digital giving a film like experience (delayed gratification etc.) is really interesting...
>
> I would love to have a camera. I think I'd want to use it as a sort of time capsule, but I would probably not last very long without smashing it. This whole idea looks like a whole lot of fun.
>
> ... sounds like an awesome project. ... we'll be working on a startup from home. I think it would be awesome to have an Obscura Camera in our main work room periodically documenting our work.
>
> Perfect! Reminds me of being a kid in Montana, saving money to buy one roll of film. Then carefully planning out 12 shots and waiting 2 weeks for the film to be processed and mailed back. You have a great idea here..

Other experimental distribution outlets. Other distribution outlets I experimented with include local retail partnerships, community bulletin boards, and guerilla tactics such as "droplifting" (leaving a product in a retail store).

Obscura 1C package left at Goodwill resale store.

Obscura 1C package delivered to a home.

Obscura 1C package mailed to a home.

Obscura 1C package on display for sale at local vintage store.

Appendix D

Obscura 1C User's Manual and Counterfunctional Cameras Brochure

OBSCURA 1C DIGITAL CAMERA

Thank you for acquiring the Obscura 1C Digital Camera. The Obscura 1C captures photo, video and audio recordings. In order to access the media files recorded, you must physically break apart the concrete enclosure to reveal the micro SD memory card buried inside. The Obscura 1C inhibits access to its contents to offer a digital experience based on uncertainty, patience, delayed gratification, and surprise.

Obscura 1C is part of the Counterfunctional Device Series. These devices are built around the principle of countering ordinary and expected functionality to create new functionality. While we celebrate digital technologies for their seemingly endless possibilities, Obscura 1C offers a unique experience based on digital limitation. As a Counterfunctional Device, it brings into focus an idea applicable to many areas: Limitations can enable new positive possibilities.

FEATURES

- captures video (with audio), photo, and audio only
- 4GB memory = 1000s of photos and hours of video
- distinctly lower resolution images
- concrete enclosure inhibits access to captured media
- extremely durable and shock resistant
- no viewfinder for less accurate and predictable frames
- small size convenient for carrying in pocket or bag

BATTERY CHARGING

The indicator light will flash red and turn off when charge is low. To recharge, use the mini USB to USB cable.

USB

Note: Media is not accessible via USB. To access stored media you must break the camera apart. (See "Retrieving Media" section.)

POWER ON/OFF

1. Press and hold for 2 seconds the **Power/Photo/Record Button**.

2. The Mode Indicator light turns red.

3. Camera is ready to record video. (See reverse side for instructions on recording Video, Photo and Audio.)

FRAMING SHOTS

The Obscura 1C is equipped with no viewfinder. You probably won't be recording quite what you think you are. If accuracy is desired, follow these heuristics:

- Use the top edge to guide vertical alignment and the sides to guide horizontal alignment.
- With the camera held 6 inches from the eye, the area obscured by the camera body 2 feet away is approximately the area within the camera view.
- When in doubt, step back. The view angle is narrow.

VIDEO+AUDIO MODE

1. Press **Power/Photo/Record Button** once to start video recording.

2. Mode light blinks red while video is recording.

3. Press **Power/Photo/Record Button** to stop recording video.

PHOTO MODE

1. Press **Mode Select Button** to switch mode.

2. Mode light turns blue.

3. Press **Power/Photo/Record Button** to take a photo. Wait for blue light to resume before taking another photo.

AUDIO MODE

1. Press **Mode Select Button** to switch mode.

2. Mode light turns purple.

3. Press to **Power/Photo/Record Button** to start/stop audio record. Mode light blinks while audio is recording.

RETRIEVING MEDIA

⚠ **CAUTION**

The concrete enclosure is designed to inhibit access. Use care when attempting to break it apart to avoid bodily injury and damage to camera memory card. **If in doubt, ask a handy friend to give you a hand.**

BREAKING THE CONCRETE CAMERA BODY

Media is stored on a micro SD memory card. To access it, you must physically break apart the concrete camera body. One method is to use a hammer and chisel.

ACCESSING THE MICRO SD MEMORY CARD

Once the concrete shell has been removed, the memory card can be located on one side of the camera circuit board. It is sealed in soft silicone and hard plastic. A sharp tool is useful for removing these protective casings.

micro SD memory card ┄┄┄┄┄

Mode Select

Mode: ● Video+Audio ● Photo ● Audio

●──Charge (Mini USB)

Power ON/OFF (hold 2 sec)
Photo / Record Button

FREQUENTLY ASKED QUESTIONS

1. Will my photos and recordings really be there?
Yes, as long as you are operating the camera properly. Although one can never be completely certain of anything.

