Computing *en plein air:* Augmented reality and impressionist aesthetics

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Abstract

Recent advancements in augmented reality (AR) technology have begun to position the medium for widespread adoption and cultural impact. But these ongoing technical victories give way to pressing challenges in the area of content creation. As the page differs from the screen, so too do the hybrid design spaces of AR differ from the virtual reality of the desktop. Caught in the transition from the personal computing era to the ubiquitous computing paradigm, multimedia producers in many fields will need to adapt to AR platforms. To which traditions, then, might we turn for aesthetic models? This article aims to incite an aesthetic transference between French Impressionist painting and AR media practices, while acknowledging the influences of other avant-garde legacies. I draw upon a transdisciplinary matrix of scholarship in media theory and visual culture in order to emphasize the relevance of Impressionism as an art historical precedent for understanding contemporary AR projects, and to suggest how Impressionist principles of composition might inform AR media aesthetics.

Introduction

The cultural status of augmented reality (AR) has shifted dramatically since Boeing researcher Tom Caudell coined the term in 1990. Witnessing the first decade of AR research, which revolved largely around prototypes of clunky headgear and demos of basic imagery projected from quick response codes, novelists and filmmakers captivated popular imagination with sci-fi scenes of how life might be if this technology ever became robust, sophisticated, and mainstream. *Minority*

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Report (2002), for instance, featured built environments embedded with transparent screens and sensor networks, which interfaced with tiny microchips implanted in people's eyes to deliver a barrage of personalized advertisements to them as they shopped for clothes or navigated a building. *Rainbow's End* (2006), like *The Terminator* (1984) before it, presents a dystopic future in which the AR medium has become a vehicle for militaristic world domination, as if the capacity to overlay and attach digital media content to places and people would lead invariably to new levels of surveillance and subjugation. Most characters in these narratives are portrayed as pure consumers (if not targets) of AR content, and so they emote a sense of disorientation or inefficacy. In spite of these literary and cinematic nightmares, however, leaders in various fields *today* are optimistic about the potential for AR applications to enhance education, tourism, publishing, retail, architecture, manufacturing, and cultural heritage.

Since 2010, popular discourse on AR has turned toward the promise of everyday use scenarios, which have become more pronounced with the convergence of AR and smartphones. Of course, militaries fund and prototype numerous AR systems as platforms for delivering actionable intelligence to combatants in real time; the Naval Research Laboratory, for instance, has been rigorously field testing and refining the Battlefield Augmented Reality System (BARS) for over a decade (Julier et al., 2000; Livingston et al., 2011). But militaristic scenarios now constitute just one of many development areas. Of the multitude of technologies being invented worldwide, the *2011 Horizon Report* (Johnson et al., 2011) identified AR as one of two technologies most likely to change the face of higher education, beginning as early as 2014. Magazine publishers from *Esquire* to *Playboy* have sought to revitalize their print editions by incorporating AR icons that effectively link their pages to exclusive digital content. Retailers oscillate between excitement and fear over the emergence of AR 'pop-up stores', which bring e-commerce to a target audience at a particular place and time, without any brick and mortar expenses. Archivists and museum professionals around the world now display their digital collections out in the streets; in London and Philadelphia, the historical photographs of a city block are readily visible to smartphone users as they move through that same space.

Still, at the time of writing, these apparent trends are referred to in tech journalism as early experiments. While smartphones and tablets have made AR feasible for everyday use, industry leaders believe that AR is in its technological infancy and that the cultural impacts of current uses are but the ripples of an impending media revolution. Claire Boonstra (2012), a co-founder of Layar Augmented Reality, exemplifies this position when she insists that AR will become 'the next mass medium' once it moves from mobile devices to *wearable* devices. Indeed, as AR coevolves with advancements in wearable computing and nanotechnology, technologists expect to bring to market AR glasses, AR contacts, and similar iterations in the near future.

What all of these predictions and forecasts take for granted is the idea that, once the hardware becomes optimized, people will start to find AR compelling enough to engage with on a regular basis. I contend, however, that AR will not be primed to become a mass medium until early adaptors – be they technologists, scholars, or designers – become more attentive to matters of content creation. More seamless hardware may be necessary, but it is not sufficient in itself. Merely consider the bulk of content now available on AR platforms: Wikipedia entries, restaurant reviews, real estate listings, etc. Save for an avant-garde of noteworthy exceptions, several of which are discussed below, current AR mediascapes simply redistribute information from the Web on a geographical basis. Rather than searching for a company's website on Google, AR users can point their phone at a company's building to access the website, for example. While this phenomenon is not without significance from the standpoint of information architecture, the experience yields little aesthetic or rhetorical value aside

from an initial shock and awe moment. Alexis Madrigal, a senior editor for *The Atlantic*, tested Google's Field Trip app and imagined how this geo-publishing platform might be experienced through the lens of Google's Project Glass. Noting critical differences between locative AR apps and standard Web browsers, Madrigal (2012) concludes that the projected futures of AR demand 'a new kind of media' that will challenge traditional assumptions about genre, audience, and context:

> No one publishes *a city*, they publish a magazine or a book or a website. If we've thought about our readers reading, we've imagined them at a breakfast table or curled up on the couch or sitting in their office. No one knows how to create words and pictures that are meant to be consumed *out there* in the world.

Conventionally, literary texts, artworks, and films exist on an opaque page, canvas, or filmstrip; they are stored, circulated, and experienced in libraries, galleries, or theaters – places designed for immersive contemplation, bracketed off the distractions and disruptions of open air spontaneity.

