Beyond Beauty: Towards a Deeper Understanding of Aesthetics in HCI

Paul Haimes
haimes@fc.ritsumei.ac.jp
Ritsumeikan University
Osaka, Japan

ABSTRACT

The word aesthetics, as used in Human-Computer Interaction (HCI), tends to refer to visual characteristics of an interface. Furthermore, it is broadly taken to mean beauty, which, while a significant aspect of aesthetics, is not its only concern. Unfortunately, HCI tends to hold a narrow-sighted view of the topic that often ignores a rich history of discourse. Aesthetics is a key concern of philosophy, considering our perception of the natural and artefactual world. In more recent times, it has grown to consider all of our sensory perceptions of the world around us, where our encounters with everyday objects and environments are two areas of interest. Here, I explain how HCI describes aesthetics and give an overview of philosophical approaches to aesthetics, show where some common ground lies between the two, and suggest how aesthetic categorisations could work for artefacts in HCI.

CCS CONCEPTS

• **Human-centered computing** → **HCI theory, concepts and models**; **Interaction design theory, concepts and paradigms**.

KEYWORDS

aesthetics, aesthetic experience, art, beauty, embodiment, everyday aesthetics, ontology, philosophy

ACM Reference Format:
Paul Haimes. 2021. Beyond Beauty: Towards a Deeper Understanding of Aesthetics in HCI. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '21 Extended Abstracts), May 8–13, 2021, Yokohama, Japan.* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3411763.3450381

1 BACKGROUND

Aesthetics, at its most fundamental, is about how we perceive both the natural and artefactual world. The term aesthetics was coined in 1735 by the German philosopher Alexander Baumgarten in his work *Philosophical considerations of some matters pertaining to the poem* [27]. It derives from the Greek word *aisthetikos*, meaning "esthetic, sensitive, sentient, pertaining to sense perception" [27]. The *Oxford Dictionary* defines aesthetics as "a set of principles concerned with the nature and appreciation of beauty; the branch of philosophy which deals with questions of beauty and artistic taste" [7]. As this definition suggests, beauty is a significant aspect of aesthetics. Objects of beauty, both natural and man-made, often call for contemplative judgments on the part of the observer. However, beauty is not the only concern of aesthetics, and aesthetics has a broader meaning beyond how an artefact is perceived visually and can involve all of the senses. In HCI, Tractinsky was among the first to emphasise that aesthetics can be "a pillar of good design... [it fulfills] psychological needs and influence[s] attitudes and decision making, its practical significance is hard to deny" [42]. It is for this reason that a more fully-formed understanding of aesthetics in HCI is necessary. Yet when reviewing the literature within HCI, it is clear that the word is generally used in such a way as to broadly ignore the rich tradition of this topic within philosophy, and is essentially shorthand for the visual elements of a digital interface. The etymology above and the discussion to follow demonstrate why HCI's conception of aesthetics is limited, but also why it is of interest to the HCI community to broaden its understanding of the term. This article has three goals: (1) to describe to an HCI audience the depth and breadth that the term aesthetics implies; (2) to help those who work in HCI realise how many of their activities could qualify as aesthetic experience; and (3) to point to overlap between aesthetics discourse and HCI research, leading the way for the two perspectives to become better acquainted with each other.

2 TWO VIEWS OF AESTHETICS

2.1 Aesthetics in HCI

One of the problems with how the term aesthetics is used in HCI is that it has not been adequately defined. Consequently, it is conceptually detached from its philosophical underpinnings and risks being used in a trivial manner. The gap between aesthetics as a philosophical inquiry and how it is discussed within HCI has been raised previously by David Heller [21]. Due to the infancy of HCI and interaction design, its aesthetics are not as fully-formed as other more established art-forms:

> When I think about interaction design in comparison with the other "arts" that have deeper roots in aesthetics, the one that strikes me as its closest relative is dance. The aesthetics of dance merge many elements through the choreography... Interaction, too, has various components that evoke a visceral response, which would drive a critique of its aesthetics. I don't think we interaction designers understand well the aesthetics of our profession[21].

It is easy to imagine several elements that comprise interaction: a user interface, an input device such as a touchscreen, gestures,

CHI '21 Extended Abstracts, May 8–13, 2021, Yokohama, Japan

ACM ISBN 978-1-4503-8095-9/21/05.
https://doi.org/10.1145/3411763.3450381

haptic feedback, aural feedback and so on. Despite Heller's article appearing more than 15 years ago, little has changed in the conceptual understanding of aesthetics within HCI. The term aesthetics continues to be used in HCI as a shorthand for 'visual aspects of an interface', or occasionally, 'beauty'.

The role of beauty has been recognised as facilitating the usability of an interface, and, according to Norman, "attractive things work better" [31]. Tractinsky et al offered a seminal work in HCI on the role of beauty in HCI design: *What is beautiful is usable* [43]. In this work, Tractinsky and colleagues built upon the premise from psychology that "what is beautiful is good" [8]. The authors suggested that there was a clear link between aesthetics and usability in interaction:

> The fact that users perceive aesthetically appealing interfaces as indicative of usable systems calls for an integrative approach to interface design which will take simultaneous account of the two seemingly unrelated properties [43].

