Interaction criticism: An introduction to the practice

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Article history:
Received 13 August 2010
Received in revised form 28 June 2011
Accepted 1 July 2011
Available online 13 July 2011

Keywords:
Aesthetics
Critical theory
HCI
Interaction criticism
Philosophy
Design

Abstract

Though interaction designers critique interfaces as a regular part of their research and practice, the field of HCI lacks a proper discipline of interaction criticism. By interaction criticism I mean rigorous interpretive interrogations of the complex relationships between (a) the interface, including its material and perceptual qualities as well as its broader situatedness in visual languages and culture and (b) the user experience, including the meanings, behaviors, perceptions, affects, insights, and social sensibilities that arise in the context of interaction and its outcomes. Interaction criticism is a knowledge practice that enables design practitioners to engage with the aesthetics of interaction, helping practitioners cultivate more sensitive and insightful critical reactions to designs and exemplars. Benefits of such an engagement include informing a particular design process, critiquing and innovating on design processes and methods more generally, developing original theory beneficial to interaction design, and exposing more robustly the long-term and even unintended consequences of designs. In this article I offer a synthesis of practices of criticism derived from analytic philosophy of aesthetics and critical theory, including the introduction of five core claims from this literature; I outline four perspectives that constitute a big-picture view of interaction criticism; and I offer a case study, demonstrating interaction criticism through each of these four perspectives.

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1. Introduction

Though the practice of interaction design varies, the field of HCI recognizes a more or less standard process of how to practice interaction design: problem definition, user study, iterative prototyping, and evaluation (I say “standard” because it is presented as such in the field’s primary textbooks, e.g., Preece et al., 2007). As with all professional and scientific practices, the methods that compose HCI’s standard process rest on a set of intellectual assumptions, which are used not capriciously but because they help the community accomplish its goals. HCI’s standard design process is no exception, for it rests on a form of philosophical representationalism.

Generally, philosophical representationalism refers to a reliance on mental representations of reality, such as those provided by sense data, in rational processes, which commonly entail the combination and manipulation of those representations to make discoveries that are believed to extend to reality. In HCI, commonly used representations include empirical data sets about users and use situations (e.g., from interviews, surveys, observations, usability tests, card sort exercises, and so forth); theories, models, and frameworks derived from related sciences, such as cognitive science and sociology; and design concepts, sketches, and prototypes. In HCI, rational [design] processes include developing and evaluating design solutions vis-à-vis empirical understandings of design problem spaces, which are frequently structured and interpreted using validated scientific models (e.g., from psychology, sociology, etc.), and then iterating on design prototypes and evaluation studies as needed to achieve specified design goals.

The philosophical assumption underpinning this whole edifice is the correspondence theory of truth, which holds that correct knowledge involves a correspondence between a representation (e.g., an idea or understanding, a textual or symbolic expression, a model/theory, etc.) and given external reality (Marian, 2009). Any knowledge practice that relies on the correspondence theory of truth has to meet two prerequisites. First, there has to be some fact, thing, or state of affairs “out there” in order for someone to have a representation of it. Second, the knower needs evidence that there is indeed a correspondence between the representation and the relevant aspect of external reality. In practical terms, if the phenomenon of interest does not have an external existence, or if the correspondence between the phenomenon and its representations cannot be established, then representationalism becomes less helpful as an underlying assumption.

This paper argues that whereas in the past representationalism was a strong pragmatic fit for the knowledge needs of HCI, in the present, there are some areas of HCI for which representationalism is insufficient and will need to be complemented with another set
of assumptions and methodologies. Areas of HCI for which representationalist approaches are likely to fall short include user experience (UX), aesthetic interaction, affective computing, intimate interaction, values-centered design, and other areas of HCI that in one way or another get at the deepest and most important dimensions of human selfhood, social justice, and everyday life. For the latter areas of HCI, I will argue that some of what we hope to know either is not “out there” in external reality, or that a correspondence between what is out there in external reality and our mental representations of it cannot be securely established. I am not arguing the extreme position that representationalism does not apply at all: of course representations, such as empirical data sets and psychological models, can inform our knowledge and design practices about, e.g., experience design. I simply argue that we must be critical about the limitations of representationalism and seek to complement it when necessary. Specifically, we should seek intellectually rigorous knowledge practices whose strengths are likely to address the weaknesses of our more established approaches. I argue that criticism, carefully appropriated from the arts and humanities, is one such practice.

A quick survey of works influential to both HCI researchers and practitioners reveals the formative role in representationalism in structuring the field’s thinking. We can see this tendency towards representationalism both in a priori assumptions about what makes interfaces “good” (i.e., normative assumptions) and in actual interface evaluation practices.

An example of a representationalist a priori assumption about what constitutes a good interface can be found in Nielsen’s (1994) widely circulated “Ten Usability Heuristics”. His first two heuristics map a double correspondence. The first heuristic (“Visibility of system status”) seeks to ensure that the user’s understanding of the system state corresponds to actual system state, a correspondence to be achieved through perceptual feedback. The second heuristic (“Match between system and the real world”) seeks to establish a correspondence between ways in which information is made available to people in the “real world” and in the system, a correspondence that is achieved through “natural and logical order” and respect for existing information conventions. Many of his remaining heuristics build on and reinforce this double correspondence. For example, the seventh heuristic (“Aesthetic and minimal design”) normatively treats aesthetic interfaces as minimal ones, where “irrelevant or rarely needed information” is thoroughly excised to ensure that “relevant units of information” have high “visibility.” In other words, interfaces are aesthetic inasmuch as they achieve an optimal clarity of the aforementioned double correspondence.

In a comparable way, Norman (2002) frames his discussion of mental models in terms of correspondences, noting that designers develop conceptual models that are appropriate for users, while the user develops a mental model of how a system works, and that “Ideally, the user’s model and the design model are equivalent” (p. 189). The correspondence between the design model and the user’s model is of course mediated by the system; thus, Norman advises designers to ensure that the parts of systems exposed to users (what Norman calls “the system image”) corresponds to and represents the design model as closely as possible, so that users can “acquire the proper user model.” Common to both the Nielsen and Norman examples are a priori normative claims about usable interfaces that involve correspondences between mental representations of the system and the system itself (and, for Nielsen, another set of correspondences to the real world).

Yet representationalism also has influenced ways that the HCI community has sought professionally to evaluate interactions. A paradigmatic example of this can be found in work on GOMS. GOMS, introduced to HCI in Card et al. (1983) and developed in John (2003) is an evaluation approach that predicts task completion times by decomposing task sequences into minimal cognitive processing units (e.g., how long it takes for a normal person typing on a keyboard to switch to the mouse, or to click the mouse after repositioning it on the screen), each represented in milliseconds. The output is a prediction for how long in seconds a task will take to complete. This predictive analysis is followed by an empirical study that measures a sample of actual users with the interface to determine how long in seconds the task takes the users to complete. If the predictive and empirical results correspond, evaluators have strong evidence about how system will perform with actual users in a real-life work environment. Now we have seen that representationalism has both served in normative theories of usable interfaces and in professional evaluative practices.

Yet the critical mass of HCI has moved beyond the workplace, changing many of the goals and values of interaction design. Task completion times, error rates, and simple measures of user satisfaction are still necessary but no longer sufficient indicators of good interaction design. Design values such as aesthetics (Bardzell, 2009; Bertelsen and Pold, 2004; Fishwick, 2006; Uden and Jørgensen, 2004), affective interaction (Boehner et al., 2005; Höök et al., 2006; Picard, 1997), experience design (Blythe et al., 2006; Buchenau and Suri, 2000; McCarthy and Wright, 2004), and intimate and embodied interaction (Bardzell and Bardzell, 2011; Bell et al., 2003; Dourish, 2001) are increasingly in demand. Now the goals of design are often much more complex; for example, Crampton-Smith (2007) writes that interaction design needs to improve its awareness of “the symbolic level of mood and meaning, of sociability and civility.” These are very different kinds of knowledge goals than improving task performance, error rate, and user satisfaction.

The phenomena we need to understand to design for and evaluate these goals—phenomena such as aesthetic experience, emotion, expressiveness, and sociability—in many ways have no straightforward factual, material, or external existence: if they can be said to exist at all, they do so within subjectivity—either of the individual or a social group (i.e., “intersubjectivity”). The (inter-)subjective nature of cultural experience creates trouble for forms of inquiry based strictly on a correspondence theory of truth, which, as I have shown, depends on some things, facts, or reality “out there” to work and confidence in the correspondence between that reality and its representation. Perhaps not surprisingly scholars of culture, who have for generations (and arguably millennia) researched such subjective experiences, are often quick to abandon any hope of establishing a singular, unified truth. In many cases of cultural experience, “questions of truth often simply do not arise,” aesthetic philosopher Marcia Eaton writes. She continues, “people at a concert do not turn to a neighbor as they applaud and say, ‘how true!’” (Eaton, 1988, p.135). Or, as aesthetic philosopher Clive Bell once put it, any “system of aesthetics which pretends to be based on some objective truth is so palpably ridiculous as not to be worth considering” (Bell, 1987, p. 189). Even when HCI researchers try to collect data about experience, e.g., studies using physiological sensors, we are far more confident in the sensors’ ability to provide representations of heart rates and skin conductance than we are in asserting that the user is engaged, is frustrated, or is having an aesthetic experience.

Any practice of knowledge production centered on the discovery and representation of some preferred truth, then, may be epistemologically ill-equipped to confront cultural experience, aesthetic interaction, sociability, and expressiveness. Of course, it is possible to operationalize these key terms by establishing normative standards (i.e., by specifying what constitutes a “good” design in a given context); in fact, designers do so all the time, implicitly or explicitly. But normative standards for good design can never be derived “ground-up” from objective data: to argue for such standards, one must make assumptions and expert-subjective judgments, prioritize among competing values, and work within...
a synoptic theory of knowledge and experience in order to explore intersubjective cultural responses. Such is the epistemological position of everyone who engages in studies of culture, from art historians and literary theorists to present-day user researchers and interaction designers. While such scholars do avail themselves of science, their primary mode of inquiry is usually not what we would recognize as scientific, at least in the empirical sense; that said, scholars in the humanities and fine arts nonetheless concern themselves with methodological rigor, the construction and ongoing evaluation of theories, and the basis on which claims are justified. Yet because these practices of rigor do not always resemble their cognates in the sciences, they can be easy for scientists to overlook or misunderstand, which has implications for how both research and pedagogy go forward in a traditionally scientific field such as HCI that is increasing turning to cultural approaches. Work is needed to help bridge some of these gaps and the present article is intended as one such contribution.