2. I don't get it. What's the point of this?
That's okay. Just use your camera phone instead.

3. Can I tell how much memory is left?
No. The camera can store 1000s of photos and hours of video and audio. When the memory is full, the indicator light will turn off after a few seconds and will not switch modes.

4. It seems to have stopped working. What do I do?
Although our devices have been carefully tested, they are still hand-crafted prototypes. If it has stopped working, now could be a good time to open it, or store it away.

4. Will this product ever be available at a major retail outlet?
Probably not.

5. Where can I get another one of these cameras?
Currently our supply is very limited. But please send inquiries to counterfunctionaldevices@gmail.com

6. What will the images look like? How will the audio sound?
Like the image below. Audible, but not great.

2014/08/18 13:30:06

date / time

MORE OBSCURA CAMERAS...

Obscura 1W

Snap the wooden enclosure to retrieve media.

Obscura 1F

Remove the 24 aluminum fasteners to retrieve media.

Obscura 1C-L

Break the large concrete body to retrieve media.

For additional counterfunctional devices visit
www.counterfunctionaldevices.com

OBSCURA 1C
DIGITAL CAMERA

COUNTERFUNCTIONAL DEVICE SERIES

COUNTERFUNCTIONAL CAMERAS are devices built around the principle of countering ordinary and expected functionality to create new functionality. While we celebrate digital technologies for their seemingly endless possibilities, these cameras offer unique experiences based on inhibited, restricted and absent functionality. The Counterfunctional Device series is designed to bring into focus an idea applicable to many areas: Limitations can enable new positive possibilities.

For more Counterfunctional Devices visit

counterfunctionaldevices.com

Ultra-Low Resolution Cameras

These cameras offer a refreshing reversal of the trend toward higher and higher resolution technology. The displays are composed of discrete LCD lights with frosted glass overlays. These images stand in sharp contrast to the overabundance of high resolution images that surround us. The ultra-low resolution images can be transferred off of the camera in JPG and RAW formats.

0x0 Pixel

1x1 Pixel

2x2 Pixel

4x4 Pixel

8x8 Pixel

16x16 Pixel

Cameras have the option to shoot in Color or Black & White. Note that these cameras do not capture high-resolution counterparts, so you can be sure the photographs are uniqualy ultra-low res.

Cabinet Cameras

The Cabinet Cameras are akin to printed photo album. You can only view the photos you take on the built-in display. You can not transfer, reproduce or edit the photos. Deleting photos leaves a visible void when viewing in Gallery mode. These limiting features allow you to enjoy the imposed uniqueness of the digital photographs you take, view and share with those nearby.

The **Cabinet 1/12** model can be initalized with an image capacity of either 12 photos or just 1 photo. This irreversible decision is one you must make during the initial setup of the camera. Similarly, the **Cabinet 120/1200** gives you the option for either a 120 or 1200 photo capacity, while the **Cabinet 12K/120K** offers either a 12,000 or 120,000 photo capacity! The Cabinet 1/12 is recommend if you want to appreciate a small, select group of images. The **Cabinet 12K/120K** is recommended if you prefer to capture many images on an ongoing basis or wish to pass this camera on to others for years to come.

Obscura L Series and S Series

Also available are the larger, heavier format L Series (ideal for capturing photos of a specific location like a home or workplace) and the smaller, lighter format S Series (ideal for capturing diverse moments on the go).

Fixephemera Camera

Fixedephemera allows you to hold fleeting photographic moments. It's like the popular app Snapchat, but personal. The photos you take pixelate and deteriorate with every second they are displayed. After 1 minute of total viewing time the photo has deteriorated to a single color representative of the orginal image. However, you can always pause the deterioration by hiding the image.

It's up to you how you choose to engage with each Fixedephemera image: You can look at it right away, but never again. Or you can glimpse at it occassionally, and watch it slowly decay over time. Or you can save it indefinitely, as a hidden but potentially viewable image.

@ 0 seconds of total display time

@ 5 seconds of total display time

@ 10 seconds of total display time

@ 30 seconds of total display time

@ 45 seconds of total display time

@ 60 seconds of total display time

Obscura Cameras

Obscura is a digital revitalization of disposable film cameras. These cameras inhibit access to their contents to offer digital experiences based on uncertainty, patience, delayed gratification and surprise.