In short, the technological conditions of mobile AR support new writing and design spaces that demand new aesthetic and rhetorical principles. As the page differs from the screen, so too do the hybrid spaces of AR differ from the virtual reality (VR) of the desktop. Caught in the transition from the personal computing era to the ubiquitous computing paradigm, multimedia producers in many fields will need to adapt to AR platforms. This article focuses principally on the cultural development of the AR medium; in particular, my aim is to establish a historical vantage point for generating aesthetic insights that may help orient digital design and content creation in AR environments.

To which traditions, then, might we turn for aesthetic models? Cultural critics writing about emerging technologies commonly employ historical practices associated with traditional media as analogies for interpreting digital practices. For instance, Lev Manovich (2002) turns to Dziga Vertov and other avant-garde filmmakers in order to conceptualize 'cut and paste' and other new media operations as homages to collage and montage techniques developed in the 1920s. In addition to posing analogies (and contrasts) for the sake of analysis and criticism, Bolter et al. (2013: 37) assert that the humanistic study of media can also provide unique frameworks for 'develop[ing] a kind of *media aesthetics* that can guide designers as they explore new forms of digital media'. Bolter et al. present the history of panoramas in parallel with their discussion of AR browsers, suggesting that critical awareness of the former might inspire design thinking relevant to the latter. After charting the emergence of panoramic paintings as a 19th-century form of exhibition, Bolter et al. (2013: 41) envision contemporary scenarios in which museum professionals might design AR panoramas that overlay a displayed artifact and provide a visual representation of the artifact's original context. The comparison also exposes a fundamental difference that distinguishes AR panoramas from the panoramic tradition in prior media, from photography to VR. That is, with mobile AR, viewers encountering a composed work remain more or less aware of their surroundings because the medium is fundamentally porous.

Building off of Bolter et al.'s approach – its insights and methodology – I aim to contribute to AR media aesthetics by examining contemporary artistic practices in light of latent connections with French Impressionist painting. Impressionists painters, spurred on by mobile inventions like paint tubes and the box easel, developed the first aesthetic and methods of composition systematically tailored around painting *en plein air*. Similarly, AR beckons artists and designers to create digital media projects that break with the logic of the studio and the lab: the VR paradigm that has dominated popular computing since the 1990s. Indeed, Manovich (2006: 237) argues that AR – though not exactly the opposite of VR – is a new paradigm that 'needs a structure, a politics, and a

poetics'. A steady stream of aleatoric and place-based art practices proliferated in the wake of Impressionism throughout the 20th century; several of these traditions (e.g. kinetic sculpture, land art, improvisational street theater, French New Wave cinema, etc.) carry their own potential to jump-start efforts to theorize and generate innovative cultural expression in AR. My rationale for concentrating on Impressionism here is that, beyond the *en plein air* link, the movement's early history models a way of seeing the world in the image of media effects, as well as an artistic precedent for developing design principles inspired by the invention of a new media technology. I will unfold the analogy with Impressionism – and its generative value for AR media aesthetics – by focusing on two themes: techniques of observation and principles of composition. Inquiry into these respective topics will be initiated by analyses of the place of Impressionism in art historical narratives, the critical reception of Impressionist exhibitions in Paris, and Monet's reflections on his own artistic practices. The insights garnered from Impressionism will provide through lines for conceptualizing contemporary AR projects and the medium's aesthetic affordances in the context of recent scholarship in media theory.

Techniques of observation

Impressionism and photography

Impressionist painting and early photography are linchpins in many historical accounts of modern art. The most familiar narratives characterize the Impressionists as a band of romantic drifters who, at the onset of photography's cultural ascent, willed imaginative ways of seeing that embraced the radical subjectivity of an individual's visual experience, and thus defied the normative, mechanical realism captured by photography. Put differently, the advent of photography frees painters from the medium's traditional investments in mimesis. Art historian Jonathan Crary (1990: 4) objects to such narratives, insisting that this 'myth of modernist rapture' is premised upon an ill-informed 'binary model of realism versus experimentation'. In his rebuttal, Crary (1990: 5) shifts the temporal focal point; he contends that Impressionism and photography in the 1870s are the symptoms of a more significant technocultural development that occurred during the 1820s: the formation of what he terms 'the observer'. The perceptual techniques of the observer – possibilities conditioned by optical technologies like the stereoscope – rest upon the notion that visual experience is subjectively constructed and, in some cases, technically manufactured. Impressionism and photography, then, both serve as mature expressions of this techn(ont)ological reconfiguration, whereby people begin to conceive of perception as a contingent activity that is open to (if not inherently interrelated with) various intellectual, psychological, and technical processes.

Both Crary's alternative account and the conventional narratives he critiques, however, remain oblivious to a third position argued by Aaron Scharf in his 1974 book *Art and Photography*, which has been largely overlooked by historians of painting. Scharf posits that the most novel stylistic elements of Impressionist painting were in fact inspired by the painters' exposure to early photography – its accidents and glitches, in particular. For the purposes of this article, Scharf's thesis is immensely provocative and merits close attention. If we can understand Impressionism as a way of seeing the world *in the image of media effects*, then we will have established a productive basis for further analogical insights relevant to AR media aesthetics.