One of the core strategies of knowledge production and expertise cultivation among scholars in the arts and humanities, the traditional intellectual home of these forms of inquiry, is criticism. A central argument of this paper is that understanding what criticism entails and accomplishes, as well as how its claims and intellectual rigor are justified and evaluated by peers, could help HCI develop more useful accounts of those aspects of user experience, aesthetics, affective interaction, value-centered design, and so forth than it presently can with more empirical/representation-ism. Speaking generally, criticism refers to an expert of a given domain’s informed exercise of judgment; familiar examples include film and literary criticism, architectural criticism, and even a qualified Master of Wine’s ability to judge wine. In each of these cases, the expert cultivates a domain-specific capacity for judgment through a lengthy engagement with relevant works/examples, theories, and other expert perspectives, an ongoing engagement that is both sensual/perceptual and intellectual. The critic’s particular judgments (e.g., of a given work or example) are typically based on a holistic, non-reductive understanding that includes issues such as the following:

1. The work’s qualities, both sexually and intellectually (e.g., its elements, their materials, their perceptual qualities, what kinds of meanings such elements commonly have in one or more communities).
2. A cultivated awareness of the critic’s own direct sensual, emotional, and intellectual experience engaging with the work/example, including what the critic felt and learned as well as how she or he changed (or might have changed) as a result of engaging with the work.
3. An awareness of (and taking a position with regard to) the moral or ethical consequences of the work and possible interpretations/uses of it.
4. Knowledge of related expert perspectives from others, that is, what other critics, experts, and scholars have said about the work or those relevant to it in some way.
5. Exemplars, that is, other known works/examples that in some interesting or worthwhile way are deemed to be comparable to the work.
6. An awareness of the work’s position in history and location, including the reception of that artifact (i.e., any information or data about how audiences, consumers, users, etc., reacted to the artifact).
7. Relevant theories, be they methodological or specific to a type of work and its tradition(s).

The resulting judgments are often simultaneously subjective (i.e., particular to the individual critic) and yet non-perspectival (i.e., claiming more than “this judgment is just my opinion,” but rather asserting that others should reach a similar judgment). The importance of [2–3] above, which will be elaborated on below, guarantees an individually subjective dimension to criticism; aspects of the sensual, emotional, intellectual, and moral perspectives of the critic are commonly foregrounded, not bracketed aside as it usually is in science. Yet this subjective dimension to criticism is balanced both by qualities found in the work itself [1] and the critical tradition surrounding that work [4–7]. But then again, it is the critic who decides which qualities of the work itself and which aspects of its broad critical tradition are brought into focus, which once again stresses a subjective aspect of criticism. However, the critic her- or himself becomes a critic in the first place by entering into one or more critical traditions, which it typically a lengthy and involved process; one does not become a Master of Wine or a literary critic simply by tasting a glass or reading a book and declaring as much. Entering into this tradition shapes the sensibility of prospective critic in recognizable and worthwhile ways. Thus we can see that expert critical claims are both subjective and also non-perspectival. This subjective/non-perspectival status stands in contrast to traditional or (post-) positivist empirical science, which seeks to achieve non-perspectival status by striving to be objective and by systematically attempting to bracket the subjective. Understandably but incorrectly, for many scientists, “subjective knowledge” and “opinion” are synonyms for the same low quality thing, but that reflects a misunderstanding of critical knowledge practices and is precisely the sort of confusion that we in HCI need to clear up.

Aesthetic judgments surrounding art, design, and other cultural phenomena thus seek to balance and integrate the insights of an experienced or expert individual with issues external to that individual, primarily the stubborn objectivity of works as material artifacts and the broader critical/knowledge communities that surround them. To assist in this balancing act, critical theories and practices have emerged to enable scholars and experts to develop, share, and evaluate their aesthetic judgments. Indeed, “aesthetics,” or the philosophy of art, might justifiably be understood as the field devoted to the justification and evaluation of aesthetic judgments, since judgments, more so than discoveries or truth claims, are fundamental to the experience and social practices of art. As philosopher Richard Miller writes, “aesthetic judgments, like moral [and scientific] judgments, are claims to appraiser-independent truth that are often rational” (Miller, 1998, p. 27).

As HCI’s cultural goals (and significance!) grows, and in particular as demand grows for thinking in HCI surrounding cultural, aesthetic, affective, ethical, and experiential categories, the field needs to improve its practice of interaction criticism. By interaction criticism I mean rigorous interpretive interrogations of the complex relationships between (a) the interface, including its material and perceptual qualities as well as its broader situatedness in visual languages and culture and (b) the user experience, including the meanings, behaviors, perceptions, affects, insights, and social sensibilities that arise in the context of interaction and its outcomes. I say “rigorous” to reiterate that, though its rigor differ in fundamental ways from those of science, a deep concern for the scope and justification of claims is prevalent in every serious critical community. Interaction criticism can benefit HCI in several ways. It is a strategy that enables design practitioners to engage with the aesthetics of interaction, helping practitioners cultivate more sensitive, insightful, and imaginative critical reactions to designs and exemplars. Benefits of such an engagement can include informing a particular design process, critiquing and innovating on design processes and methods more generally, developing original theory beneficial to interaction design, and exposing more robustly the long-term and even unintended consequences of designs (Bardzell, 2009).
Interaction designers have been practicing interaction criticism all along. No one designs interaction in a vacuum, without consideration of prior or analogous interfaces. But even now, and in spite of promising steps such as Dourish et al. (2004) and Sengers et al. (2006), HCI lacks a rigorous discipline of interaction criticism, that is a stable vocabulary and set of critical practices that can be subjected to discussion and review. Without this discipline, designers' and researchers' critical judgments are hidden from view or even denied to exist at all. In the process of offering my conceptualization of this discipline, I will refer to analogous fields, including aesthetic philosophy, film, literary, visual communications, and fashion theory. Building on these traditions, I offer a framework of the domain of interaction criticism, exploring the analogies between cultural artifact and interface, and between consumer/reader and user. I then use this framework to explore a contemporary interaction design, Lumino, a tabletop interaction that allows users to interact with a Microsoft Surface table using stackable tangible blocks.

2. From criticism to interaction criticism

Before developing a theory of interaction criticism, it is worth attempting to characterize the nature and contributions of serious criticism more generally. “Criticism” is a term used in a variety of contexts to describe a wide variety of activities, including newspaper-based book or film reviews, design studio-based peer crits, “close readings” of Shakespeare, customer reviews on Amazon, the elaboration of interpretative frameworks for a given body of discourse (e.g., the Victorian novel or Soviet cinema), speculative cultural theory, and case studies, among others. For the purposes of this paper, I focus on serious criticism, that is, criticism by trained professionals in the course of critiquing, analyzing, interpreting, and/or evaluating cultural artifacts for which they were trained to do this work.

I am excluding amateur criticism, e.g., Amazon customer book reviews, for reasons that shortly will become obvious. (Lest this position sound needlessly elitist, I believe that amateur criticism online makes its own important cultural contributions, as I have explored in Bardzell et al. (2009); however, it is the more academic and rigorous form of criticism that I argue should be used as a model for interaction criticism.) I am also, of course, excluding the colloquial notion of criticism meaning “to say something bad about something”; serious critique may or may not invoke evaluative norms (e.g., that something is “good” or “bad”), but above all it should be understood as a rigorous practice of engaging with an artifact, event, or phenomenon in the full complexity of its situatedness in time, space, culture, and society.

2.1. Criticism and/or aesthetic response: 5 claims

Criticism itself has been heavily theorized in the humanities, and I present some key claims here to illustrate some of what constitutes this activity. At the outset, it is worthwhile to distinguish between two major traditions in the humanities since the early twentieth century: the split between analytic and continental philosophy. Briefly, analytic philosophy, practiced especially in the Anglo-American world and Scandinavia, emphasizes tightly scoped, carefully formulated, and rigorously evaluated claims; the use of formal and often symbolic logic; and explicitly defined key vocabulary (Stroll, 2000; Lamarque, 2001; Glock, 2008). It is the source of cognitive approaches to art, and most humanist works in English today using the term “aesthetics” are connected to the analytic tradition (see e.g., Levinson, 2003). It is also closely aligned with science, including computer science and cognitive science. Continental philosophy, centered in French and German thought, is more holistic, cultural, and political in its aims, and it has manifested itself in semiotics, feminism, phenomenology, Marxism, postmodernism, and other traditions (Moran, 2000; Cutrofello, 2005; Rush, 2004). Continental philosophy has dominated the critical humanities—literary studies, gender studies, music and art history, new media studies, and so forth.

This split between analytic and continental traditions, which occurred on both intellectual and geographical lines, persists in many ways today. The importance of this distinction notwithstanding, one of the goals of the present essay is to show that both traditions offer valuable resources to interaction criticism and HCI more generally and that HCI, as a field, should not take sides in their disputes. Rather, I try to show that as far as issues relevant to our field are concerned, both are more similar to each other than is frequently advertised. Of course, individual researchers may gravitate towards one or the other, as is only natural, but as a field, HCI has much to learn from both.

While the correspondence theory of truth and representationalism do not dominate humanist disciplines the way they do traditional science, both aesthetic philosophers (who are, again, historically connected to the analytic tradition) and critical theorists (who are historically connected to the continental tradition) are committed to the position that art and criticism together contribute to knowledge. It is important to understand how an intellectual tradition can contribute to human understanding and knowledge without depending primarily on representationalism. Such an understanding both facilitates the use of these strategies in HCI and also ensures that the community can appropriately evaluate their rigor and contribution. To that end, I introduce five fundamental claims, widespread in aesthetic and critical theory, about the role of art and criticism in human knowledge production, as follows. The five claims are as follows:

1. Art and/or criticism educates our perception and/or directs acts of cognition.
2. Criticism and aesthetic response are inseparable; that is, criticism does not precede or stand over aesthetic response.
3. Critical activity involves a back-and-forth movement between pointing out material particulars and relating them to interpreted wholes.
4. Art/criticism is enlightening.
5. Art/criticism is ethically uplifting.

In the coming pages, I explore each of these claims individually, fleshing out their implications for criticism as well as offering sources for each from continental and analytic traditions.

2.1.1. Art educates perception and directs acts of cognition (claim 1)

Earlier I noted the centrality of the critic as the subject of knowledge in critical knowledge production, and the relationship between works and the critic’s perception is a key dimension of that. Aesthetic philosopher Richard Shusterman traces the role of perception in criticism back to the origins of aesthetic philosophy, in the work of eighteenth-century German philosopher Alexander Baumgarten, who first coined the term aesthetics. Baumgarten characterizes aesthetics variously as “the art of beautiful thinking,” “the art of analogical thought,” and “the science of sensory cognition” (Shusterman, 2000, p. 264). Shusterman quotes and summarizes Baumgarten elaborating on these characterizations:

“The end of aesthetics . . . is the perfection of sensory cognition as such, this implying beauty,” while the contrasting “imperfection” (identified as “deformity”) is to be avoided. . . . Baumgarten insists especially on “keenness of sensation,” “imaginative capacity,” “penetrating insight,” “good memory,” “poetic disposition,” “good taste,” foresight,” and “expressive talent.” (Shusterman, 2000, pp. 264–265).
Bumgarten is not simply arguing that we use our senses to contemplate art; he is making the much stronger claim that by means of contemplating art, we are able to cultivate our cognitive capacity by means of enriching our sensory powers. There are two claims here. First is that perception is an active, cultivatable skill, not merely the cause-effect result of sense data hitting a receptive sense organ. Not all humans are equally good at perception. Second is that by improving this skill, we improve cognition itself, which is to say that cognition is dependent not merely on being informed by sense data, but rather on a subject’s sensitivity to it, one’s keenness, imagination, disposition, and penetrating ability to perceive beauty.