Obscura 1C

In order to access the media files recorded, you must physically break apart the concrete enclosure to reveal the micro SD memory card buried inside.

Obscura 1W

Snap the wooden enclosure to access the SD memory card. Obscura 1W is less inhibitive than Obscura 1C.

Obscura 1F

Remove 24 aluminum fasteners to access the SD memory card. Return the fasteners to resume taking photos. Obscura 1F encourages infrequent access to its contents.

Obscura 1P+

Shatter the delicate porcelain enclosure to access the SD memory card. Obscura 1P+ is designed to discourage access and encourage intrigue. Comes equipped with a display showing total number of images taken.


Single-Shot Cameras

The earliest cameras could take only one photograph at a time. In order to take another photo you had to manually reload the camera. The Single-Shot Cameras give back the option to only take one single photo at a time, and to appreciate an only photo taken. Before taking another photo you must manually transfer the image to your computer.

Single-Shot Multi-Angle

The multi-angle version entices you to adopt a single-shot mentality with a unique new postive feature. The camera instantly captures photos in 5 orthogonal directions. A composite photo is created along with a separate photo for each of the 5 angles.

Even more counterfunctional cameras…

Retrieval Camera

The Retrieval Camera does not display the photo you've just taken. Instead it displays a photo previously taken. Choose between two shooting modes: Random Photo -or- Related Photo.

Peripheral Camera

Peripheral Camera captures images to either side and puts them at the center.

Prompt Camera

You can only take pictures when the Prompt Camera lights up and chimes at random moments—prompting you to take a picture when you otherwise would not.


Fixture Camera

This camera is bulky and extremely heavy. Think carefully about where you put, because it's a hassle to move.

COUNTER-FUNCTIONAL CAMERAS

Counterfunctional cameras are devices built around the principle of countering ordinary and expected functionality to create new functionality. While we celebrate digital technologies for their seemingly limitless possibilities, these cameras offer unique experiences based on limited, restricted or absent functionality. Counterfunctional Device Series is designed to focus on ideas applicable to many areas, can enable new positive possibilities.

COUNTERFUNCTIONAL DEVICE SERIES

Appendix E

Tutorial for a Useless Covered Spoon

Intro: Useless Covered Spoon

This tutorial will show you how to make a useless covered spoon originally designed by kkstudio (pictured above). See the entire design series "The Uncomfortable" at http://www.kkstudio.gr/projects/the-uncomfortable.

Image Notes
1. Image credit: kkstudio, from the series "The Uncomfortable." See, http://www.kkstudio.gr/projects/the-uncomfortable

Step 1: Gather Materials and Tools

You will need the following:

1. disposable plastic spoons (minimum 2)

2. scissors

3. soldering iron (alternatively, a cigarette lighter will work)

4. sand paper (180-grit or finer recommended)

Step 2: Cut spoon to make a cover

Cut one of your spoons to form a cover. Here I've chosen a symmetric form that covers half of the spoon. But there are many other forms of covers that will make a useless spoon as well!

Step 3: Sand edge of cover

Gently sand the cover to remove any rough edges. Do this now because it will be difficult after you have soldered it onto the spoon.


Step 4: Tack sanded spoon cover in place

Before creating a watertight weld, tack the cover in place to keep it from shifting position.

**Be sure to open a window for ventilation prior to soldering.**

Grasp a fresh spoon and your cover together with one hand. Touch the soldering iron in a few points to tack the cover to the spoon.

Step 2: Cut spoon to make a cover

Step 5: Solder cover to create watertight seal

Using a gentle back and forth motion, solder the cover in place. Make sure you penetrate deep enough so that the weld will hold after sanding. But be careful not to solder too deep or your final spoon will look ragged even after sanding.


Step 6: Sand to form a smooth edge

Carefully sand the weld to remove excess material and form a smooth edge. You may need to weld again if you sand too deep. Repeat welding and sanding as necessary until you are happy with the edge formed between the conventional spoon and your new cover.

Step 7: Admire your finished useless covered spoon
Isn't it wonderfully useless!

Step 8: Use your useless spoon

Related Instructables

Paper Made Tableware by Kion Designs

Aurora Digitalis: Lights in the North by Nikola Tesla Patent Producers

Underfoot Tableware: Coasters, tablemats and placemats from carpet offcuts [Alpha prototype] by royshearer

How to make art. by randofo

Spoon Carving for Everyone by noahw

Readymake: Duchamp Chess Pieces (3D Recreations from Photographs) by scottkildall