When the artists we now call Impressionists (e.g. Monet, Renoir, Pissarro, etc.) came to Paris in the 1860s, they arrived as Realist landscape painters amid the first wave of photography's

industrialization (Scharf, 1974: 125; Venturi, 1941: 35). For the first time, professional photographs and stereoscopic images circulated as popular spectacles readily available to a mass viewership, though amateur cameras would not be marketed until the turn of the century. The spread of photography incited debates among painters who felt themselves torn between imitation and expression; many artists began working from photographs, though they rarely admitted to it for fear of losing credibility with dealers and patrons (Scharf, 1974: 125). To date, no documentation confirms the notion that French Impressionists painted directly from photographs; in any case, it is a mystery of little aesthetic importance. As Scharf suggests, the paintings themselves attest to a greater, figurative dimension of photographic influence at the level of perception, which furnished the Impressionists with techniques of observation as they painted *en plein air*.

For instance, Scharf presents striking parallels between the Impressionists' brushwork and 1860s photographs of Parisian settings, which had been on exhibit throughout the city. Whereas portrait and still life photographs of the period could capture images that passed as exact likenesses, photographs of modern urban life were far from 'realistic'. Due to slow exposure speeds (by current standards), photographic images tended to blur whenever pictorial subjects were in motion: pedestrians walking the sidewalks were rendered into 'anonymous smears', flags in the wind lost their angular contours, and horse-drawn vehicles left only 'ghostly vestiges' (Scharf, 1974: 129). These surreal distortions, which technologists regarded as a problem to be solved, contain the same stylistic tendencies that came to define Impressionist painting.

While these features were common in early urban photography, the Impressionists' treatment of pedestrian figures, for example, 'seems entirely new in art [i.e. painting]' (Scharf, 1974: 129). Further stylistic commonalities – intense contrast of light and dark areas, elevated viewpoints, diffusion of details – collectively support Scharf's (1974: 126) claim that '[the Impressionists'] desire to record the transitory character of natural light and shade, amounted to a kind of perceptual extremism which was germane to photography itself'. And yet, the first art critics writing about Impressionism (and most since then), failed to note this transmedia influence, which appears undeniable from the side-by-side image comparisons collected in Scharf's book.

On the basis of Scharf's analysis, one might reframe Lionello Venturi's esteemed claims about the nature and significance of the Impressionists' artistic achievement. According to Venturi (1941: 38), 'What the Impressionist painters actually accomplished was the finding of a form closer to the first impression of the appearance of things than other painters had'. Venturi (1941: 38) credits this innovation to the artists' 'vivid sensibilities' and insists that 'their mind[s] [were] sufficiently free of traditional principles of abstract form to undervalue their impressions'. The notion of an 'innocence of the eye', which Venturi borrows from Ruskin and Monet, is conceivable only in the wake of 19th-century advancements in optical technology (Crary, 1990: 66). The techniques of observation that propelled Impressionism were not the equivalent of pressing the reset button on Western artistic consciousness. Rather than learning to see like a child or a blind man 'suddenly gifted with sight' (Ruskin, 1858: 22), Scharf (1974: 131) maintains that Monet, consciously or subconsciously, painted things 'not as the eye would see them but as they might be recorded by a camera'. From this angle, the Impressionist aesthetic is not one of transcendence but of *transcoding*. That is, instead of cultivating a natural or 'naïve' subjectivity in opposition to what Venturi calls the devices of the 'mechanical arts,' the Impressionists' innovations may be attributed, at least partially, to their ability to transcode the basic operations and visual logic of photography into their perceptual experience and, subsequently, their principles of composition.

Technics of perception

Understood in this manner, the relationship between Impressionist aesthetics and early photography exemplifies Bernard Stiegler's philosophical thesis that contemporary recording technologies have complicated the phenomenology of perception. Stiegler's argument, which culminates in a reworking of Edmund Husserl's schema of retentions, is premised upon his radical conception of technics. Through his *Technics and Time* series, Stiegler routinely defines *technics* as 'organized inorganic matter'. The term refers both to the history of fabricated objects (e.g. flint, hammers, pencils, computers, etc.) and to domain of *techne* – all techniques, practices, and skills involved in 'in-forming matter' or making (something with) technology (Stiegler, 1998 [1994]: 93). For Stiegler, the invention of technical objects creates horizons of social becoming within which new techniques develop through experimentation, play, and adoption. Similar to Manovich, Stiegler (1998 [1994]: 34, my emphasis) argues, 'An essential part of innovation is accomplished through *transfer*, whereby the functioning of a structure in a technical apparatus is *analogically* transposed into another domain'. If Impressionism can be regarded, first of all, as an innovative technique of observation, which was inspired by photography in no small measure, then it behooves us to account for the technical evolution in (and perceptual ramifications of) visual media technologies since photography, so that we might comment more specifically on the aesthetic transfer to be gained by conceiving of AR practices in relation to Impressionism.

Stiegler's critique of Husserl clarifies the essential technicity operative in any technique of observation, and he also supplies a techno-logical bridge that implicates a tacit link between photography and AR. Stiegler accuses Husserl of bracketing out technics in his accounts of perception and memory. In particular, Stiegler problematizes Husserl's phenomenological description of listening to a melody. Husserl postulates two categories of retention: primary and secondary. *Primary* retentions are synonymous with 'immediate' perception and are regarded as properties of whatever phenomena are present to consciousness *right now* (Stiegler, 2011 [2001]: 14). As one hears a melody, in Husserl's example, the echo of a prior note is retained as a residue against which each succeeding note is heard. This cumulative resonance is what distinguishes melody from sheer noise. Grounded resolutely in perception, primary retentions are never imaginary; they are always presented to consciousness by an object or flux that is present (Stiegler, 2011 [2001]: 16). *Secondary* retentions are activated by intentional or involuntary recall; consciousness projects to itself the properties of a past-present phenomenon that has been stored in one's living memory. Because Husserl concerns himself only with 'lived experience', he does not address any retentions that accrue outside of human perception and individual memory – retentions which Stiegler believes play a constitutive role in the basic activities of consciousness (Stiegler, 2011 [2001]: 21).