Claim [1a], that art educates perception, has a rich heritage since Bumgarten. Twentieth-century American pragmatist philosopher John Dewey holds a very similar position, as Eldridge writes,Instead of rules for deciphering meaning or determining value, what we need and can receive from apt elucidatory-critical attention to a work is, in Dewey’s phrase, “the reeducation of perception of works of art,” where critics’ insights into elements and their arrangement function for us as “an auxiliary to the process, a difficult process, of learning to see and hear.” (Eldridge, 2003, p. 144).

Dewey’s phrase “the reeducation of perception” again stresses a theory of perception that is active and cultivated as a goal and common outcome of art. An implication here is that contemplating art contributes to knowledge not so much by telling us what reality is (i.e., what a given work of art “means”), or even giving us rules (akin to scientific methods) for its study, but rather that criticism educates and cultivates our perceptual skills, making us better at thinking about the aesthetic arrangement or manipulation of formal characteristics; the density and complexity of the artifact’s semantics; the extent to which it analyzes, sorts, orders, and organizes; by how it serves the cognitive purpose: by the delicacy of its symbolization, then, is to be judged fundamentally by how well it serves the cognitive purpose: by the delicacy of its discriminations and the aptness of its allusions; by the way it works in grasping, exploring, and informing the world: by how it analyzes, sorts, orders, and organizes; by how it participates in the making, manipulation, retention, and transformation of knowledge. (Goodman, 1987, p. 253)

While Goodman’s cognitivism might come across as somewhat bracing to many critics—a correspondence theory of truth, for example, appears to be implied in his notion of how art reveals reality to us—the overall point that art directs cognition is shared by many others. For instance, fellow analytic aesthetic philosopher Gordon Graham proposes “aesthetic cognitivism” as the basis for his normative theory of art (Graham, 2005). Graham summarizes, “the value of art is neither hedonic, aesthetic [here meaning pertaining to what is beautiful] nor emotive, but cognitive, that is to say, valuable as a source of knowledge and understanding” (p. 52). Richard Miller characterizes aesthetic value as “based on an enjoyment of a learninglike process . . . articulatable . . . in terms of surprise and discovery, apparent randomness and the dawning recognition of order” (Miller, 1998, p. 49). Aesthetic reasoning, Miller continues, “is a means of enabling others to enjoy a learninglike experience by appropriately directing their attention and expectations” (Miller, 1998, p. 49). In continental philosophy, Hans-Georg Gadamer makes a similar argument when he writes of aesthetic experience that “in the apparent particularity of sensuous experience, which we always attempt to relate to the universal, there is something that arrests us and compels us to dwell upon the individual appearance itself” (Gadamer, 2002, p. 16). That is, for Gadamer, art simultaneously directs our cognition in two directions: toward the sensible appearance of an object and toward the universal, i.e., human understanding. For aesthetic philosophers, art contributes to knowledge in ways analogous to science, philosophy, and other forms of knowledge production, a position made forcefully by Goodman: “The difference between art and science is that between feeling and fact, intuition and inference, delight and deliberation, synthesis or analysis . . . but rather a difference in domination of certain specific characteristics of symbols” (Goodman, 1987, p. 256). Art and science both contribute to human knowledge, because both inform and direct human cognition in productive ways.

Evidence of [1b], that art and criticism directs acts of cognition, is also widespread and can be found in both continental and analytic aesthetic philosophy. Nelson Goodman, an analytic philosopher, writes, aesthetic

[s]ymbolization, then, is to be judged fundamentally by how well it serves the cognitive purpose: by the delicacy of its discriminations and the aptness of its allusions; by the way it works in grasping, exploring, and informing the world: by how it analyzes, sorts, orders, and organizes; by how it participates in the making, manipulation, retention, and transformation of knowledge. (Goodman, 1987, p. 253)

2.1.2. Criticism and aesthetic response are inseparable (claim 2)

Claim [2], that criticism and aesthetic response are inseparable, also runs counter to traditional scientific notions of knowledge production. As noted earlier, empirical science seeks to achieve its claims of non-perspectival truth (i.e., that scientific claims need not be qualified with “in my opinion”) by striving for objectivity, a disciplined bracketing of the scientist as a subjective being (Kincaid, 1996). However, expert critical analysis and discourse production usually plays down any distinction between its own activity and the everyday experience of art; in other words, the discursive form of expert aesthetic knowledge—a work of criticism—is inseparable from the personal and subjective activity of engaging with a work. We can see this in Gadamer, who writes that criticism “is not really a subsequent judgment by means of which we could subsume the ‘beautiful’ scientifically under concepts or produce a comparative assessment of quality. Rather, it is the experience of the beautiful itself” (Gadamer, 2002, p. 18). The critic does not express the work as it is in itself, but rather the work as experienced...
by an appropriately sensitive subject—modeled by the critic her- or himself.

This position of criticism as conjoined with everyday aesthetic experience is implied by the notion of criticism as a form of directing attention, as Eaton makes explicit: a critic “regards us as ‘fellow readers’. . . He does not have to distort the text in order to get us to see things hidden in it. . . Good criticism results in a fuller, richer aesthetic experience by ferreting out the aesthetic value of objects and events” (Eaton, 1988, p.122, emphasis in original). Eldridge likewise plays down any distinction between critical and everyday interpretative activity, writing that through criticism, “we become able ourselves in light of new readings to see particular works both more comprehensively and with more awareness of the multiple significances of details” (Eldridge, 2003, p. 148). Here again we see the epistemological, rather than ontological, orientation of criticism: it is recognized as successful by its contribution to our capabilities of perception and judgment, not by its truth-claims about what the art means or is. That is, critical activity not only helps us understand the complexities of art; it also helps us understand ourselves and, recalling Cavell’s words, the “mysterious thoughts and feelings within us.”

2.1.3. Criticism is a back-and-forth between material particulars and interpreted wholes (claim 3)

One of the reasons we need to cultivate our perceptions and sensitivities is because aesthetic beauty is not simply “out there” yet hidden to everyday perception (not, at least, the way many natural phenomena such as bacteria, tectonic plate movement, or physical laws are). Rather, aesthetic beauty can be found only in the union of material works and human lifeworlds (the latter including hopes and fears, perceptual skills, everyday needs and wants, and so forth). In other words, while bacteria really are there whether or not we have a microscope to see them, the beauty of an aesthetic work does not exist until a person perceives, interprets, reacts to, and/or expresses it as such. The work may be out there even if no one ever encounters it, but it is not an aesthetic work until it is experienced as such. The hybrid existence of aesthetic works—at once inhering in material objects and human subjective responses to them—implies a hybridity of aesthetic cognition.

Aesthetic cognition, or criticism, is a back-and-forth between material particulars of objects and interpretative/meaningful wholes. We have already seen a source of this understanding in the Gadamer quote in section 2.2.1, where he describes our split attention between the material appearance of an artifact and our interpretive drive to relate it to the universal. Variations of this view can also be found in Dewey, as paraphrased by Eldridge:

elucidatory-critical understanding of the arts is, in Dewey’s formulation, both analytic or parts-discriminating and synthetic or overall-organization-discerning. Elucidatory-critical attention moves back and forth between attention to discrete elements and the location of elements in an overall arrangement. (Eldridge, 2003, p. 143)

Literary theorist John Ellis similarly stresses the relationship between material parts and understood wholes, writing, “An interpretation is a hypothesis about the most general organization and coherence of all the elements that form a literary text” (cited in Eaton (1988, p. 110)). Likewise, Clive Bell writes, “To be continually pointing out those parts, the sum, or rather the combination, of which unite to produce significant form, is the function of criticism” (Bell, 1987, p. 189). Continental philosopher Martin Heidegger similarly argues, “All works have this thingly character. . . The work of art is a thing that is made, but it says something other than the mere thing itself is. . . [T]he thingly element in the art work is like the substructure into and upon which the other, authentic element is built” (Heidegger, 1987, p. 260). These quotes reveal a little more clearly the mechanisms by which art directs perception and cognition, since art focuses our attention on material particulars and incites us to make sense of those particulars in a more general way, i.e., figure out what they mean to us.

The material particulars (e.g., a selection of a text, a visible feature of a sculpture, a given melodic line) ground the argument to some extent, because they can be said to “be there” in order to be pointed to. At the same time, a given selection is pointed to because of its participation in a larger process of interpretative meaning-making. Thus, over time, as larger interpretations change, so too will the material features that are pointed to. In other words, which material features we attend to is relative to our broader socio-cultural interpretation; there is not a “correct” set of material features that encode a static, if hidden, meaning.

These broader interpretations can undergo radical, and important shifts. For example, the film Triumph of the Will, which celebtrated Hitler’s rise to power, was a phenomenal success upon its 1935 release, garnering awards not only in Germany, but also in film festivals in Venice and Paris, in large part because of its visual beauty and cinematic pageantry. It also had the undesir-able achievement of softening opposition to the Nazis outside of Germany in the 1930s. Just a few years later, during the run-up to World War II, the Allies manipulated clips of the film to motivate resistance to Hitler by editing masses of Nazi soldiers marching and speeding up the film, effectively dehumanizing them to viewers. Today, the film continues to be discussed in philosophical aesthetics as a troubling example of beautiful evil, a beauty achieved through masterful cinematic technique that constructs a vision of the Nazis as strong and benevolent. The success of the film’s form poses a challenge to formalist theories of aesthetics, because if art inheres in significant form, such as Clive Bell and many others have argued, then this film must be considered a great and enduring masterpiece, in spite of its glorification—and contemporary furtherance—of the Nazi program. That we cannot accept Triumph as an aesthetic masterpiece suggests that we must also not accept purely formalist theories of aesthetics or other theories of aesthetics that leave no room for ethical considerations (Devereaux, 1998). These three broad interpretations—the initial critical response inspired by its vision, the British wartime reworking the film’s vision to mobilize political opposition to it, and Devereaux’s retrospective analysis in service of aesthetic philosophy—all emphasize different material particulars to build up their overall interpretations. It is as if viewers interpreting within the contexts of these three interpretations are seeing three different films, and indeed, phenomenologically speaking, they are.

2.1.4. Art/criticism is enlightening (claim 4)

So far I have established that in aesthetic philosophy, human perception itself is an improvable skill, not a signal capture and translation service; that aesthetic response and discursive acts of expert criticism are continuous, rather than separate activities; that art directs perception and cognition, challenging us to make sense of material particulars in beautiful ways, and in doing so improves our perceptual and imaginative skills. Clearly these claims have implications for cognition and knowledge, and it is time now to turn to these.

Throughout aesthetic philosophy is the claim that the long-term outcome of [1], that art enhances our skills at seeing and attending, is that [4] art is enlightening, or to put it another way, art entails the transformation of the self. Mechanisms for this outcome can be found in theories of embodiment, such as those of philosopher John Russon. Russon, in criticizing our everyday view of
mind and body as separate and radically different entities, argues instead “we need the concept of a body as a sensitive thing, of a body as cognizant” (Russon, 2003, p. 25). Russon again emphasizes the notion of perception as a form of cognition, not as a passive data reception service for the mind. Russon continues, “our body is not . . . a system under our control, but is a multiplicity of openings, of revelations, of connections that let various flows start, a multiplicity that offers determinations for our interest . . . The body is, rather, the very medium of existence within which [self-conscious] agency can emerge” (Russon, 2003, p. 26). Strongly implied in this embodiment theory is the notion that the cultivation of embodied sensibility is simultaneously and inextricably linked to the cultivation of selfhood and agency, that is, that transformation in perceptive capacity entails a related transformation of the self as a knower.