Since Tractinsky et al's work, the view that beauty fosters usability has been repeatedly challenged (e.g., [20]) and more recent research has suggested that the opposite is true: that *what is usable is beautiful* [19]. Aesthetics in HCI is frequently assumed to refer to a visual yet superficial beauty, which is taken to only apply to the visual characteristics of an interface. Further adding to this limited conception of aesthetics, the *Interaction Design Foundation*'s online encyclopaedia has an entry, also by Tractinsky, named *Visual Aesthetics* [42]. As the name suggests, it too has a limited perspective of what aesthetics is, relying on a dictionary definition from *The American Heritage Dictionary of the English Language*, which claims that aesthetics refers to "an artistically beautiful or pleasing *appearance*" (In [42]). Though that brief definition captures some of what aesthetics entails, it does not fully encapsulate the principles noted in the Oxford dictionary definition (See *Section 1*), nor that it is an entire, significant sub-branch of philosophy. Tractinsky himself notes:

> While the scientific community may have a hard time defining what is meant by the concepts of "aesthetics" or "beauty"—perhaps due to the multiple disciplines that deal with these concepts and which attach different meanings to them, my experience is that ordinary people's intuitive interpretation of the terms correspond closely to the dictionary definition [sic] provided above, which guides research on visual beauty in HCI [42].

Much of the commentary on the *Visual Aesthetics* encyclopaedia entry also points out that HCI's discourse on aesthetics ignores the philosophical tradition [42]. To make matters worse, references to Tractinsky's entry by other HCI researchers perpetuates the view that aesthetics in HCI is merely concerned with "visual appeal or pleasing appearances" of artefacts [32]. It should also be mentioned that in this entry, and in *What is beautiful is usable*, what counts as beautiful in interaction is not clearly defined by Tractinsky and colleagues. Very few HCI researchers acknowledge that aesthetics is a key interest of philosophy and fewer still engage with its discourse. Even Udsen and Jørgensen's ambitiously-titled *The aesthetic turn: Unravelling recent aesthetic approaches to human-computer interaction* [45] failed to acknowledge the millennia-old discussions on aesthetics which debate what counts as an aesthetic experience. Bardzell holds that the ongoing deficiency in how HCI approaches aesthetics is "still working itself through a liminal state of being neither true to its origins... nor particularly grounded in its destination" [1]. HCI needs to reconcile with the philosophical origins of aesthetics before it attempts to ground its own theories in aesthetics.

It is worth emphasising, though, that Tractinsky's early work on the beautiful in HCI was crucial in highlighting that HCI researchers and practitioners ought to consider visual aesthetics as a way of fostering usability. According to Bardzell (one of the few HCI researchers who truly understands the meaning and breadth implicit in the term aesthetics [1]), Tractinsky, in the late 1990s:

> ...decisively undermined prevailing attitudes (especially the high-profile urgings of Norman and Nielsen at the time) that viewed the aesthetic as inherently in conflict with the usable. Tractinsky helped change the field by offering evidence that usability and aesthetics were not, in fact, in conflict [42].

This 'undermining', to me, suggests that contrary to Tractinsky's statement above, there is room in HCI for a broader conception of what the term aesthetics can apply to. And while there are 'multiple disciplines' that deal with concepts of aesthetics, it is philosophy, psychology and art that deal with them primarily, and these disciplines already have a close relationship to HCI [41].

There are, however, a handful of exceptions in HCI that discuss aesthetics in reference to the philosophical tradition and understand that it is as much about *us* as it is the artefacts and phenomena that we engage with. For example, Sonderegger and Sauer's *The influence of design aesthetics in usability testing*[39] acknowledges that aesthetic experience is based on not just an object's qualities, but our engagements with and reactions towards them. Fels' paper *Intimacy and Embodiment: Implications for Art and Technology*[10] too is an impressive rare exception which demonstrates a richer understanding of aesthetics, where *embodiment* — "being living, feeling, bodily entities situated in a physical world" [28]. — not just the visual appearance of an artefact, is fundamental to our aesthetic experience (e.g., Fig. 1). Bardzell's *Interaction Criticism and Aesthetics* showed some promise at reconciling HCI with aesthetics and critical theory, but fell short by only offering clear ways in which critical theory can inform HCI, but not aesthetics more broadly[1] [1]. Bardzell does, though, suggest that analytic aesthetics, which relies on logical reasoning, rather than continental, critical approaches ("cultivated through the deconstruction of knowledge as it appears in — and produces — culture"[1]) would be best-suited to HCI approaches to aesthetics:

> If HCI wants to engage with aesthetics, then rather than making up its own frameworks, it should work with the best aesthetics has to offer. Such an integration might work from the analytic aesthetic tradition, whose shared history with the philosophy of science

[1] A further criticism of Bardzell's paper is that it — perhaps unintentionally — downplays the contribution of analytic philosophy to aesthetics theory in favour of continental philosophy and critical theory, but this is not the place to address that criticism.

> would seem to make it compatible with empiricist and positivist approaches to interaction.