Stiegler thus introduces a third term – 'tertiary retention' – to theorize the interplay of recording technologies and so-called immediate perception and living memory. When we listen to a melody that has been recorded (and view a photograph or film), the separation between perception and imagination fundamental to Husserl's framework proves to be false. In such cases, the melody remains exactly the same, yet one inevitably has 'two different musical experiences' (Stiegler, 2011 [2001]: 21). The retained phenomena of a past-present experience (distinct from the 'just past') supply consciousness with criteria that (re)orients perception qua primary retention, which is always a process of selection, due to retentional finitude. In contrast to Husserl's schema, Stiegler (2011 [2001]: 18) ties his fluid theory of perception to a critical awareness of technics: 'the intervention of the imagination at the heart of perception, is only made *obvious*

by tertiary retentions – by a phonogram [in this case]'. Furthermore, the 20th-century recording technologies and audiovisual media generated a new mode of temporal experience, which, in turn, informs the perceptual conditions unique to AR and augmented spaces.

For Stiegler, the historical progression from photography to film to television marks the emergence of 'real time'. The real time of contemporary technics, beginning with photography, can be distinguished from deferred time of orthographic writing (painting included). In the contexts of alphabetic literacy, people can easily differentiate between their perception of live events and their engagement with forms of tertiary retention; granted, one's engagement with any tertiary artifact can shape the criteria (i.e. secondary retention) that directs his or her lived perceptions (i.e. primary retention). Nevertheless, this impact occurs over time – it is deferred – on account of the technics of writing. Stiegler traces the dawning of real time to what he calls (following Roland Barthes) the 'reality effect' of photography. That the photograph, at least in theory (see above for exceptions), manifests a 'conjunction of the past and of reality' makes for a temporal situation very different from that of linear writing: 'The instant of the capture coincides with the instance of that which is captured' (Stiegler, 2009 [1996]: 16). Film transforms the photographic image into a temporal flux, so as to render audiovisual objects that correspond to the stream of human consciousness; this is Stiegler's explanation for the immense global appeal of cinema, television, and digital video (2011 [2001]: 9–12).

Stiegler's analysis of real time culminates in an in-depth look at the live feeds of televisual news broadcasting. Live television incorporates the consciousness-like audiovisual flux of cinema *and* amplifies the photograph's reality effect, such that the instant of projection coincides (more or less) with the instant of recording. After singling out broadcasts of the first moon landing as a model for the real-time event, Stiegler (2009 [1996]: 242) writes, 'If a distinction between primary and tertiary memories remains possible ... here it has nonetheless become absolutely formal and empty'. Hence, the real time of live footage scrambles Husserl's schema of retentions even further.

Streams of real-time information events signal a general convergence of perception and recording, of indexicality and digitality. The 'here and now' of real time is always an *already there*. Live footage is promoted and archived as an event before having happened. Hence, real-time media do not constitute a departure from technological memory, but rather the arrival of a new paradigm in memory's exteriorization. For instance, once accustomed to the global positioning system (GPS) devices, drivers tend to make navigational decisions in the real time of a techno-geographical gaze, and not primarily on the basis of their own historical consciousness. With mobile and wearable AR, the synchronization of primary and tertiary retention, initiated by photography, has intensified to an unprecedented degree. For the Impressionist painters, the technique of observing the world in the image of media effects was a figurative process that manifested in differed time; for AR artists and designers, this process becomes literal and happens in real time.

Real-time mediascapes

Digital artists and cultural institutions now experimenting with AR are currently in the position to do for computing what the Impressionists did for painting in the 19th century. Whereas many early Impressionist paintings depict urban scenes in a style informed by 1860s urban photographs, mobile AR projects tend to transcode the logic of digital image layers onto traditional practices associated with installation art, exhibition curation, and public media. Collectively, the following examples – most of which are based in New York City – forecast the potential for a more widespread transformation of public spaces and built environments, which may take hold if, as AR

technology continues to evolve, a critical mass of designers and content creators incorporate such techniques of observation into their media practices.

Moreover, at the level of subject matter, the Impressionists' desire to paint the people and places of everyday Parisian life – a radical departure from French artistic conventions of the period – foreshadows the ethos of spatial-institutional transgression common among several of the most noteworthy AR works to date. In addition to fleeing the studio in favor of *plein air*, so to speak, AR artists – as their projects' titles emphasize – have *invaded* museums and galleries, *taken over* ad space, and *occupied* financial districts. Certainly, the more overtly politicized avant-garde groups of the 20th century (e.g., Situationist, Fluxus, etc.) influence current AR artistic agendas; still, I maintain that Impressionism adds a valuable source of stylistic resonance – alongside these other art historical legacies – for developing an AR media aesthetics to support design thinking and cultural criticism. In the Fall 2010, artists Mark Skwarek and Sander Veenhof organized *We AR in MoMA*, an 'augmented reality art invasion' at New York's Museum of Modern Art. The exhibition, which bypassed the museum's curators, included a wide range of digital works appearing (for smartphone users) in the same gallery spaces as the physical, curated exhibits. In many cases, the digital works grafted onto pieces from the MoMA's collections (in the tradition of Dada and appropriation art), while others took a more conceptual or performance-based approach, such as Skwarek's piece that situated author Bruce Sterling's avatar in the MoMA lobby and included a thought bubble broadcasting a live feed from Sterling's Twitter account.