Other major philosophical ideas make this argument explicit, including Michel Foucault’s “aesthetics of existence” (Foucault, 1985) and Richard Shusterman’s “somaesthetics” (Shusterman, 2000), the latter heavily influenced by Foucault. One of Shusterman’s key goals is to reconstruct a theory of aesthetics from a rereading of the aesthetic philosophical tradition going back to the eighteenth century and Baumgarten, but that replaces mind/body dualism with an aesthetic philosophy in which the body is restored to its rightful place. In Shusterman’s own words (Shusterman, 2000, p. 267):

[M]y prime goals here are reconstructive, rather than historical: (1) to revive Baumgarten’s idea of aesthetics as a life-improving cognitive discipline that extends far beyond questions of beauty and fine arts and that involves both theory and practical exercise; (2) to end the neglect of the body that Baumgarten disastrously introduced into aesthetics (a neglect intensified by the great idealist tradition in nineteenth-century aesthetics); and (3) to propose an enlarged, somatically centered field, somaesthetics, that can contribute significantly to many philosophical concerns, thus enabling philosophy to more successfully redeem its original role as an art of living.

For Shusterman, the philosophical tradition has expended too much effort critiquing the reliability of sense data and seeking to find ways to provide a secure foundation for establishing the correspondence between mental representations and external reality (e.g., attempts by Descartes, Hume, Kant and all the way through to twentieth-century logical positivism). There is alternative way to improve knowledge: “The complementary route offered by somaesthetics is, instead, to correct the actual functional performance of our senses by an improved direction of one’s body” (Shusterman, 2000, p. 267). In other words, we can improve knowledge not just by developing better formal methods of data collection and analysis (i.e., a strategy embraced by traditional science); we can also improve it by being more experienced and sensitive embodied thinkers in the first place (i.e., a strategy embraced in the arts and humanities).

Applying this global theory of embodied cognition to interaction design, I argue that a prolonged and serious engagement with interaction criticism—both as a practitioner and as an expert/scholar of fellow practitioners, however that may be defined—can help us cultivate sensitivities to designs and their broadest consequences that could help us become sensitive to aspects of design that would be quite epistemologically difficult and financially impractical to acquire via traditional science. In other words, interaction criticism can complement science as a source for intellectual growth in interaction design. Further, if insightful perception and criticism is a cultivatable skill, then that implies design and interaction criticism is a teachable skill, which has implications for future curricula and textbooks in the field.

2.1.5. Art/criticism is ethically uplifting (claim 5)

Insightful perception and enhanced cognition is also linked to ethical concerns. American philosopher Richard Rorty argues that the enhanced sensitivity that results from wide reading makes people more imaginative about and empathic toward others’ suffering. This enhanced empathy toward suffering encourages social solidarity and a more just society (Rorty, 1989). Rorty is thus a source of claim [5], which is that aesthetic response/criticism is ethically uplifting. For Rorty—and indeed many aesthetic philosophers and critical theorists—criticism and theory do not exist to describe the world (i.e., via representational correspondence) but rather to change it. Because criticism educates our perception and cognition, we become habitually more perceptive to the intersubjective responses and values of others situated in ours and other cultures. This sensitivity pushes us to pursue more just social policies.

Other variants of the notion that art/criticism drive us to worthwhile action can be found throughout aesthetics and critical theory. Analytic film theorist Gregory Currie (2005) notes that films can give vivid expression to a previously inchoate desire in the viewer. Once this desire has been clarified, the viewer is both more motivated and more capable of pursuing it. Currie’s theory of desire is not unlike the notion of “utopian hope” explored by Marxist science fiction theorist Carl Freedman (2000). Freedman’s concept builds on German philosopher Ernst Bloch’s theory that hope is a human drive—like Freud’s sex and death drives (eros and thanatos)—and that utopian visions (and much of science fiction) are systematic and clarifying elaborations of hope. Once available, these elaborations lead in turn to social action in the present. Such a dynamic is clearly visible, for example, in feminist science fiction writers such as Ursula Le Guin and Marion Zimmer Bradley, whose novels unabashedly advocated for women’s and homosexuals’ rights in 1960s and 1970s Western society.

Another example of [5] can be found in controversial postmodernist critic Jean Baudrillard, whose contribution is summarized by Merrin:

For Baudrillard, therefore, [cultural] theory is also a symbolic challenge. His aim is not simply a descriptive statement of the real but its critique and transformation; hence, he offers original, speculative, engaged, strategic readings, hoping to hasten its processes and push towards the point of implosive collapse and reversal [of the repressive modern technocratic system]. This requires . . . a “speculation to the death”—both an unending speculation, revisiting, and remodeling of all interpretations, and a speculation continuing until the death of the system. For Baudrillard, theory must be an event in the world . . . (Merrin, 2005, p. 158, emphasis in original)

Baudrillard’s contribution is, once again, fundamentally epistemological: instead of offering a scientifically defensible representation of his topic (mass media), he seeks to use his readings provocatively to deconstruct and force us to reflect on our interpretative framings, pushing us to adopt new ones that will hopefully produce a more just society.

Claim [5] is thus evident across postmodernism, Marxism, analytic aesthetics, and pragmatist philosophy. The operational notion of truth in all this is not a representation of the real but rather any knowledge that spurs us to change or create a new real. This fundamental orientation towards knowledge is not always well understood, especially among those who evaluate postmodernists such as Baudrillard according to the correspondence theory of truth, an evaluation on which, Merrin notes, Baudrillard certainly fails. Yet pragmatists such as Dewey and Rorty, and analytic aestheticians such as Gregory Currie, form a somewhat surprising alliance with cultural theorists such as Bakhtin, Foucault, de Beauvoir, Freedman, and Baudrillard precisely because their cultural criticism is
more preoccupied with changing reality than in representing it. Design, including interaction design, is likewise inevitably more interested in changing reality than representing it.

2.2. Emerging critical theories of interaction

Aesthetics-oriented and critical stances have entered interaction design in recent years. Nonetheless, the collection of these works does not yet fully constitute a coherent body of research focusing on the agenda of a discipline of interaction criticism. Udsen and Jørgensen (2004) offer a readable overview of some of these approaches; however, their conclusion suggests that the variety of approaches they surveyed, all under the banner of “aesthetic interaction,” are so broad that they dilute, rather than bring into focus, the notion of aesthetics in the context of interaction design. The 2004 special issue of Human–Computer Interaction on beauty offers an example of this confusion: focusing on scientific models of measurement and practical and concrete design advice, the articles describe beauty in terms that are very different from the aesthetic tradition going back to Plato. Indeed, as one of the authors of that issue (Hassenzahl, 2004) notes, this 2000-year tradition is apparently seen as a liability by some in the field. Hassenzahl’s point suggests that ignoring this tradition almost certainly consigns us to reinventing it—and all of its missteps—a problem that one can already see in HCI. The trend of exploring aesthetic interaction in terms of psychometrics and actionable design principles has continued, as exemplified by a special double-issue of Transactions on Computer–Human Interaction (Petersen et al., 2008) and the recent Designing for User Engagement: Aesthetic and Attractive User Interfaces (Sutcliffe, 2010). These works on aesthetic interaction are important for HCI because they ask aesthetic questions within HCI’s dominant scientific framing, but at the same time they also seem disconnected from mainstream aesthetics. It would be worthwhile to clarify the relationship between HCI-aesthetics and mainstream aesthetics, because it seems likely that each could serve as a resource for the other, rather than the present situation, where each version of aesthetics seems conceptually impoverished by its lack of engagement with the other.

An early example of a critical, as opposed to psychometric, approach to interaction is Steven Johnson’s (1997) Interface Culture. This popular science book, which began (and was never completed) as Johnson’s dissertation, seeks to situate recent technological change (as of 1997) in a trajectory of nineteenth- and twentieth-century culture. The work proposes and follows a promising critical strategy, which Johnson describes in the introduction: “I have tried to strike a balance in the following pages among technical explanations, historical narratives, and cultural analogies” (p.8). This three-part strategy is quite interesting, though it falls short of a rigorous critical approach (Johnson left academia to become a highly successful popular science writer). Yet building a critical understanding of technology by interweaving technical explanations, historical narrative, and cultural analogy has promise, even if it remains—at least from an academic perspective—somewhat methodologically under-developed in Johnson’s book.

A much more recent example of work in the area of interaction criticism is Bertelsen and Pold’s (2004) “Criticism as an Approach to Interface Aesthetics.” After making the case for interface criticism as a response to rising interest in the aesthetics of interaction design, the paper offers a formalized guide to interface criticism as a practical approach to interface aesthetics. This guide consists of encouraging interaction designers to consider the following 8-part framework as they study interfaces:

- Stylistic references.
- Standards and conformance to tradition.
- Materiality and remediation.
- Genre.
- Functional versus cultural dimensions of an interface.
- Representational techniques.
- Challenges to user expectations.
- Capacity for unanticipated use.

As I note in Bardzell (2009), these eight guidelines are drawn from a range of critical sources. While the authors are convincing that the framework is worthwhile as a pedagogical aid, the framework is both too specific and too heterogeneous to form the basis of a coherent theory. As an artifact-centric framework, it also has much more to say about the design itself than about designer intentions, human responses to and uses of it, and its more general role and situatedness in culture.

Another approach gaining popularity is that of critiquing interaction as a form of experience, and in particular, aesthetic experience (McCarthy and Wright, 2004, 2005; Löwgren and Stolterman, 2004; Sengers, 2003). A key strategy in McCarthy and Wright (2004) is to redefine the unit of analysis away from the interface, from user or designer intentions, and instead to focus on “experience,” including the internal and subjective notion of “felt experience.” Much of their book is devoted to laying out ways for analysts to gain access to this phenomenon, which is so hard to represent and therefore difficult to subject to analysis. Thus, they lay out critical strategies for understanding the production of meaning in the mind of the user, e.g., the “dialogic” interaction between the self and the other, as described by Bakhtin. They also offer critical frameworks, such as the “four threads of experience”: the sensual, emotional, compositional, and spatio-temporal. McCarthy & Wright’s introduction of the phrase “felt experience” to everyday UX vocabulary is an important contribution to the field. However, felt experience offers only a partial perspective on the sorts of issues critics talk about, because it is strictly within the subjectivity of a viewer/user, and this perspective cuts off any analysis of the materiality of the artifact—a criticism Gadamer made of Immanuel Kant’s aesthetic philosophy, which similarly positions the aesthetic inside of subjective experience (Hammermeister, 2002).