Although the distinction between analytic and continental traditions is not necessarily useful to make when engaging with aesthetics theory, I broadly concur with the view that the best frameworks of analytic aesthetics can inform HCI's views on aesthetics, and offer some ways in which HCI can consider aesthetics categorisations (*Section 3*).

In his seminal book *Emotional Design: Why We Love (or Hate) Everyday Things*, Norman distinguished three levels in which users experience a design artefact: "Visceral Design — appearance; Behavioural Design — the pleasure and effectiveness of use; [and] Reflective Design — self-image, personal satisfaction, memories" [31]. In my view, HCI generally considers aesthetics to only sit at the visceral level, while in philosophy, aesthetics encompasses the visceral, behavioural and reflective. In the following section (2.2), I briefly describe how aesthetics is approached in philosophy. It should be clear from this overview that while HCI has a narrow, fixed understanding of aesthetics, a more comprehensive sense of its scope is necessary.

2.2 A short overview of aesthetics in philosophy

Aesthetics has been a key area of interest within philosophy since the Enlightenment, but draws on philosophical conversations on beauty, which date back to the work of Plato and Aristotle [6]. Although both Platonian and Aristotlean philosophy were picked up by medieval Christian scholars such as Thomas Aquinas [9], it was not until the Enlightenment period that aesthetics was truly established as a key area of philosophy, with both nature and works of art its primary focus. David Hume considered "aesthetic pleasure as an instinctive and natural human response"[16]. Kant considered natural beauty superior to art [14], while Hegel believed that art, being a human creation that (in many cases) attempted to "make the divine visible", was superior to nature [24]. Regardless of the object or phenomenon at hand, aesthetic experience is bound up with our sensuous aspects of the encounter and therefore cannot easily be separated from it [35]. Kant proposed three kinds of aesthetic judgment:

- **judgments of the *agreeable***, meaning those that we simply say that we, personally, like
- **judgments of *beauty***, or, equivalently, judgments of taste (elaborated on in *Section 2.2.1*)
- **judgments of the *sublime*** [14].

The sublime is, according to Kant, when we are in awe, overwhelmed by something bigger than us, where we recognise "our physical powerlessness, but at the same time it reveals a capacity for judging ourselves as independent of nature, and reveals in us a superiority over nature that is the basis of a self-preservation" [25]. Kant's examples of the sublime include ominous cliff-faces, thunderstorms, volcanoes and hurricanes [25]. Modern aesthetics is not just about highbrow objects of the art world or stunning landscapes, but also music [26], architecture [37], design [13] and *everyday aesthetics*, which, although loosely-defined, can apply to any phenomenon that cannot be easily categorised as art, nature or architecture [34]. Much of what is said about beauty and aesthetics:

> ...ignores the minimal beauty of an unpretentious street, a nice pair of shoes or a tasteful piece of wrapping paper, as though these things belonged to a different order of value from a church by Bramante or a Shakespeare sonnet... They are part of the context in which we live our lives, and our desire for harmony, fittingness and civility is both expressed and confirmed in them [36].

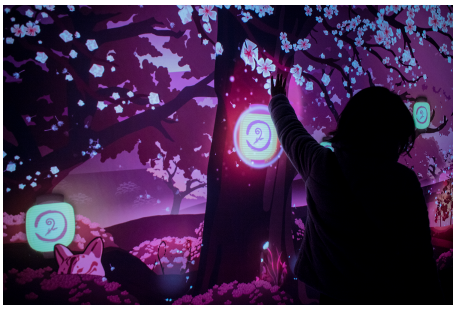

Figure 1: *Tabegami Sama* — "A multisensory foodie fantasy in Japan" [29] — A tactile, interactive exhibition designed by *Moment Factory*, held in Tokyo. Such interactive storytelling relies on somatic experience, putting the body at the centre of our aesthetic engagement. Photograph by the author.

Aesthetic experience applies to all human senses, including smell, touch and taste [35]. This plurality of the senses is one feature that distinguishes *everyday* aesthetics from art-focused aesthetics (at least in the tradition of western art-forms [34]). Focus on both everyday and environmental concerns are two ways in which contemporary aesthetics discourse distinguishes itself from Philosophy of Art [35]. Several of our seemingly unremarkable experiences of the every day, such as eating an apple, involve several of our senses at once, with sight, sound, taste and smell often combining to produce an aesthetically-pleasing experience [35]. Everyday aesthetic experiences matter to all design disciplines because "our positive aesthetic appreciation somehow implies our endorsement of these objects/phenomena" [35]. *Environmental aesthetics*, a recent area of interest, considers the human experience of being in the natural environment and includes environmental (political) concerns [4]. Within its scope are "comparison[s] of nature to art, the relation between the built environment and the natural one, the history and character of landscape appreciation in national traditions and in general, and the aesthetic critique of specific environments" [2]. Environmental aesthetic experiences also includes factors that are rarely found in traditional arts, such as an understanding of geological phenomena, land use history or other spatio-temporal factors [2]. Environmental aesthetics can, therefore, apply to certain areas within HCI, such as interactive architecture, ubiquitous and mobile computing, *GeoHCI* and so on. Given the breadth of what both everyday aesthetics and environmental aesthetics encompass, it is difficult for either to offer definitive guidelines; other than to say that their focus on utility and somatic, bodily experiences means that their discourse bears relevance to HCI's relationship between artefact and user [34]. Nevertheless, some general characteristics

of everyday aesthetics can inform categorisations for HCI artefacts, as described in *Section 3*.