In addition to transforming the conditions under which the museum's exhibitions are normally displayed, the invasion-exhibit – which the MoMA staff actually came to embrace – raises several questions concerning the future of cultural institutions. How does the space of a museum change now that practically any digital work can be virtually exhibited within its walls? What becomes of our relations to exhibited artworks when user-generated, social media commentary is seen alongside the expository text panels that accompany professionally curated collections? *The Invisible Artist* (2010), a London-based AR project created by John Goto and Matthew Leach, poses as a guide to the city's top galleries. Approaching the entrance of each gallery, users are greeted by a well-dressed, headless 3-D figure that provides historical commentary about these institutions. The commentary, in spite of the figure's pleasant demeanor, assembles a discerning assessment of the galleries' curatorial practices, effectively 'satirizing the bureaucracy and lack of diversity of London's contemporary art scene' (Goetz, 2011). In turn, the figure's missing head becomes an emblem for the artists whose work is routinely marginalized for failing to appeal to the finite tastes of appointed Academicians (in the case of the Royal Academy of Arts). Here, one cannot help but note the project's obvious resonance with the Impressionists whose submissions to Paris's illustrious annual Salon were overwhelmingly rejected by the French Academy.

Indeed, AR works often echo quasi-Impressionist sentiments, such as the will to resist, expose, and subvert various institutional criteria by pursuing a kind of revolution of everyday life. In two 2011 NYC AR projects – *The AR/AD Takeover* and *AR Occupy Wall Street* – what I have qualified as an Impressionist technique of observation becomes infused with the Situationist tactical imagination. Critics writing about locative media often appeal to Situationist notions such as *derive*, *detournement*, and psychogeography in order to interpret contemporary projects (see McGarrigle, 2010; Paul, 2012). Parallels with the Situationist movement are illuminating, but these approaches seem best suited for thinking about mapping projects that use GPS to either direct or trace users' paths through a city, sometimes generating cartographic traces supposed to represent alternative productions of social space (e.g. *Amsterdam RealTime* [2002]). While *The AR/AD Takeover* and *AR Occupy Wall Street* certainly invoke Situationist politics, both projects are less about the

visualization of locative data in relation to virtual maps, and more about designing 'a way for the user to experience the world around her as a mixed and hybrid reality of information on the one hand and physical location and embodiment on the other' (Bolter et al., 2013: 44). In other words, the chief aim of both projects' in-mixing of vibrant matter and composed imagery, akin to impressionist paintings, is to transform viewers' perceptions of places they inhabit, as opposed to generating and displaying virtual traces of people's movement through those places.

The AR/AD Takeover targets one of the most ad-ridden places in the world: Times Square. Times Square epitomizes the discursive conventions that have, in almost every modern industrialized city, largely restricted the production of media in urban environments to signage made by companies or government organizations with the intent to promote corporate or utilitarian interests. Realizing that AR holds the potential to disrupt this dynamic, BC Biermann and Jordan Seiler (2011:1), the project's creators, endeavored to 'use street level ads and billboards to trigger a city-wide curated art installation in augmented reality'. As such, the project transforms one's relationship with ads from passive consumer to creative citizen; no longer an untouchable facet of a city's infrastructure, ads and ad space can be regarded as contestable grounds to be overlaid with provocative juxtapositions and visual counter-arguments, or simply as blank canvases for playful abstractions and otherwise arbitrary digital overlays. *The AR/AD Takeover* thus presents a fruitful model for imagining digital public spheres that may be radically different from the hyper-consumerist depiction of AR and advertising in *Minority Report*. As content creators-curators in potential, equipped with apps that enable custom filtering, 'citizens will possess the choice of what messages, if any, they consume [or produce] in public space and whether they are commercial, artistic, political, or social' (Biermann and Seiler, 2011: 3).

Skwarek's *AR Occupy Wall Street* suggests content variety and user choice will also extend to the ways we perceive building facades and the institutions they house. As a crowdsourced initiative, *AR Occupy Wall Street* was a wide-ranging collaboration between artists and activists; some of its most intriguing overlays were concentrated around the New York Stock Exchange. For example, one piece transforms the building's grand columns into a slot machine, while another blankets the visual field with a streaming NYSE stock ticker, such that pedestrians moving in the background of the frame are obscured by arbitrary flows of financial data. In both cases, the metaphors occur *at the interstice* of live urban geography and programmed multimedia. The technique of observation attends to the range cinematography potential to the experience ecology of a city block. Buildings, traffic, weather, pedestrians, and street debris – these are all inevitably constitutive elements of AR works, just as they were for Impressionist paintings.

Principles of composition

The unfinished

Impressionism was, of course, more than a way of seeing; the transcoding of photographic media effects bled from perception to pictorial composition. While the technics of early photography clearly inform Impressionist aesthetics, the encounter was by no means deterministic. Indeed, had they not developed a loose set of *painterly* aesthetic principles, the Impressionists would have been remembered as little more than gimmick artists, whose novelty would have worn off once photography became acculturated as a mass medium.

One of the most amusing events in the story of Impressionism lies in the 1874 critical reviews of what historians now call the 'First Impressionist Exhibition'. These critics were blind to the trace

of photography, as noted above, and several did in fact dismiss the Impressionists' style as gimmicky. Most importantly, the critics – whose reviews read like a contest amongst themselves to see who could best ridicule the paintings – unwittingly identified one of Impressionism's most generative principles, which also seems to be echoed in recent aesthetic discussions of ubicomp and the AR medium.