Löwgren and Stolterman (2004), relying on different sources, also arrive at an understanding that foregrounds the subject. They, too, replace the goal of “knowledge” with one of “thoughtfulness” and a “reflective mind.” Characterizing design theory as “knowledge that can liberate the designer from preconceived notions” or “knowledge focused on creating new conditions for design,” their emphasis is on original thinking. To achieve the goal of becoming a thoughtful, reflective designer, Löwgren & Stolterman propose four resources:

- A sensibility regarding the qualities of designs and design processes.
- A developed language, by which I think they mean a technical analytic vocabulary.
- Reflective thinking, which emphasizes the interpreting subject’s awareness of her- or himself in the development of one’s own thoughts.
- Retrospective reflection, a speculative activity that explores the “arguments and ideas that could explain a design.”

This designer-centric perspective is powerful for designers seeking to cultivate their critical sensibilities, inasmuch as it clarifies the characteristics of such a sensibility. However, this perspective does not directly offer guidance on how to study artifacts or the subjective experience of everyday users.

Clearly, the critical approaches summarized here are complementary, in that they emphasize different key aspects of interac-
tion. But underneath their differences is an important similarity: all amount to critical frameworks, rather than scientific models; that is, their frameworks are not meant as abstract representations of the true nature of the experience of interaction design, but rather as a repertoire of skills to enable people to “think more clearly,” “talk about,” and “direct our attention to particular aspects of” the elusive phenomena of interaction. The outcome of this strategy should be richly interpretive, rather than representationally accurate. Its goal is to generate insight and reflection, rather than to demonstrate or validate tightly formulated truth claims, such as, “prototype B offers 20% faster performance than prototype A.” This insight or reflection in turn facilitates the cultivation of a perceptiveness, a sensitivity that guides designers’ activity in the world. Echoes of Baumgarten and the subsequent tradition of cultivating perceptiveness and insight are clearly evident here.

A stable discipline of interaction criticism would support further work on frameworks such as these, by more clearly revealing their relationships and the gaps left by them. It would stabilize emerging critical vocabularies, simplifying communication among researchers and practitioners. It would also reveal strengths and weaknesses of the state of the art. For example, surveying human-researchers and practitioners. It would also reveal strengths and weaknesses of the state of the art. For example, surveying humanists-inspired approaches in HCI today reveals that the existing literature provides far better coverage of human-centered approaches than artifact-centered ones.

3. Four perspectives on interaction criticism

In his Language of New Media, Manovich (2001) introduces five principles of new media, which he claims are the building blocks of works of digital media, including interfaces. One of these is transcoding. Transcoding is the principle that computer files have both a computer layer and a cultural layer. The cultural layer includes categories such as stories, compositions, genre, mimesis, and tragedy. The computer layer includes functions and variables, data structures, packets, and so on. A digital image, for example, is of or about a person, experience, or place, etc., but it is also composed of pixels, color descriptions, compression algorithms, etc.

One of Manovich’s key insights is that these two layers—computer and cultural—mutually influence each other (Fig. 1). For example, the evolving use of Photoshop has altered our conceptualization of photography, which now gives billions of people everyday access to seamless photographic composites. Likewise, certain computer structures are becoming cultural forms in their own right: Manovich describes the database as originally a computer form that is also becoming a cultural form. Using similar reasoning, Johnson (1997) argues that the hyperlink is a new form of punctuation, because it is a marker that establishes relationships between two text units, in much the same way as does a semicolon or comma.

I agree with Manovich’s overall characterization of the mutual interaction of cultural and computer layers, but I feel the key terms—cultural and computer—are too broad to be directly useful for interaction design. To operationalize these terms, I begin by considering the major categories, or problem spaces, of traditional criticism. I found that the major critical traditions each emphasized issues that, broadly speaking, fell under one or more of the following four general headings:

- **Creator**, including author, composer, sculptor, director, etc.
- **Artifact**, including texts, films, paintings, etc.
- **Consumer**, including reader, viewer, listener, etc.
- **Social context**, including historical setting, class, ideology, gender, etc.

For example, auteur theory in film emphasizes the role of the director (Bazin, 1971; Sarris, 1962/63); artifact-centered orientations are found in semiotic approaches, which treat works or artifacts as “texts” to be studied, as in the “language of fashion” (e.g., Barnard, 2007); in literary theory, reader-response criticism privileges the role of the reader; Marxist and feminist theories across the arts, privilege the significance of social context. Thus, in my sketch I use twentieth-century critical trends to redefine and operationalize Manovich’s notion of the cultural layer.

These four general categories can be adapted to subsume at a general level critical concerns in HCI as well:

- Interaction designer.
- Interface.
- User.
- Social context.

The two sets of categories on the two layers are roughly congruent to each other (Fig. 2). The benefit of this adaptation is that it bridges two hitherto separated knowledge domains—HCI (including psychology and engineering) and criticism (including the liberal arts and design)—and potentially enables their systematic cross-pollination. This cross-pollination would have important benefits, such as helping the HCI community better assess its own broad cultural impact (i.e., getting beyond immediate, but superficial and often unsustainable user impressions and performance measures). It would also help the community gain a better understanding of the sensual, emotional, experiential, interpretative, social, and judgmental dimensions of interaction, as some have already demonstrated, e.g., McCarthy and Wright (2004). It would connect discourses on values (e.g., value-sensitive design, e.g., Friedman, 1997; Cockton, 2004; and sustainability, e.g., Blevis,
more robustly to ethical thought going back over two thousand years in the West. It would also benefit critical theory itself, since presumably qualities of interaction—e.g., emergence—may provide new examples that demand further clarification and elaboration of theory developed in the context of less interactive cultural artifacts, such as novels and films.

4. Interaction Criticism and Lumino

In the following pages, I explore each of the four perspectives—creator, artifact, consumer, and social context—to illustrate the types of insights and blindnesses that typically arise from each. I do so by developing a critical interpretation of a recent innovation in interaction design, Lumino (Baudisch et al., 2010), which is a technique used to move tabletop interaction on an unmodified Microsoft Surface table into the 3D space above it (Fig. 3). Lumino is made with simple building blocks stuffed with a glass fiber bundle, which transmits the light both upward from the surface of the table and also downward from above the table to the cameras hidden inside of it. Lumino combines optical scaling and unique, tangram-like markers (visible in the black and white markings on the cubes shown in Fig. 4) to enable the stacking of blocks on one another in a way that the table can recognize each of the blocks and their relative positions. To demonstrate their novel user interface, the research team also developed three widget applications: checkers, an architectural design application (shown in Fig. 3), and an image editing application.

Before I begin my interpretation, I want to stress that my goal here is to map out the kinds of concerns, strategies, and insights that one can achieve by exploring each of the four perspectives. For reasons of space and to accommodate the intellectual goals of this paper—to introduce interaction criticism—I present only brief analyses based on the four perspectives I've described. I do not suggest that all interaction criticism should cover all four perspectives. Indeed, most critical essays in the arts and humanities only seriously explore one or two of these perspectives, often only engaging with a single theory within a given perspective. I will, however, briefly critique Lumino from all four perspectives to provide readers with a sketch of the different types of concerns, insights, and blindnesses of each of them.

4.1. Interaction Designer as Creator

Works of art and design alike are human-made. The agency, responsibility, and intentions of creators have been of central concern of criticism since the ancient world. Because design entails intentional change, interpreting a design artifact with design intention and designer agency in mind is an obvious and important strategy. In this section, I consider a pair of theories of authorship derived from the humanities to show the kinds of critical strategies they offer. I use “author” here in a very general sense, including the senses of novelist, painter, composer, sculptor, designer, and any other creative source of a cultural artifact. Likewise, I use “text,” “reader,” and “reading” in general, non-art-specific senses. The theories of authorship I will introduce and apply are not compatible with each other—there is no single accepted theory of authorship in the arts and humanities, as authorship remains a hotly contested issue—and the points of their conflict themselves can be illuminating.

Throughout much of criticism in the nineteenth century, the goal of the critic was to uncover the author’s intention, that is, what the author was trying to say to readers. Arguably the most recent serious proponent of this approach comes from literary critic E. D. Hirsch, who argued that the standard by which different interpretations should be measured is the norm provided by the author’s original intentions (Holub, 2005). Though Hirsch is outside of mainstream literary theory, his marginal position in that field should not determine the status of his ideas in HCI, where I argue they have some application. While criticism may reveal different significances of a work in culture, interpretation according to Hirsch should consist of a correspondence between our understanding and the author’s intention as manifested in the text (Holub, 2005). Academic HCI has implicitly followed in Hirsch’s footsteps: design intentions are made explicit via papers, and it

Fig. 3. Lumino extends MS Surface into the 3D space above it, using blocks and fiber optic cable.

Fig. 4. Lumino combines a futuristic conceptual interaction aesthetic with a childishly simple form of embodied interaction.
is papers, rather than designs, that are the primary reason a work is accepted for publication/presentation in the field's journals and conferences. In other words, HCI has, for better or worse, adopted a Hirsch-like position of evaluating contributions to the field largely in terms of researcher intentions and their expressions.

The intentions of the Lumino researchers, especially when compared to those of authors and artists, are quite conveniently available: the researchers have created a Web site for Lumino, which includes their 10-page award-winning ACM CHI paper, a 145-slide PowerPoint presentation, a 2-minute documentary video, and other resources. These documents make clear that the researchers' intentions are to make tabletops a platform for tangible interaction by going beyond the surface to create an interactive 3D space. They also clarify additional aspects of their intentions, e.g., to offer a solution that does not require modifying the Surface table and features blocks that are themselves low maintenance (e.g., do not require batteries or special care). In the conclusion of the paper, they declare their success: "In this paper, we demonstrated how to sense 3D arrangements of building blocks with a regular, unmodified diffuse illumination table" (Baudisch et al., 2010, p. 10).

We can describe these intentions as technocentric. The design goals involve solving a technical problem, namely the difficulties of below-surface cameras to perceive objects above the surface of the table. The goal was further constrained to solutions that do not require modifying the table or high-maintenance parts. In the paper, they walk through an engineering rhetoric of problem—solution—limitation that iteratively circles back and starts anew, to show how they arrived at their solution. Absent from their goal, and any of their technological reasoning, is significant reference to specific human needs, which arguably puts them out of the mainstream of HCI. Certainly the authors describe no serious application informed by user research or needs analysis. It is clear that the actual use of their invention is out of the scope of the research. One way to read this is to say that the researchers have invented a technology that is "open to interpretation" (Sengers and Gaver, 2006), that is, one might adopt a hermeneutic perspective that sees this technology as designed in an open-ended way under the assumption that the technology would be subsequently interpreted and appropriated by others. An alternative way to read this is to say that the researchers have developed a "pure" technology, which needs to "applied" by others elsewhere. This dichotomy between abstract and pure technology on the one hand, and its applied and material implementations on the other, replicates the mind/body dualism characteristic of everyday thought and often ascribed to scientific rationalism, a position both embedded deeply in computer science and also long criticized in HCI (e.g., Winograd and Flores, 1986; Suchman, 1987).