2.2.1 Types of aesthetic engagement. According to contemporary aesthetician Bence Nanay [30], there are four fundamental ways in which aesthetic engagement can be framed.

(1) **Aesthetics as pleasure**. Aesthetic pleasure is "not immediate in the manner of the pleasures of the senses, but is dependent upon, and affected by, processes of thought" [37]; it is a sustained pleasure. However, not all aesthetic experiences are necessarily pleasurable [30].
(2) **Aesthetics as an emotional experience**. That an aesthetic experience of an artefact is an emotional experience is a concept shared across several cultures, including Islamic, Japanese, Chinese and Indian theories of aesthetics. Emotional experiences can linger and be savoured, and evoke multi-modal imagery [30].
(3) **Aesthetics for its own sake**. We engage in aesthetic experiences without any practical considerations [30]. Although not entirely relevant to the more utilitarian applications of HCI, or design more broadly, objects (both human-made and natural) can simply be aesthetically appreciated for their own sake, and this is something to bear in mind for the more artistic, speculative side of HCI.
(4) **Aesthetics as beauty**. Considered the "Kantian", traditional view, but also the most fully-formed.

There is much to say about beauty, and as it is of interest to HCI, it is worth explaining in some detail how beauty is described in aesthetics discourse. Roger Scruton, a contemporary advocate for the Kantian view of aesthetics, described beauty as "consoling, disturbing, sacred, profane... It is never viewed with indifference: beauty demands to be noticed; it speaks to us directly like the voice of an intimate friend" [36]. Beyond European traditions, Japan too, has its own rich traditional conceptions of beauty, such as *wabi-sabi*, which sees natural decay as something to be embraced, *mono no aware*, which sees beauty in the ephemeral, *ma*, which seeks harmony between objects and the negative space between them [33], and *shibusa*, which promotes humility and austerity in objects [17]. *Wabi-sabi* has gained some attention within HCI — perhaps as it could be seen as the antithesis to the push for perfectly-machine-crafted interfaces[2]. Scruton has attempted to define how beauty works in aesthetic experiences:

(1) **Beauty pleases us**.
(2) One thing can be **more beautiful than another**.
(3) **Beauty is always a reason for attending to the thing** that possesses it.
(4) **Beauty is the subject-matter of a judgement**: the judgement of taste.
(5) The **judgement of taste is about the beautiful object**, not about the subject's state of mind. In describing an object as beautiful, I am describing it, not me.
(6) Nevertheless, **there are no second-hand judgements of beauty**. There is no way that you can argue me into a judgement that I have not made for myself, nor can I become an expert in beauty, simply by studying what others have said about beautiful objects, and without experiencing and judging for myself [36].

These characteristics, like beauty-focused views on aesthetics generally, are by no means universally-accepted by all aestheticians (for example, Nanay considers the concept of beauty "superfluous", and as a "placeholder for the character of our experience" [30]), but could serve as a tangible starting point for discussions of beauty in HCI.

2.2.2 Aesthetics and utility. Architecture, being a key area of interest in aesthetics, can assist HCI in articulating the relationship between aesthetics and utility. Ever since Louis Sullivan coined the maxim "form follows function" [40], which should take precedence in architecture and design has been a controversial topic of debate. Conversely, from the perspective of aesthetics, it is difficult to separate a form's utility from the form itself, where "fitness" is seen as contributing to perceptions of beauty:

> To experience beauty, it might seem to imply, we should concentrate on pure form, detached from utility. But this ignores the fact that knowledge of function is a vital preliminary to the experience of form... we experience beauty when we see how the function of a thing generates and is expressed in its observable features [36].

One's knowledge of an artefact's ability to perform a particular task means its utility cannot be easily disassociated from its form. This is a view shared by Yuriko Saito in *Everyday Aesthetics*. When describing the utility of a knife, Saito notes:

> The aesthetic value of a knife consists not only of its visual qualities and its feel in my hand, determined by its surface texture, weight and balance, but, most importantly, by how smoothly and effortlessly I can cut an object with it [35].

As both Saito and Scruton suggest, a form and its function are two aspects of the aesthetic experience bound up in a single artefact and should therefore not be considered in isolation, as they tend to be in HCI (*Section 2.1*). Although this does not imply that conversations in aesthetics have settled the matter of form versus function (for example, Kant considered utility to be a constraint upon a form's beauty [25, 34]), it demonstrates that this conversation has taken a different turn to the framing of it within HCI.