Shown at the 1874 exhibit, Monet's *Impression, Sunrise* emerged as an emblem for the movement during its early years. In addition to inspiring critic Louis Leroy's coining of 'Impressionism' (which he used scornfully), this painting was the object of Leroy's (1874) quintessential comment: 'Wallpaper in its embryonic state is more finished than that seascape'. Reviews by Ernest Chesneau and Jules Castagnary also focused on the notion of finish in their back-handed compliments of the exhibition. Chesneau (1874) labeled Monet's *Boulevard des Capucines* 'a marvelous sketch', before revealing his underlying position: 'Clearly, this is not the ultimate statement of art in general, nor of this art in particular. This sketch must be transformed into a finished work.' Despite a lavish assessment of several artists' potential, Castagnary (1874) nonetheless dismissed Impressionism as a flimsy, unfounded exaggeration of a minor tendency in more established styles of painting (what he termed 'the unfinished'), and ultimately stated that the impressionists are 'soon to perish where they stand'. In each review, the mockery, the satire, and the objections hinge upon the assumption that fine art entails a high degree of finish: figures should be well defined and every aspect of the scene rendered in painstaking detail. Not until roughly a hundred years later would continental philosophers champion the unfinished in their reflections on modern literature, music, and visual art (e.g. Barthes's 'writerly text', Eco's 'open work', and Cixous's 'works of being').

Stylistically, Impressionism emerged in point-by-point contrast to the then-critically-acclaimed standards of 'academic art', and in many ways this dichotomy foreshadows critical differences between AR and VR. Academic painters (who dominated the annual Salon) typically portrayed subject matter associated with 'history, myth, and imagined worlds' (Schapiro, 1997: 10). Even in portraits of their contemporaries (e.g. William Bouguereau's *Breton Brother and Sister*), academicians contrived the scene so as to immobilize their human subjects in a classical pose, whereby all is clear and discrete, without a hint of movement or change. In accordance with these conventions, a painting is not finished until no apparent trace of the painter's brush remains. By contrast, impressionist paintings are 'discernibly constituted by the stroke', and this, for art historian Meyer Schapiro (1997: 51), is their key feature – one that is all the more evident when seen in person. Whereas most prior styles of Western painting work to conceal artifice, the Impressionists emphasize materiality and movement, both in their representation of the landscape and in their material engagement with the paint itself. Paradoxically, Impressionist composition renders 'both the illusive image-appearance of a scene in deep space and the tangible substance of the painting as effects produced by the artist on the framed surface of the canvas' (Schapiro, 1997: 52). That is, the twofold style indicates a representational or virtual image, but does so in a decidedly painterly and materialistic manner.

Unlike academic art, Impressionist paintings present scenes of a world constantly in flux. 'Objects' appear rough and permeable, not for the artist's uncertainty, but because nothing alive is finished. The founding gesture of Impressionism is 'the dissolution of the line' (Schapiro, 1997: 9). Lines stabilize the play of phenomena into defined objects with essential properties. In metaphysical terms, to delineate objects via lines is to finish the impression and to institute a hierarchy of the intelligible over the sensible; or, borrowing from Deleuze and Guattari (1983 [1972]: 3), it is to experience nature as a product rather than as 'a process of production'. Impressionism, as an aesthetics (and even a metaphysics) is *not rooted* in intelligible essences of defined objects; rather,

it is *uprooted* by the accidents of the sensible. Photography shares this dynamic. As an indexical document, the photograph is a measure of singularity. This is why Stiegler qualifies Barthes's 'punctum' as 'photography's essential phenomenon' (2009 [1996]: 19). The real time of photography allows it to capture what remains unnamable in the image, owing its irreducibility to cultural codes – codes that have themselves accumulated from the deferred economy of linear writing, which can no more capture the singularity of an instant than the rhythmic economy of living memory could retain abstract, prosaic statements (see Havelock, 1963).

As indicated above, AR intensifies the real time of photography, such that the scene of online media consumption can become more integrated with the material flux of geography. If Impressionism developed painterly principles of 'unfinished' composition that transcoded photographic media effects at the level of artistic practice, then what design principles might theorists and practitioners surmise for an AR media aesthetics premised upon a transcoding of digital image layers?

Layers

On a concrete level, Impressionist practices revolve around a unit of composition that may help situate and orient AR design practices. When asked to describe his approach to painting, Monet (cited in Schapiro, 1997: 49) once replied, 'Merely think, here is a little square of blue, here is an oblong of pink, here is a streak of yellow; now paint, just as it looks to you, the exact color and shape until it gives you your own naïve impression of the scene before you'. The principle of composition is to abstract *shapes of color* from any subordination to an intelligible signified: 'to no longer "paint water lilies" while painting water lilies' (Cixous, 2000 [1991]: 589). Conversely, we might describe the AR medium in terms of metonymy; drawing upon users' familiarity with personal computing, designers abstract *layers of multimedia* from their subordination to GUI/WIMP frameworks that have anchored the desktop metaphor.

Layers have long been a commonplace form essential to authoring software such as image, audio, and video editing programs. In Photoshop, for instance, image files are comprised of discrete 'layers' that can be manipulated independently. Since *The Language of New Media*, Manovich has returned often to the significance of layers in software; his recent discussion of digital image layers in 'Inside Photoshop' (2011) resembles Schapiro's comments (above) about the two planes of Impressionist composition: 'An image is thus redefined as a provisional composite of both content elements and various modification operations that are conceptually separate from the elements.' Drawing on Manovich's principles of modularity and variability, design researchers Ellen Lupton and Jennifer Cole Phillips (2008: 127) write, 'Layers allow the designer to treat the image as a collection of assets, a database of possibilities'. Now, with the emergence of mobile AR and ubicomp, layers of multimedia are primed for post-desktop circulation amid extra-computational entities and events in the lifeworld. As such, the modular logic of visual layering – evident in GUI authoring software as well as Monet's method of composition – will likely become transcoded as a preeminent cultural form. Increasingly, the ways we interact with digital images in Photoshop or video tracks in Final Cut Pro serve to model more than *human–computer* interactions. The array of media effects typical to desktop authoring software are becoming constitutive dimensions at play in our relations to all kinds of environments, provided we are within range of an Internet signal. Graphic design becomes experience design, and web browsing becomes world browsing. The expansion of layers as a ubiquitous media form, however, introduces new dimensions of materiality, indexicality, and spontaneity into their production and circulation.