We might be tempted, therefore, to read Lumino, at least from the standpoint of creator intention, as an example of traditional engineering reasoning, especially since user-oriented reasoning is largely absent in the paper. In reading the paper as grounded in technological reasoning, we might expect to see evidence of a disregard for material aesthetics, since they would be, on such a theory, superficial decorations quite separate from the "hard" problems of the math and physics that this invention is centrally concerned with. And indeed, much of the paper is devoted to explaining the problem and solution in terms of the physics of light. The problem with this reading is that both the invention itself and its expression in the paper and slides contradicts what we would expect of researchers only concerned with the pure engineering problem. For example, the rhetoric of the paper is quite accessible, even to those not trained in engineering or physics, and this is important, because this is after all a paper fundamentally about engineering and physics. The authors of such a scientific paper might have chosen to express the physics problems using equations, a rhetorical strategy that would simultaneously express the problem and their solutions in the most precise terms and also establish their credibility to specialized peer reviewers, but they did not; instead, the authors chose to use diagrams, photos, and simple descriptions, communicating the problem in lay terms. This accessibility seems to invite readers to join the researchers; non-specialist readers can almost replicate the project themselves having simply read the paper. Strengthening this reading is Lumino's web site, which actually has a section entitled "DIY," which explicitly invites do-it-yourselfers to contact the authors for free mentoring.

Here another theory of authorship may be helpful: the notion of authorial excess, which states that human-made artifacts always have more significance and meaning than their authors can ever intend (Danto, 1997). Theories of authorial excess have been developed in Marxism, feminism, and psychoanalysis, all of which explore ways that authors' intentions are shaped by broader cultural trends that affect or even constitute authorial agency. But one does not have to turn to such broad strategies to engage with the phenomenon of authorial excess.

In the case of Lumino, it would appear that diverse and even competing motivations shaped this project and its expression and that accordingly its final form was overdetermined in the sense that Eldridge writes that all human actions are: "actions are overdetermined by a number of reasons and motives, both conscious and latent but articulable" (2003, p. 134, emphasis in original). Eldridge uses the example of a tennis player's arm swing during a serve, which is shaped by a desire to win, knowledge of an opponent's weaknesses, the player's own skills, the player's present fatigue, the position of the sun, an awareness of which serves have been successful in this match, anxiety about income and security, her or his grip on the racquet, and so forth: this single arm motion has numerous determinations, and while it cannot be pinned down to one of them, we can articulate many of them.

So it is with Lumino as an expression of designer intention. On the one hand, its rhetorical form is shaped by the metanarrative of scientific progress, which is the argument implicit in much scientific work that science becomes progressively better by means of the incremental improvements scientists make over time. The paper and slides heavily reference prior and related work, positioning Lumino as an incremental improvement on existing tabletop user interfaces. This rhetoric is dominant—with good reason—in the CHI community, and its use increases the likelihood that peer reviewers will know how to evaluate the work.

On the other hand is the rhetoric of DIY. The paper, slides, and especially the video show very clearly how the blocks were made, resembling a DIY hobby site. All of the presentation media have attractive line drawings, as opposed to the functional but sterile CAD-style engineering drawings that one might expect. Photographs of the demos are also done in high quality, with soft focus used to draw attention to the intended portion of the photograph while adding an artsy touch, and side-lighting of the hands manipulating the blocks, to ensure that the hands are visible as hands (as opposed to shadowy silhouettes) without competing with the display screen of the tabletop itself: the photography is thus effectively communicative and also aesthetically appealing to the eye. Without a critical awareness of photographic technique, it would be quite easy to overlook how these images become so efficacious and therefore much harder to replicate. Once visible, rhetorical decisions such as attractive line drawings and elegantly photographed images, in a critical interpretation, can be stressed as choices, and reasoning about these choices, including possible choices not taken, can shed light on authorship.

One can thus infer from this interpretation that the designers are indeed serious scientists capable of doing serious science defined, but that this project was also something like a hobby to the researchers—a hobby that they are both passionate about doing.
with an almost loving care and also sharing with others. All this suggests that the researchers establish a relationship with their readers that treats them simultaneously as scientist peers and fellow crafters—and this particular combination, I argue, is quite compelling to an HCI audience, made of academic researchers and also practitioners who work more closely than in many other fields, and between whom the lines are constantly blurred. The creator perspective allows us to read the available materials to make inferences about their authors—in this case, the Lumino researchers—as well as the relationship they seek to establish with the readership. However, nothing in this perspective is all that helpful in telling us what Lumino is; neither does it really help us understand the significance of Lumino for its audiences, including MS Surface users and the HCI community; and neither does it tell us much about the place of Lumino in culture or society. Let us turn to artifact-centered perspective to try to respond interpretively to the question of what Lumino is.

4.2. Interface as cultural artifact

Twentieth-century aesthetic philosophy and critical theory both developed powerful interpretative theories around the artifact. In analytic aesthetics, one finds strong theorization around art as “significant form.” This theory is most closely associated with Bell (1987) as cited earlier, but variants can also be found in Goodman (1987), who identifies the following five “symptoms” of the aesthetic symbol: syntactic density, semantic density, relative repetitiveness, exemplification, and multiple and complex reference. Aesthetic philosopher Monroe Beardsley, following a tradition that goes back to the Enlightenment, also stresses the importance of an organizing unity; in classical aesthetics, one key criterion of the aesthetic was “unity in variety” (e.g., eighteenth-century philosopher Francis Hutcheson, as described in Dickie (1997, pp. 14–15)). Less important for now than understanding the specifics of what each of these individual concepts means is recognizing that they are fundamentally formal criteria of art. That is, art is recognized not by what it says, who says it, or to whom, but rather in terms of the form of the expression itself. A cognate strategy was developed in continental critical theory under the banner of semiotics, which proposed that cultural artifacts could all be analyzed as concrete implementations of cultural “languages” (see, e.g., Barnard, 2001). These languages may or may not be verbal, and they are often popular and not necessarily “literary” or “high art.” For example, the evolution of cinema in the twentieth century was often described as the emergence of a cinematic language (e.g., Eisenstein, 2004; Metz, 1991; Bazin, 1971); fashion is likewise often described as constituting a special language (e.g., Barthes, 2005; Davis, 1992). Such an approach is also appearing in interaction design; for example, Löwgren articulates a theory of aesthetic interaction around the formal qualities of pliability, rhythm, dramaturgical structure, and fluency (Löwgren, 2009).

The visual form or visual language of Lumino is quite striking, arguably on the terms specified by Goodman and in semiotic theories: Lumino is semantically dense and yet in a viscerally simple and appealing way. Its visual form can easily be tied to many other cultural forms, which are both quite familiar to us and also replete with meaning. These include relevant technologies, most directly Microsoft Surface and its position within tangible and embodied interaction (a subdomain of HCI with its own annual ACM-sponsored conference, TEI). The researchers’ PowerPoint deck has 28 slides devoted to related work, most of which involve Surface and/or TEI projects.

Yet Lumino appeals to much more than the cutting edge of HCI research. Indeed, it reaches back centuries in its cultural allusions. These include dominoes, which are alluded to by the name, Lumino, and also the size, form, and function of the blocks. The pleasure of manipulating blocks, such as the clicking noise as they are stacked and their different textures—of the cool metal, or the sanded ends of the hundreds of fiber optic “noodles”—offer a tactile pleasure that is basic to human experience. As noted earlier, some of the blocks have tangram-like patterns painted on them (visible in Fig. 4), and the paper actually references tangrams as an inspiration behind the particular signaling system the inventors devised to enable the table to differentiate each of the blocks. Clearly board games are strongly referenced, as they are in nearly all Surface applications, due to the size of the table surface and the abstractness and function of the “pieces” that sit on, control, and indicate system/game state; this reference is strengthened by the demo application of checkers. First encountering the application, one wants to explore its features and limitations, by doing what one is supposed to, violating it, seeing whether fast movements can trick the computer, and so forth.

In the image editing demo application, the metaphor of rubber stamping color profiles—a metaphor derived from Photoshop, which is itself derived from everyday craft—also is referenced. Unlike in Photoshop, it is not merely a conceptual metaphor, used to provide users mental models to understand what a feature does, but it is also an embodied metaphor. One wants to apply the rubber stamp effect for the pleasure of clicking and twisting and having the computer respond. This interaction thus evokes the rubber stamp metaphor in image editing from a cognitive abstraction to a much simpler and more familiar embodied form.

We can also immediately recognize in Lumino the visual language of science fiction, a recognizable visual culture genre disseminated through Hollywood movies and book covers, with its fluid abstractness, cool and bright color palette, futuristic imagination, and mixed reality. This science fiction visuality helps Lumino break away from the everyday, calling attention to its own novelty and implicitly contrasting it with more familiar everyday computing (e.g., keyboard and mouse). As a highly novel and still underdeveloped technology that will need years of work to achieve its potential, Lumino is all about the future and not the present—its science fiction visuality sets our expectations where they need to be. The science fictional visuality might be identified as Lumino’s “organizing unity” (Beardsley) or “unity in variety” (Hutcheson), that is, the visual force that ties together and makes sense of all of Lumino’s diverse references. Tying together creative speculations of the future (i.e., its promise as a future form of interaction), technology (from fiber optics to Photoshop and Surface itself), and play (i.e., video games, electronic remediations of the traditional games of checkers and dominoes), science fiction is particularly apt at organizing and making sense of the novel juxtapositions that make up Lumino as a cultural artifact.

The value to criticism of this activity of beginning to articulate the cultural language, or significant form, of Lumino is once these features have all been pointed to, we can start investigating what they mean once they are juxtaposed into a single form. As noted at the beginning of the essay, one of the claims about art is that it directs perception and cognition. By elaborating aspects of its significant form, we can see the mechanisms by which it begins to do so. Lumino is an attempt to move 3D interaction beyond the screen. This concept is highly abstract and difficult to understand; the HCI community has been wrestling with it for decades. At the same time, as Fig. 4 shows, one only has to glimpse briefly at Lumino to understand it and to want to touch and play with it. Lumino’s significant form can described as the unity in variety that is its simultaneous existence as a work of a sexy hi-tech prototype and a child’s toy. In other words, the visual language of Lumino—and in stark contrast to many other technological advances in 3D embodied interaction, which are frequently hard to understand and even in some cases scary looking—powerfully and very concretely envisions an appealing idea of 3D embodied digital interaction.
That children’s toys inform the design reasoning not only at the level of presentation (i.e., what an everyday user would see, such as the surface of the blocks) but also at the fundamental level of the engineering itself (e.g., in the design of a computer-readable sign system based on the metaphor of tangrams), proposes a way to think about conceptual interaction design—from the ground up in terms of pleasing everyday objects—that presumably could be used beyond the design of Lumino. Finally, that the researchers made this reasoning explicit; blurred the boundaries between engineering, crafting, and presentation; and extended an invitation to the DIY community also proposes by example a model of an interaction design process that is more open and collaborative than traditional interaction design, and it does so precisely at what is often among the most closed parts of the process: the design of novel user interface hardware and interaction paradigms.