2.2.3 Aesthetics and computing. In recent decades, three prominent areas within aesthetics have grown that are of relevance to HCI. The first, *computer art*, is simply digitised extensions of existing art-forms such as music and two-dimensional or three-dimensional images, comprising "virtually any artwork made with the assistance of a computer" [3]. Secondly, there is *computational aesthetics*, also referred to as *algorithmic aesthetics*, which uses mathematical approaches to generate digital objects [23]. The third, which has grown in the past decade largely thanks to the efforts of Paul Fishwick, is *aesthetic computing* [11], which is the closest that any

[2]I introduced an experimental prototype [18] that incorporated a traditional Japanese wind chime into its design to promote discussion on the history of Japanese aesthetics and how it might apply to HCI interfaces. There are few other examples of research describing how Japanese aesthetic concepts can inform interaction design [44].

computing specialist has come to a holistic understanding of aesthetics. Fishwick's approach to aesthetic computing consists of:

- representing programs and data structures with customized, culturally specific notations
- **incorporating artistic methods** in typically computing-intensive activities, such as scientific visualization
- improving the **emotional and cultural level of interaction** with the computer [11].

It is these last two points in particular which apply to HCI, which need to be recognised as the domain of aesthetics beyond ambiguous proclamations of beautiful interfaces. An art-informed aesthetics of HCI ought to consider a "multitude of cultural aspects, genres, and historical episodes... plurality must encompass both *body* and *mind*, the *material* as well as the *mental*" [emphasis mine]. Fishwick highlights that aesthetics in computing encapsulates "subsets of those found in art (e.g., minimalism, symmetry, the harmony of the golden ratio in architecture)". The least that HCI could do, then, is begin to incorporate art categorisations (See *Section 3*) into its aesthetic descriptions.

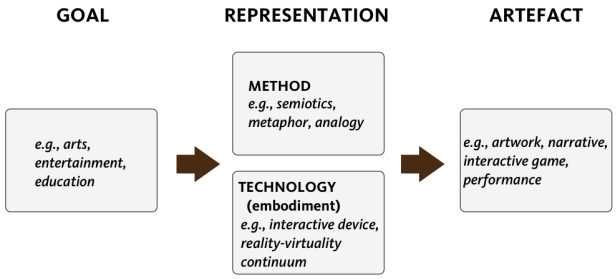

Figure 2: An aesthetic model for HCI, that places meaning (method) and embodiment through interaction at the centre. Based on Fishwick's *Aesthetic Computing Method* [12], but without reference to formal languages.

It is worth acknowledging that commentary on Fishwick's entry on aesthetic computing in the *Interaction Design Foundation*'s online encyclopaedia, suggests that Fishwick has moved away from his broader, art-based approach to aesthetics towards one that is more narrowly-focused on aesthetic interests relevant to his own research: namely, that Fishwick now seems to believe that "aesthetic computing corresponds naturally with mathematical formalism"[3] [12]. Despite this legitimate criticism, Fishwick correctly notes that although traditional arts-based representation (which may include metaphors, semiotics, etc) is essential to computing, the experience of interaction with technology (embodiment) ought to be central to any aesthetics of computing, from the perspective of HCI. Therefore, Fishwick's model — reproduced in Figure 2 without reference to formal languages, data structures, semantics and so on — is a sensible starting point for a firmer understanding of aesthetics in HCI.

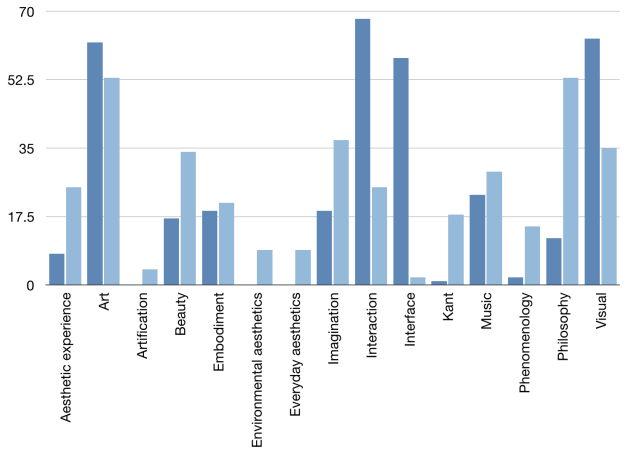

Figure 3: Keyword analysis (as a percentage) comparing 1,635 *ACM Digital Library* (Dark blue) articles on aesthetics with 752 articles from the *Contemporary Aesthetics* journal (Light blue). In HCI, aesthetics is heavily related to art, visuals and interfaces.

2.3 Bridging understandings of aesthetics

In the *ACM Digital Library*, there are 1,635 results for works that feature the keyword aesthetics in their abstract. As a small experiment, I ran some keyword searches related to aesthetics, from HCI and philosophy, on the full text of these 1,635 papers. I also ran the same keyword searches on the entire archive (752 articles) of the open-access journal *Contemporary Aesthetics* (CA)[4] — which is representative of broader topics in aesthetics. In Figure 3, these keywords are presented as a percentage of the two respective sets of articles.