Both painting *en plein air* and computing *en plein air* involve processes by which the virtuality of intelligible essences scrambles, blurs, and bifurcates in the face of the variability of sensible plentitude, or what Mark Weiser (1991: 94) called 'the infinite richness of the universe', which, he claimed, was excluded from VR systems. Abstracted from the WIMP construct, the layers of multimedia currently hosted on AR browsers mark a crucial site of the paradigm shift from personal computing to ubicomp. AR layers incorporate the activity of autonomous physical entities as semiotic assets integral to the 'database of possibilities' that a digital image constitutes. Scholars writing about AR works today take the exact inverse stance of the art critics who condemned Impressionism for its lack of finish. For instance, Bolter et al. and Christiane Paul attribute aesthetic value to the unfinished when they each caution AR designers against creating the kinds of immersive experiences fundamental to classical storytelling, Hollywood film, and VR narratives. Bolter et al. (2013: 45) advocate for contingent fragments of narrative or information, even if they 'often seem messy ... because they consist of hybrid layers of information and images that users may choose to read or disregard'. Writing about locative media narratives, which often involve AR, Paul (2012: 410) cautions that 'very rich media content and traditional narration ... might run the risk of competing with the audience's awareness of and focus on the site itself'. Writers, artists, and designers should aim, then, to produce *texts* that do not block out the *contexts* of their reception. And yet, seeming to contradict her own guideline, Paul (2012: 415) echoes the first Impressionism critics' aversion to the unfinished when she wonders if ubicomp users' ability to identify and concentrate on individual texts will not be inevitably compromised in the midst of 'contextual noise'. She takes this dilemma to be an urgent cultural *challenge* of the ubicomp paradigm.

Contrary to Paul, I contend that – as long as we maintain text/context oppositions – we will be caught in the catch-22 to which her argument succumbs. The more fundamental challenge is to learn how to conceptualize and design multimedia without recourse to text/context oppositions. Akin to the impressionist conception of shapes of color, AR layers of multimedia beckon theorists and practitioners to consider the integral role of sensible plentitude in digital design and composition practices. Layers, in the ubicomp paradigm, are not merely a category of electronic textuality; layers mark a new attentional form wherein any and all so-called contextual noise becomes a constitutive element in the visual, sonic, tactile, or textual field. AR layers, by default, assign an aesthetic or rhetorical function to the sensible plentitude imminently perceptible within and around the mobile or wearable screen, which is always permeable because it is simultaneously a live camera.

Sensible plenitude

Though I have emphasized the visual, AR layers exist in what Maria Engberg (Bolter et al., 2013: 44) terms a 'polyaesthetic' design space: 'a combination of sight, hearing, touch, and proprioception'. Consider the aesthetic role of sensible plentitude in site-specific sound installations, which may be regarded as AR or MR works in a broad sense. Sonic artist Abby Aresty's installation project *Paths II: The Music of Trees* (2012) created an embedded sound layer throughout Washington Park Arboretum in Seattle. Aresty spent roughly a year recording audio at specific spots in the Arboretum, then composed seven tracks comprising noises from the Arboretum's soundscape. For the project's exhibition, seven speakers were installed in the Arboretum at the respective spots from which each of the tracks drew. Visitors heard Aresty's compositions amid whatever noises (and other sensory elements) took place on the spot. Aresty's aesthetic task, as she (2012) describes it, was to 'bring these simultaneous yet distinct layers of sound into dialogue with one another'. 'Contextual noise' (e.g. sounds, sights, tactile sensations) permeates the audio of a sound layer;

more precisely, the sound layer is audio *plus* noise. The sound layer that each piece is *is* a singular performance that accrues at the interstice of the composed audio and the spontaneous aural-visual-tactile noises of blowing leaves, wildlife, nearby auto traffic, air traffic, fellow park visitors, etc. Aresty (2012) insists, 'The pieces bring attention to the Arboretum's dynamic soundscape, but also depend on it to bring new life to each listening'. To close one's eyes – straining to listen exclusively to the audio – would be the equivalent of bringing sheet music and earplugs to a concert.

Accordingly, creators of site-specific soundscapes and more image-driven AR layers must make decisions about subject matter in two interrelated registers: (1) multimedia files, and (2) the locations or entities to which those files are attached or tagged. While plenty of relevant insights could be drawn from on-location filmmaking techniques, the Impressionists' manner of selecting subject matter and conceiving of geographic milieus as aesthetic forces provides a productive heuristic for contemporary AR practices. For instance, important parallels abound between Monet's reverence for relationality and several AR works created by artists of the Manifest.AR collective for the 2012 ZERO1 Biennial. Art historian John House characterizes Monet's artistic evolution around a pivotal shift in his choices of subject matter. As Monet's career progressed, sky, water, fog, and patches of intense sunlight became 'the keynotes of [his] paintings,' forming *kaleidoscopic* spaces in which the identity of any object diffuses (House, 1986: 19). According to House (1986: 17):

> [Monet] was insisting that the significance of the objects he painted lay in the relationships between them, in the multifarious elements which together went to make up the modern scene, and not in any external ordering process imposed by the artist in order to elevate one aspect above the others.