4.3. User as reader/viewer

Artifact-based approaches peaked by the middle of the twentieth century, and increasingly aesthetic philosophers and cultural critics alike shifted their attention to the role of the reader. The problem with formalist interpretations, as noted earlier in this essay using the historically complicated case of Triumph of the Will, is that formalist approaches struggle to explain the significance of both the material history of a work and the sense-making activities of the reader in building an interpretation; it almost suggests that the meaning of a work of art is simply there waiting to be discovered. Yet as the historical reception of Triumph demonstrates, the meaning of a work can change radically over time. Reader-based approaches stress the significance of the reader as a someone situated in a time and place, with her or his own intentions and prejudices, and the ways that these are necessary to make meaning happen in the first place. Hermeneutic phenomenologist Gadamer, for example, describes aesthetic meaning-making as a “fusion” of the “lifeworlds” (i.e., the totality of one’s historically situated subjective existence) between authors and readers (Gadamer, 1989). An account such as Gadamer’s can explain the radically changing interpretations of Triumph by observing the different relationships different audiences have had with the film and its creators.

The role of the individual reader’s subjectivity in the construction of meaning of cultural artifacts is a theme developed in Kant, who argued that cultural objects have no objective meaning to be discovered, at least not in the way that scientific objects of knowledge do, and thus the aesthetic was inherently situated in human subjective response (for an accessible introduction to Kantian aesthetics, see Dickie (1997, pp. 20–24)). Kant clearly defines the nature of a subjective aesthetic response, as summarized by Dickie: “A judgment of beauty is a disinterested, universal, and necessary judgment concerning the pleasure that everyone from the experience of a form of purpose” (by “form of purpose” Kant is anticipating Bell’s “significant form,” except that Kant places more emphasis on authorial intention). At any rate, common to these aesthetic theories is both (a) the constitutive role of the consciousness of the reader in meaning-making and (b) an emphasis that these subjective judgments are not merely idiosyncratic opinions, but rather that they are historically determined (Gadamer) and intersubjective (Kant). In other words, an aesthetic judgment is not just whatever I think is beautiful, but rather what I claim that we must all agree is beautiful (though who this “we” is that must all agree is a contentious question). This emphasis on how a viewer aesthetically judges a work, and then how that viewer articulates that judgment to others (i.e., as an interpretation, a collection of claims, or even an argument), is, I believe, the theoretical engine behind recent approaches in experience research and design, e.g., that advocated by McCarthy and Wright (2004).

It is also possible to speculatively construct an understanding of a user’s subjective response by appealing to another reader-centered theory, the implied reader. This notion, derived from semiotics, suggests that every communication can be understood as inscribing within it an ideal reader who is categorically distinct from any actual readers. Borrowing an example from Thwaites et al. (2002), we can imagine that a typical job application cover letter supposes that its reader is a hiring manager, a person of authority, to whom the applicant is subordinated and needs to legitimate him- or herself for the purposes of persuading that manager to invite her or him to an interview or some further dialogue that might lead to a hire. This hypothetical hiring manager is this letter’s implied reader. However, many other actual readers may see this letter. A friend or colleague might read it in draft form to offer feedback. Alternatively, perhaps a random person in the office reads this letter because it is laying out in the open. Perhaps no one will ever read this letter at all, and so forth. Thus, while discovering information about actual readers requires empirical access for the researcher, the implied reader is analytically available to the critic by means of a close reading of the artifact itself. Implied-reader-based critique is effectively a hybrid of artifact-centric and reader-centric approaches.

In the case of Lumino, we can distinguish between a number of different ideal audiences.

- **Members of the HCI community.** This audience specifically includes the peer reviewers who decide whether this work is disseminated to the scientific community. This audience is obviously not the putative end user of Lumino, but as a gatekeeper to both the dissemination and further development of technical inventions, the HCI audience is important from a practical standpoint.

- **A Lumino end user,** that is, someone who will actually use these blocks to complete architectural planning or image editing tasks, to play checkers, etc. One might imagine that this user moves initially from simply exploring and playing with Lumino to a more focused investigation or activity. Increasingly, she or he will use space—both virtual and physical—in a hybridized way to map out, understand, manage, and manipulate data representations to do tasks. Likely collaboration with others (and Lumino, and Surface in general, are optimized for multiple users) may introduce cycles of play and focus. It is easy to envision the first blush of pleasure users have with Lumino, but longer term use is much harder to imagine at present.

- **Members of the DIY community,** presumably both within and outside of the HCI community proper. As mentioned before, much of the rhetoric of the presentation of Lumino—its paper, its PowerPoint deck, and its video—is clearly directed at this audience. Members of this community are most likely to carry the Lumino agenda forward, requiring few resources from the inventors.

Of course, a single actual living person could be any combination of these ideal readers; indeed, in the HCI community it is quite reasonable to expect many of those who encounter this research at any level will belong to two or even all three of these ideal readerships.

Lumino, as both a technology and as a body of presentational works about that technology, never fully realizes any of these ideal audiences. It comes closest; arguably, to the HCI audience, but as noted earlier, the paper could have been written in a more scientifically rigorous way than it was (e.g., a more technical explanation of the math and physics of it). Its end users are never fully realized, because Lumino remains too abstract for “real” users; it is an embodiment of a concept and a working prototype of a new paradigm of embodied 3D interaction, but it as yet offers no actual applications and no defined understanding of user needs or
requirements. Finally, while the DIY community is invited and any reader has an understanding of the gist of how to build Lumino, Lumino is far from a construction kit or recipe.

That all three of its ideal audiences are only partly realized, however, may be one of its strengths. As noted earlier in the essay, one of the consequences of aesthetic response is often an increased clarity of desire, e.g., Currie’s “inchoate desire” or Freedman’s “utopian hope.” It is possible that upon engaging with Lumino in its present state, a certain number of people will have prior promising, but nebulous, ideas or agendas clarified in some way, and that they will pursue them with new focus, motivation, and wherewithal. Such inspiration benefits the individual people who have been inspired, the inventors of Lumino, and the HCI community more broadly. Less optimistically, it is also possible that once the novelty wears off, and because Lumino lacks any serious depth of application, it may be prematurely dismissed as cool but ultimately vacuous. As a cultural domain, science fiction itself supports both outcomes, that is, science fiction can be seen as visionary and inspiring (e.g., the way Neal Stephenson’s Snow Crash inspired designers of virtual worlds, such as Second Life) or it can be seen as enjoyable but forgettable trash.

One implication of this interpretation is that the Lumino project provides an example of a successful design rhetoric, both in terms of the design itself and its meta-materials (i.e., papers, slides, videos, and demos). I often encourage doctoral students to study the formal rhetoric of successful papers in their area of interest as an activity separate from their engagement with its content. The rhetoric of a design and its meta-materials can both be emulated, a project that includes not only its logical and presentation features, but also the ways that it constructs—and serves the needs of—its ideal audience. In the case of Lumino, this half-realized triple audience—scientists, everyday users, and do-it-yourselfers—seems to work, at least as far as generating the community’s interest.

### 4.4. The social context of HCI

Ultimately, researchers and practitioners in HCI and interaction design justify ourselves to users, taxpayers, shareholders, and so forth on the grounds that our work contributes in some way to social groups, from micro-groups such as design teams to society at-large. In other words, interaction design is not, in the end, fundamentally concerned with expressing the intentions of the designers or researchers behind them; neither is it concerned with producing a novel form of discourse that is elegant and complex in its semioticity; neither is it to produce individual subjective responses, however aesthetic they may be. Design involves changing our world and does so in ways that exceed intention (Willis, 2006). Of all the perspectives we might take on design, the social context and implications are surely the most complex, dynamic, subtle, and long-term of them all, a point noted nearly two decades ago in HCI (Rogers et al., 1994). Accordingly, the social context of interaction design demands a central place in interaction criticism.

One way to approach this problem can be appropriated from Gadamer, who claims that the “function of the beautiful is to bridge the chasm between the ideal and the real” (2002, p. 5). The “ideal,” as a concept, is socially constructed; we do not each define our own ideal reality independent of others. One critical strategy, therefore, is to compare the ideal constructed by a design against a more social construction of the ideal. In the case of Lumino, I have already shown how the design seeks to abstract itself from specific users and applications, leaving itself to others to finish. Such a reading constructs Lumino as a neutral vessel, which will only become good or bad once it is further implemented in real context, placing the responsibility for these designs on the ultimate designers of those applications; this reading also seems to excuse the designers of Lumino from any responsibility for its deployment in society.

The problems with such a reading are manifold. As science and technology studies (STS)—a field devoted to the social implications of technology—have demonstrated convincingly that technology never sits neutrally outside of society (e.g., Misa, 2003; Brey, 2003). We can see that the researchers designed Lumino within a given socio-historical context, evidence of which is inscribed throughout their work. Also, by publishing this paper in the scientific community and reaching out to DIYers, the researchers have ensured that their work is already acting in the social world. This action further contributes to the direction of future action. Thus, we can see two critical activities that could inform our understanding of Lumino in its social context: (1) by offering an account of Lumino of having been produced—and marked—by the historical context of its production; and (2) by analyzing Lumino both as a social act in itself and also as an force that directs subsequent acts.

I begin with (1): one of the contexts in which we all work in HCI and computing more generally is a well documented and well known gender inequality. Critical strategies that expose the workings of that inequality can potentially lead design in worthwhile directions (Bardzell, 2010). It is relatively easy to see the masculinism of Lumino. Its apparent commitment to mind/body dualism, evident in both its engineering reasoning and its refusal to deal with actual users, actual situations, and/or actual applications, has already been discussed; these traits, commonly associated with male-dominated Western science, have been critiqued in feminist writings for years (e.g., Harding, 2004). Other evidence supports this interpretation. All three authors are men, as are all ten of the professors listed at the institute out of which this work came. The videos and slides show almost exclusively white men as both designers and users of Lumino. Two of the three demo applications have stereotypical male coding: the competitive and abstract game of checkers and the building and construction-oriented architecture demo. The color palette, which is predominantly blue, is in the contemporary West associated with masculinity. Lumino’s visuality is, as noted earlier, derived from science fiction, and sci-fi itself (as opposed to fantasy) is also gender-coded as masculine.

All of that said, the DIY and craft aspects of the project, as well as the emphasis on accessibility and material beauty, undercut a reading of Lumino as simply a traditionally masculinist engineering project. How do we resolve this apparent conflict? Postmodernist critic Douglas Kellner (cited in Crane, 2000) proposes the notion of “conflicted hegemony,” which is the idea that the media and popular culture no longer offer a single coherent perspective or narrative for consumers to buy into, but rather offers a mish-mash of competing values, within which consumers can fashion their own identities and values without committing to any single one. Crane applies this concept to fashion to explain the differential ways that researchers have shown that demographic groups—older women versus younger ones, white women versus black ones—make sense of fashion images. Along similar lines, Entwistle (2000) characterizes dress as “a practical negotiation between the fashion system as a structured system, the social conditions of everyday life, such as class, gender and the like as well as the ‘rules’ or norms governing particular social situations” (p. 37). Perhaps interaction design—including both its products and its processes—can be understood in similar terms. If so, one way to read Lumino, then, is as an example of conflicted hegemony, where traditional scientific and engineering values of abstraction and universality are undercut by the aesthetic, social, craft, and accessible dimensions of Lumino. Different readers/users must select among these different readings of Lumino.