While HCI (unsurprisingly) sees aesthetics as a concern regarding interfaces, this topic rarely receives attention in CA. HCI also tends to have a beauty-focused approach to aesthetics and is more interested in visual appearances than the authors of CA. Contemporary topics in aesthetics, such as environmental aesthetics [5] and everyday aesthetics [35] do not appear to be topics of interest in HCI, even though the latter — with its concern for utilitarian artefacts — is particularly relevant to design and HCI. Interestingly, both HCI and CA see art as a prime concern of aesthetics and this is a promising sign for HCI gaining a broader understanding of aesthetics. Furthermore, embodiment and interaction are somewhat significant keywords in both HCI and CA and suggests where a suitable bridge between HCI and aesthetics theory could be more firmly established.

3 AESTHETIC CATEGORISATION

One of the tasks of philosophers of aesthetics has been to explore the ways in which the aesthetic qualities of objects or phenomena

[3]Fishwick's model now seems to be more concerned with *formal languages* (computation), which are not a primary concern of HCI. Aesthetic computing "must employ a more expansive conception of embodiment, informed by recent discourses in aesthetics and other disciplines" [38]. For this reason, references to formal languages and related concepts have been removed from the proposed aesthetics model for HCI in Figure 2, which places both meaning (method) and interaction with technology at the centre of its aesthetics.

[4]https://contempaesthetics.org

can be analysed. Of all the areas of aesthetics introduced in *Section 2.2*, art, everyday aesthetics and computing aesthetics are the most relevant to HCI and hence, I will draw on some of the categories within those spheres. Categorisations for art objects introduced by Goran Hermeren and Alan Goldman have been influential in aesthetics theory, and Goldman's categorisations account for beauty. It should be easy for HCI researchers and practitioners to see that they involve more than just visual aspects of an interface, but also how these qualities are relevant to artefacts and experiences in HCI. Hermeren proposed five aesthetic attributions:

- **Emotion qualities**: e.g., 'sad'
- **Behaviour qualities**: e.g., 'restrained'
- **Gestalt qualities**: e.g., 'unified'
- **Taste qualities**: e.g., 'garish'
- **Reaction qualities**: e.g., 'moving' [22].

Goldman provided a broader set of eight aesthetic properties:

- **Broadly evaluative terms**: e.g., beautiful, ugly, sublime, dreary
- **Formal terms**: e.g., balanced, graceful, concise, loosely woven
- **Emotion terms**: e.g., sad, angry, joyful, serene
- **Evocative terms**: e.g., powerful, stirring, amusing, hilarious, boring
- **Behavioural terms**: e.g., sluggish, bouncy, jaunty
- **Representational terms**: e.g., realistic, distorted, true to life, erroneous
- **Second-order perceptual terms**: e.g., vivid, dull, muted, steely, mellow (ascribed to colors or tones)
- **Historical terms**: e.g., derivative, original, daring, bold, conservative [15].

However, these methods of categorisation from Hermeren and Goldman overlook the utility which is of concern to both HCI and everyday aesthetics, and the interaction that is at the heart of HCI. According to Parsons and Carlson, typically, objects of the everyday can be characterised as:

- **utilitarian** in nature
- involving us in **multi-sensory** interactions
- and lacking:
  - **determinate boundaries** [i.e., context of use matters, and objects may be used in systems or environments with other objects],
  - **permanence** [we replace our objects, especially electronic devices, regularly] and
  - **meaning** [when compared to artworks] [34].

These categorisations, along with the relevant elements of Fishwick's model (Figure 2), could be combined and re-purposed for analysing artefacts in HCI, in a way such as:

- **Broadly evaluative terms**: beautiful, ugly, sublime, dreary. *What are the broad aesthetic judgments of the artefact likely to be?*
- **Emotional categories**: sad, angry, joyful, serene. *How might the user react to engaging with the artefact?*
- **Behavourial categories**: restrained, sluggish, bouncy, jaunty, garish. *What kind of atmosphere does the artefact communicate to the user?*
- **Formal categories**: unified, balanced, graceful, concise, loosely woven. *How is the form composed?*
- **Representational categories**: interaction, reality-virtuality continuum. *What type of interactive experience does it bring to the user?*
- **Second-order perceptual categories**: vivid, dull, muted, steely, mellow. *How are the colours and materials used perceived?*
- **Utilitarian categories**: functionality, artistic meaning. *Is the work built with a clear utilitarian purpose, or is it a work of art? Will the user understand its purpose (if it has one)?*
- **Sensory or embodiment categories** - visual, auditory, gustatory, olfactory, tactile, multi-modal. *How will the user interact with the artefact?*
- **Contextual categories** - standalone, system, environment. *Is the artefact a standalone object, or part of a larger system or environment?*
- **Meaning categories** - semiotics, metaphors, analogies. *How does the artefact communicate meaning to the user? Are there cultural or social meanings inherent in the artefact?*

Although this list of categories is not intended to be definitive, I share Fishwick's view that computing, and HCI specifically, ought to build an understanding based on aesthetic categorisations from art [11] but acknowledge the utility and embodied interaction fundamental to HCI artefacts. Everyday aesthetics [34] and Fishwick's own work in aesthetic computing [12], both of which account for embodied experience, have provided solid underpinnings that can assist HCI in a more comprehensive understanding of what qualifies as aesthetic engagement.