For Monet, particularly in his later landscapes, sensation and mood intensify around places that generate their own abstractions and afterimages qua reflections, weather filters, and atmospheric movements. 'Without the fog', Monet wrote, 'London would not be a beautiful city' (cited in House, 1986: 29).

Beautification is not the principal aim of the Manifest.AR pieces on exhibit during the ZERO1 Biennial (with the exception of William Pappenheimer's *Parking Lot Decorator*), but Monet's relational scenes supply an artistic precedent for thinking about the selection of subject matter in the design of AR layers. The two AR works I comment on below – each of them set at computer company headquarters around Silicon Valley – forge kaleidoscopic spaces of sorts. In these cases, distinct from Monet's technique, the identity of a place becomes diffused or compounded by the gravity of its relations to historical events, social issues, or environmental problems – relations that are insisted upon by the artists' digital overlays, but not otherwise apparent to the casual observer. Tamiko Thiel's piece *Clouding Green* converts the findings of a Greenpeace report on hi-tech companies' environmental impact into a series of locative data visualizations. Using a black-green color spectrum to indicate the degree of each company's impact, Thiel's AR layers show a digital cloud in the sky above each headquarters, thus making the companies' e-waste or clean energy practices an integral (or inescapable) element of their public image. *From Lewisburg, PA to Silicon Valley* – a collaboration between John Craig Freeman, Mark Skwarek, and Lily & Honglei – mobilizes a more complex matrix of history and geography. The juxtaposition between composed multimedia and the indexcality of the scene is visually striking but conceptually puzzling: sketched images of plainly dressed young men and women float in the air outside of Apple stores and Apple's headquarters; their bodies upside down and contorted, lacking any notable facial expression, they appear to be drifting whimsically through the scene like plastic bags caught in the wind.

In notes on the piece, Freeman et al. (2012) describe the city of Lewisburg as a manufacturing mecca during the postwar era. Starting in the 1970s, however, a critical mass of American companies began to move their facilities away from unionized towns like Lewisburg to 'right-to-work' states, and later internationally to Mexico and China, in pursuit of ever-lower operating costs. Coupling this labor migration with the fact that China is now the world's leading manufacturer of consumer electronics, one sees in these floating figures an intricate constellation of political and economic outcomes in which companies like Apple – and digital media consumers like us – are thoroughly implicated. As the user holds her iPhone up the Apple building, she beholds the displaced American workers whose factory jobs have been outsourced – and whose relatively high quality working conditions have been sacrificed – for the sake of high profits and low prices. The piece creates an exemplary kaleidoscopic scene of globalization that enmeshes *now* with *then*, *here* with *there*, and *me* with *them*.

Bottom-up public media production

Each of the AR projects I have discussed forecast rich democratic possibilities that might emerge with the spread of AR and ubicomp, which are not without hegemonic affordances, as critics so frequently note (see Greenfield, 2006). Computing *en plein air* supports the display of multimedia among public spaces without physically altering or defacing a place's material makeup. For this reason, the AR medium can support a much wider economy of contribution than other forms of place-based cultural expression. Paul (2012: 404) points out that 'so-called public art' typically relies on the authorization and limited funding of governments or other institutions; such terms and conditions variously constrict expression, and '[public art] has frequently been used by totalitarian regimes for propaganda'. Conversely, street art forms such as graffiti have long been illegal in most American cities; it would be unthinkable for graffiti artists or even mural painters to make works on the facade of the New York Stock Exchange.

The cultural significance of AR works may be akin to that which Stiegler attributes to video sharing sites, when he insists that YouTube and other web 2.0 platforms 'constitut[e] a radical novelty in the history of humanity' (2010: 52). After constructing an analogy between 'scribal culture' in ancient Mesopotamia and the 'audiovisual scribes' of the 20th-century culture industries, Stiegler (2010: 52) locates the unique value of platforms like YouTube in their 'bottom-up' approach to metadata, which 'up to this moment ... ha[s] always been executed in a top-down way'.

Countering Habermasian concerns that image culture poses a fundamental threat to rational, democratic debate, Stiegler concludes that the separation of producer and consumer is not an inherent consequence of audiovisual media, just as the public sphere is not an automatic feature of alphabetic writing and print. Indeed, there was no public sphere in early scribal cultures. New media technologies appear to be evolving in ways similar to those of alphabetic writing, such that recent advancements seem to 'deeply modify relations to the audiovisual temporal flux, allowing one to imagine the appearance of a more reflective and less consumerist gaze' (Stiegler, 2010: 41).

From 1980s home video to contemporary AR browsers, an expanding range of people are becoming positioned to break down, manipulate, annotate, produce, and revise the audiovisual flux. That artists are pioneering much of the early innovative work in AR should come as no surprise, especially when we recall McLuhan's (1969) observation that 'it's always been the artist who perceives the alterations in man [sic] caused by a new medium, who recognizes that the future is the present, and uses his work to prepare the ground for it'. The AR medium supplies unique technological conditions that facilitate the rise of digital public spheres set in vibrant public spaces.

Impressionist aesthetics, as I have suggested, provide digital artists, designers, and content producers – today's *en plein air* avant-garde – with a rich art historical referent as they endeavor to see the world in the image of multimedia effects and develop principles for composing medias-capes that flourish outdoors amid the build environment.

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