The second critical activity (2) is to investigate Lumino both as an action in HCI’s research community and as a force that shapes...
subsequent activity. By submitting this work to CHI—and furthered by this project’s winning a Best Paper award—the researchers are changing the community. Previous parts of this essay have expressed some ways it does so: by contributing to a theory of interaction; by solving a technical problem in a highly replicable way; by critiquing and then addressing a limitation of Microsoft Surface and related technologies; by offering a concrete and viscerally appealing vision of a concept of interaction; by inviting non-specialists to join them in taking on engineering and physics problems. Of course, their work is also a boon to Microsoft Surface—and the principal researcher Patrick Baudisch is formerly a member of Microsoft Research who worked on Surface.

To explore how the Lumino project remains a force that directs subsequent research, we can ask the speculative question of how Lumino could have been otherwise. In answering this question, it becomes more clear how subsequent research is affected by decisions made on the Lumino research. Here again I will focus on the relatively abstract and non-specific uses of Lumino. One hypothetical alternative would have been to pursue Lumino as a user interface specifically to assist a given community, for example, people with cognitive disabilities, children, the elderly, the developing world, or as a project to increase female or minority participation in engineering. By staying at a certain level of abstraction, not only did the Lumino design process itself not engage in those types of questions—and the user research attendant on them—but it was also evaluated without such goals in mind, with the implication that peer reviews and constructive criticism also did not engage in such problem spaces, either. Thus this project has iterated in a way that simply does not take such questions into account, making it that much more effort for Lumino to be developed in ways benefitting marginal users. None of this suggests that Lumino was misguided or is somehow unethical. Rather, the point of this reading is simply to show that Lumino’s bridging of the ideal and the real relates more closely to some social ideals than others, and that these relations have social consequences. Of course, these consequences can be addressed through a continuation of the Lumino project—a continuation that the researchers took care to encourage open participation in.

4.5. Final notes on Lumino

My four-part reading of Lumino was intended to show the kinds of concepts and strategies interaction designers can use to critique designs. I proposed that the authors worked within largely technocentric intentions, and yet a certain amount of passion for craftsmanship led them to integrate their invention into relevant culture more than was necessary from a purely engineering standpoint. The artifact itself juxtaposes a variety of visual languages, including board games and CSCW software, and these languages are organized and made coherent within an overriding science fiction visuality. Lumino speaks to audiences in visceral ways, inviting embodied interaction, exploration, and play. In the best scenario for Lumino, this initial curiosity will have the benefit of clarifying its multiple audiences’ inchoate desires, which may spur its audience to participate in actualizing its potential. Lumino was developed in a male-dominated context, and at the same time (and perhaps not coincidentially) is too abstract to engage with real people and real problems. Changing its abstract orientation will likely require proactive effort from someone outside its invention process, but the open-endedness of Lumino as both a process and a product actually encourages emergent appropriation.

As noted earlier, and in contrast to what I have done in this paper, traditional criticism does not usually devote equal attention to creator-, artifact-, reader-, and social context-centered perspectives. I certainly do not want to advocate a normative standard that interaction criticism should entail an analysis from all four perspectives. Moreover, as I hope is clearer now, different perspectives raise different sorts of questions, and these questions may be more interesting to some aspects of inquiry than others. For example, careful analysis of artifacts and readers may go far to shedding light on aesthetic response, a topic of central concern for experience design. Conversely, social context-based approaches obviously shed light on social concerns, so value-sensitive design, sustainability, and similar socially oriented forms of HCI may benefit more from those types of readings. Interest in design processes, rationale, and intentions will obviously benefit from critiques stressing the designer and the artifact.

I also want to make clear that I make no claim to offering a correct representation of the meaning of Lumino. As I hope to have shown, criticism does not accept the philosophical commitment—representationalism—that underlies such a value. Along with this position, however, is a simultaneous rejection of the notion that the designers of Lumino are in an authoritative position to articulate their own design significance. Certainly they are in a privileged position to talk through their own decisionmaking, rationale, goals, and processes, but criticism seeks to get beyond such accounts to explore significances beyond the rational control of the designers.

Instead, if Lumino is significant at all (and I believe it is), it must be significant to a community, most obviously the HCI community, but also DIY, HCI education, tabletop interaction, STS, and presumably other communities as well. Members of these communities, then, are responsible for engaging with and articulating the significance of designs such as Lumino. The form of that engagement and articulation is likely to include critical dialogue. This dialogue involves acts of pointing to significant, if easily overlooked, features (such as the use of side-lighting in the photographs of the prototype, the way that Lumino speaks to diverse constituencies, or the apparent technocentrism of its inventors’ intentions versus the aesthetically crafted product they actually created).

My interpretation of Lumino is a position within that critical dialogue. It is expert, in the sense that I am a member of the HCI community and also have at my fingertips a range of relevant aesthetic and critical theories. At the same time, my interpretation is not meant to be final or authoritative—such a view undermines the possibility of critical dialogue. It is also worth noting that my formal interpretation of Lumino was inexpensive in that the core ideas for my reading were developed in about 2 h, and further fleshed out in a written critique over about 2 days (for the first draft) and further refined in subsequent revisions. Professional designers practice informal critique constantly—an act that can be described as constantly “reading” the designs around them and using them to engage with their own theories and critical understandings. Such ongoing, informal, and largely internal critique is a part of the everyday skill set of professional designers, and I argue that this skill set needs to be cultivated in the HCI community as well.

5. Conclusion

Aesthetic experience and criticism both inevitably confront the problem of perceiving the relationships between material cultural expressions and our social reality (our myths, values, ways of being, etc.) on the one hand and an attempt to change that social reality intentionally and progressively on the other, an intention made clear in the five claims laid out earlier in this paper. Design, too, is far more about changing the world than representing it, though certainly it makes heavy use of knowledge representations (e.g., market data, user studies, and social science) to do so.

I have also drawn some distinctions between critical approaches and scientific ones to knowledge production, in part on how they respectively prioritize truth claims and epistemological
innovation. This has important implications for how contributions to the community are evaluated, and one way to clarify this is to consider the different goals of scientific versus humanist claims, specifically, the way scientists distinguish between “description” and “explanation,” contrasted with the way humanists distinguish between “description” and “interpretation.” In the philosophy of science, a description merely offers an account of a state of affairs: “it is raining” or “the puppy keeps biting his human family members.” A scientific explanation goes beyond description by accounting for why a phenomenon is the way it is, e.g., by demonstrating an empirically verifiable causal relationship between one or more scientific laws (e.g., of nature), a given situation, and the phenomenon in question (Rudge, 1998). Explanations help reduce the complexity of reality to a manageable number of hypotheses (e.g., evolution is a hypothesis that explains an extraordinary range of observable phenomena). Explanations can also be used to predict phenomena, from the presence of oil miles below the surface of the earth to chemical combinations that could be made into drugs that fight disease.

Whereas empirical scientists tend to be extremely cautious in the claims they make, critics are often less so. The reason for this comparative lack of caution has nothing to do with rigor, and everything to do with the uses to which the claims are put. Humanists distinguish between “description” and “interpretation,” as follows:

The philosopher Robert J. Matthews believes that we must distinguish between description and interpretation. Because we often cannot settle (or finally determine) the matter with respect to an interpretation, we are less certain about our claims. Our descriptions, however, can be definitely determined because they depend upon things in the work to which we can directly point. We describe the governess as a young woman, and interpret her as sexually repressed. Description depends on being able to know if what we say about a work is true or false. Interpretation depends upon being in a position to know whether we say is plausible, reasonable, or defensible. (Eaton, 1988, pp. 108–109, emphasis in original)

The lowering of the standard from demonstrating an objective truth (as science seeks to do) to proposing a plausible interpretation (as criticism seeks to do) may seem like an extraordinary compromise to those trained in the sciences. But this lowered standard is compensated for by a concomitant raising of the standards of speculative and creative insight. Criticism, as I argued earlier, is committed to raising our perceptual ability, our ability to notice and make sense of the relationships between the formal and material particulars of cultural artifacts and their broader socio-cultural significance. This ability, continually practiced and refined in critical dialogue, over time constitutes a heightened sensibility or competence. It is by means of this competence and this sensibility that our inchoate desires can achieve the clarity and motivation needed to carry them forward. In this way, I argue, interaction criticism can hope to respond to Crampton-Smith’s call to improve interaction design’s awareness of otherwise muddy problems, such as “the symbolic level of mood and meaning, of sociability and civility.” Through that emergent intersubjective awareness, we can hope to create more worthy designs than we could without it.

A discipline of interaction criticism thus has much to offer interaction design. Though criticism is often applied in human domains, such as literature, film, advertising, and the social psychology of groups, it historically grapples with notions increasingly relevant to interaction design: representation, beauty, language, self-transcendence, subjectivity, creativity, interpretation, identity, self-determination, and social justice, among others. Criticism offers theories and rigorous processes that are relevant to the work of contemporary HCI, but I argue that the HCI community needs to engage criticism and humanist theory with the same seriousness that it has engaged cognitive science or social science—and this has not yet happened. Criticism’s emphasis on intervention and change may provide intellectual tools for designers to productively engage in changing how we experience, perceive, understand, and feel about our experiences with technology. It is likely to do so, however, by generally improving designers’ sensibilities and judgments, and not necessarily by means of offering bullet lists of best practices, and/or immediately actionable implications for design. Criticism, when deployed in a community literate in the same theories and exemplars, can also yield verbal accounts—written, presented, conversational—of design choices vis-à-vis understandings of relevant human aesthetic or emotional experience, social and moral values, and a holistic sense of their effects on the most inclusive range of possible stakeholders beyond “the user” or “the team.”

Additionally, this program of research will not only enhance our understanding of the most subjective and difficult to measure aspects of interaction design, but it will also improve the teachability of the field. A standardized vocabulary and body of theory, even with all the usual academic disputes and border wars, provides a domain with a multilevel working space, or clearing, facilitating many forms of relevant discourse. As an example, the theorization of “film language” has been developed sufficiently in film studies to organize introductory student guides (Lacey, 2005), practitioner manuals (Arijon, 1991), philosophical treatises (Bazin, 1971; Metz, 1991), and philosophical dissent (Currie, 1993; Gaut, 2010). Part of being an expert at film is both understanding what the film community understands by the idea of cinematic language and also developing one’s own position on it.

Criticism is already central to applied arts traditions (e.g., industrial design, fashion, architecture, etc.), and I believe the HCI community needs to work to adapt it to meet the needs of interaction design. Harmonious and universal agreement about the nature and applicability of particular critical theories to interaction is neither likely nor necessary. Yet HCI’s “cultural turn” could be profoundly enriched by a committed engagement with the works of scholars that have gone before us who have similarly devoted themselves to questions of aesthetics, culture, and criticism.

Acknowledgments

This article is the culmination of several years of research. Three people above all have shaped not just this article, but the thinking and readings behind it: Shaowen Bardzell, Gilbert Cockton, and Erik Stolterman. Others have also influenced this work at various stages, including (alphabetically) Ann Light, Jay David Bolter, John McCarthy, Jonas Löwgren, Mark Blythe, Peter Wright, and Phoebe Sengers. Anonymous reviewers, including Interacting With Computers editors, have challenged weak and fuzzy ideas and justly demanded iterations. I gratefully thank you all.

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