4 CLOSING REMARKS

HCI has a narrow understanding in how it considers aesthetics, which is in stark contrast to the breadth of discussions on aesthetics within philosophy and related disciplines. Previous attempts from Heller, Bardzell and others to reconcile these two accounts, have, unfortunately, had little discernible impact broadly on how the term aesthetics is used in HCI, and many HCI researchers may not realise many interactive experiences are aesthetic in their nature. Aesthetics is conceptually far broader than just the visual characteristics of an artefact, and the word ought to be used as such. Moreover, unlike HCI, philosophers of aesthetics have made notable attempts to describe the characteristics of beauty in our interactions with artefacts and phenomena. Although by no means indicative of a consensus, turning to philosophical discussions of beauty could serve as a starting point for the same discussions within HCI.

Everyday aesthetics and aesthetic computing are two important areas within modern aesthetics that can help HCI gain a more fully-formed understanding of aesthetics. Fishwick did important work in articulating the bounds of aesthetics in computing, but his recent emphasis on formal languages has meant a lack of focus on interaction. Fishwick's model, then, stripped of its bias towards formal languages, can provide a clear aesthetic framework for HCI. Embodiment and interaction are two themes where HCI and aesthetics clearly have shared interests, putting us humans — with our somatic sensations, judgments and contemplations — at the

centre of aesthetic experience. Fishwick appears correct that art categorisations would be of use in HCI, and these, combined with the utilitarian features of everyday aesthetics and Fishwick's own previous emphasis on embodiment, should provide a useful set of categories for HCI artefacts and their scenarios of use.

Beyond aesthetics, HCI, as a comparatively new discipline, also has the potential to broaden its scope to integrate the tools, methods and discourse from other relevant philosophical areas of interest, such as Philosophy of Technology. I believe it has the capacity to do this, and will do so, over time. After all, from its very outset, HCI has been able to absorb concepts and methods from other fields and this is one of its clear strengths.

ACKNOWLEDGMENTS

Thank you to all reviewers for their insightful comments. This research was partially supported by a Kakenhi research grant from the Japan Society for the Promotion of Science (JSPS).

REFERENCES

[1] J. Bardzell. 2009. Interaction Criticism and Aesthetics. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Boston, MA, USA) *(CHI '09)*. Association for Computing Machinery, New York, NY, USA, 2357–2366. https://doi.org/10.1145/1518701.1519063

[2] A. Berleant and E. Brady. 2014. Environmental Aesthetics. In *Encyclopedia of aesthetics. 2nd, rev.*, M. Kelly (Ed.). Oxford University Press US.

[3] T. Binkley. 2014. Computer Art. In *Encyclopedia of aesthetics. 2nd, rev.*, M. Kelly (Ed.). Oxford University Press.

[4] A. Carlson. 2010. Contemporary Environmental Aesthetics and the Requirements of Environmentalism. *Environmental Values* 19, 3 (2010), 289–314. http://www.jstor.org/stable/25764252

[5] A. Carlson. 2019. Environmental Aesthetics. https://plato.stanford.edu/entries/environmental-aesthetics/

[6] D.E. Cooper. 2019. *Aesthetics: the classic readings.* Wiley Blackwell.

[7] Oxford Dictionary. n.d.. Aesthetics: Definition of Aesthetics by Oxford Dictionary on Lexico.com also meaning of Aesthetics. https://www.lexico.com/definition/aesthetics

[8] K. Dion, E. Berscheid, and E. Walster. 1972. What is beautiful is good. , 285–290 pages. https://doi.org/10.1037/h0033731

[9] U. Eco. 1988. *The Aesthetics of Thomas Aquinas.* Harvard University Press.

[10] S. Fels. 2000. Intimacy and Embodiment: Implications for Art and Technology. In *Proceedings of the 2000 ACM Workshops on Multimedia* (Los Angeles, California, USA) *(MULTIMEDIA '00)*. Association for Computing Machinery, New York, NY, USA, 13–16. https://doi.org/10.1145/357744.357749

[11] P. Fishwick. 2008. *Aesthetic Computing.* MIT Press.

[12] P. Fishwick. n.d.. Aesthetic Computing. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/aesthetic-computing

[13] J. Forsey. 2016. *The aesthetics of design.* Oxford University Press.

[14] H. Ginsborg. 2013. Kant's Aesthetics and Teleology. https://plato.stanford.edu/entries/kant-aesthetics/

[15] A. Goldman. 2018. *Aesthetic Value.* Taylor & Francis.

[16] T. Gracyk. 2020. Hume's Aesthetics. https://plato.stanford.edu/entries/hume-aesthetics/

[17] P. Haimes. 2020. On Japanese minimalism. *Contemporary Aesthetics* 18, 1 (2020). https://contempaesthetics.org/2020/09/24/on-japanese-minimalism/

[18] P. Haimes, T. Baba, and K. Kushiyama. 2016. TaifūRin: Wind-Chime Installation As A Novel Typhoon Early Warning System. In *Proceedings of the 13th International Conference on Advances in Computer Entertainment Technology* (Osaka, Japan) *(ACE '16)*. Association for Computing Machinery, New York, NY, USA, Article 24, 6 pages. https://doi.org/10.1145/3001773.3001830

[19] K. Hamborg, J. Hülsmann, and K. Kaspar. 2014. The Interplay between Usability and Aesthetics: More Evidence for the "What is Usable is Beautiful" Notion. 2014, Article 15 (Jan. 2014), 1 pages. https://doi.org/10.1155/2014/946239

[20] M. Hassenzahl. 2008. 11 - Aesthetics In Interactive Products: Correlates And Consequences Of Beauty. In *Product Experience*, Hendrik N.J. Schifferstein and Paul Hekkert (Eds.). Elsevier, San Diego, 287 – 302. https://doi.org/10.1016/B978-008045089-6.50014-9

[21] D. Heller. 2005. Aesthetics and Interaction Design: Some Preliminary Thoughts. *Interactions* 12, 5 (Sept. 2005), 48–50. https://doi.org/10.1145/1082369.1082400

[22] G Hermeren. 1988. The Variety of Aesthetic Qualities. In *Aesthetic quality and aesthetic experience*, M.H. Mitias (Ed.). Rodopi, 11–23.

[23] F. Hoenig. 2005. Defining Computational Aesthetics. In *Computational Aesthetics in Graphics, Visualization and Imaging*, Laszlo N., Mateu S., B. Gooch, and W. Purgathofer (Eds.). The Eurographics Association. https://doi.org/10.2312/COMPAESTH/COMPAESTH05/013-018

[24] S. Houlgate. 2020. Hegel's Aesthetics. https://plato.stanford.edu/entries/hegel-aesthetics/

[25] I. Kant and W.S. Pluhar. 1987. *Critique of Judgment.* Hackett Publishing Company.

[26] J. Levinson. 1980. What a Musical Work Is. *The Journal of Philosophy* 77, 1 (1980), 5. https://doi.org/10.2307/2025596

[27] L. Manovich. n.d.. Aesthetics. https://keywords.nyupress.org/media-studies/essay/aesthetics/

[28] P. Marshall and E.H. Necker. 2013. The SAGE Handbook of Digital Technology Research. https://doi.org/10.4135/9781446282229

[29] Moment Factory. 2017. Tabegami Sama — A multisensory foodie fantasy in Japan. https://momentfactory.com/work/shows/all/tabegami-sama

[30] B. Nanay. 2019. *Aesthetics: A Very Short Introduction.* OUP Oxford.

[31] D. Norman. 2007. *Emotional Design: Why We Love (or Hate) Everyday Things.* Basic Books.

[32] K. Oyibo, I. Adaji, R. Orji, B. Olabenjo, and J. Vassileva. 2018. The Interplay between Classical Aesthetics, Expressive Aesthetics and Persuasiveness in Behavior Modeling. In *Proceedings of the 32nd International BCS Human Computer Interaction Conference* (Belfast, United Kingdom) *(HCI '18)*. BCS Learning & Development Ltd., Swindon, GBR, Article 15, 10 pages. https://doi.org/10.14236/ewic/HCI2018.15

[33] G. Parkes and A. Loughnane. 2018. Japanese Aesthetics. https://plato.stanford.edu/entries/japanese-aesthetics/

[34] G. Parsons and A. Carlson. 2008. *Functional Beauty.* OUP Oxford.

[35] Y. Saito. 2008. *Everyday Aesthetics.* OUP Oxford.

[36] R. Scruton. 2009. *Beauty.* OUP Oxford.

[37] R. Scruton. 2013. *The aesthetics of architecture.* Princeton University Press.

[38] E. Shanken. 2014. Computing, Aesthetic. In *Encyclopedia of aesthetics. 2nd, rev. ed*, M. Kelly (Ed.). Oxford University Press US.

[39] A. Sonderegger, J. Sauer, and J. Eichenberger. 2014. Expressive and classical aesthetics: two distinct concepts with highly similar effect patterns in user–artefact interaction. *Behaviour & Information Technology* 33, 11 (2014), 1180–1191. https://doi.org/10.1080/0144929X.2013.853835

[40] L.H. Sullivan. 1896. *The tall office building artistically considered.* J.B. Lippincott Co.

[41] D Svanaes. n.d.. Philosophy of Interaction. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/philosophy-of-interaction

[42] N. Tractinsky. n.d.. Visual Aesthetics. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/visual-aesthetics

[43] N. Tractinsky, A. S. Katz, and D. Ikar. 2000. What is beautiful is usable. *Interact. Comput.* 13 (2000), 127–145.

[44] V. Tsaknaki and Y. Fernaeus. 2016. Expanding on Wabi-Sabi as a Design Resource in HCI. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) *(CHI '16)*. Association for Computing Machinery, New York, NY, USA, 5970–5983. https://doi.org/10.1145/2858036.2858459

[45] L.E. Udsen and A.H. Jørgensen. 2005. The aesthetic turn: unravelling recent aesthetic approaches to human-computer interaction. *Digital Creativity* 16, 4 (2005), 205–216. https://doi.org/10.1080/14626260500476564