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Whither the Material in New Media Studies?

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Introduction

When thinking about the media, there is a tendency to focus on those elements that make them distinctive from other forms of representation: that they cast light and sound, the immateriality of their screen based images, and the constructed environments in which we make ourselves captive to these images. Stanley Cavell's poetic reflection on cinema distilled an early fascination with the philosophical and phenomenological questions posed by our interactions with the media:

A screen is a barrier. What does the silver screen screen? It screens me from the world it holds—that is, makes me invisible. And it screens that world from me—that is, screens its existence from me.¹

Cavell's lines were penned in reference to the magic of cinema and its immaterial imagery that draws us imaginatively into the world on the display, but keeps us at arm's length from it. His sentiment that the screen is a barrier prefigures an early definition of the virtual, as the "liminally immaterial."² The virtual world depicted is a space of illusion that does not have physical form outside of its immaterial existence on the screen.

In contrast to Cavell's Cartesian musings about the screen, media artists have recently been experimenting with emerging visual technologies in an effort to explore their capacity to unsettle our perception of our immediate surroundings. Mateusz Herczka and Pär Frid's new media art project, "Reverse Avatar" (2010), for example, challenges the manner in which we relate to our physical environment through media interfaces. The basis of the work is a piece of technology that Herczka and Frid designed: a set of off-the-shelf video goggles which is modified to receive a live video feed transmitted wirelessly by a remote camera operator. When the camera operator stands directly behind viewers wearing the goggles, they can see themselves moving through physical space. The live feed it provides is reminiscent of the disorienting perspective frequently adopted by cinematographers (think, Gus Van Sant's (2003) extended steadicam shot through high school hallways in *Elephant*) and first person video games, but in "Reverse Avatar" viewers are seeing themselves in the position of the protagonist. The interface has a derealizing effect on viewers' perception of themselves not only because they are interacting with their immediate surrounding through a live video feed, but because of the out-of-body perspective the device affords: viewers see themselves seeing the world--the protagonist in their own live cinematic drama.

As Herczka and Frid's work illustrates, screens no longer just screen us from the world. Screens can screen our world, that is, the world immediately around us. The screen is not always an opaque barrier, but can be a media enhanced window onto our surroundings. As I develop later in this article, in contemporary research on emerging interface technologies, like Augmented Reality, where attention is being paid to how the boundary between the computer generated and the real are being blurred with the arrival of mobile computer interface technologies,³ a concept of the virtual continues to predominate. The virtual continues to guide

¹ Stanley Cavell, *The World Viewed; Reflections on the Ontology of Film*. (New York: Viking Press, 1971).

² Anne Friedberg, *Virtual Window* (Cambridge, MA: MIT Press, 2006), 11.

³ See Jason Farman, *Mobile Interface Theory : Embodied Space and Locative Media* (New York: Routledge, 2012); Steve Benford and Gabriella Giannachi, *Performing Mixed Reality* (Cambridge, Mass.: MIT Press, 2011); and Gabriella Giannachi and Nick Kaye, *Performing Presence : Between the Live and*

theoretical and historical research into interactive, immersive new media technologies, but this research is founded on conceptual exclusions that have limited the breadth of how we understand new media.

This article addresses new media theory's endemic exclusion and erasure of the material, a claim made in spite of the fact that such research has frequently situated its work with reference to an account of it. It has been, furthermore, precisely through its conceptual erasure that the material has served to draw attention to a corresponding rise of the virtual. To employ an idea drawn from deconstruction, the material has been "supplemental"⁴ to the celebrated definition of the virtual, and the material has yet to be theorized apart from its contingency. This has resulted in limitations in the way in which to conceive of how the media have a role in shaping one's knowledge and awareness of the material. An examination of the concept can open new pathways for media research, such as ways to rethink the history and function of the computer interface and the existence of media and cultural practices that enable us to recognize and reflect upon the materiality of our physical surroundings.

Given the scope of such a claim, this article focuses primarily on the former aspect of the argument: that the material has been supplemental to the definition of the virtual in new media studies. I demonstrate this claim by examining three influential accounts of the virtual in which I explore how an idea of the material has had a role in constituting knowledge precisely through its exclusion. These three accounts of the virtual include the history of technologies of the virtual, embodiment and informatics, and post-structuralist theories of digital media. This is only a selection of the many definitions for the virtual,⁵ but I would not go so far as Anne Friedberg as to claim that the term "has lost its descriptive power,"⁶ because of the proliferation of meanings surrounding the term.⁷ Indeed, part of the argument of this article is that the influence of the concept is evident precisely in its ubiquity today. The virtual is used across a wide spectrum of inquiry, each definition reflecting the nuances of the approach. Given this diversity, it would be fruitless to try to generalize across them all. The intention here is neither to collapse the distinctions between the various definitions for the virtual, nor imply that this reading applies to all of them without regard to their differences. The choice of these three influential accounts of the virtual illustrates the existence of a pattern of supplementarity established early in new media research, one that still exerts influence over the use of the concept today.

On the basis of this analysis, a definition of the material is offered, one that responds to, but is not informed by, these exclusions.⁸ The material, like the virtual, is deeply embedded in many areas of speculation, from political economy to philosophy and theology. The conceptualization developed here resonates with some of those found in other fields, but these connections are not explicitly explored. A more detailed definition is provided at length later, but the material is understood here as the objects, structures and people that comprise one's

the Simulated (Manchester, UK; New York; New York: Manchester University Press ; Distributed in the United States by Palgrave Macmillan, 2011).

⁴ Jacques Derrida, *Of Grammatology* (Baltimore: Johns Hopkins University Press, 1976).

⁵ As Shields, Lister, and others have suggested, there are a multitude of definitions for the virtual across different areas of research. The intention here is not to provide a review of all of them.

⁶ Friedberg, *Virtual Window*, 7.

⁷ As is reviewed later, this did not deter Friedberg from submitting her own definition for the term as the "liminally immaterial."

⁸ This definition of the material will be incomplete, because the emphasis of the article is on the exclusion of the material and its role in constituting knowledge in new media research.

immediate surroundings and the media's role in enabling or enhancing one's capacity to cognize the things in one's surroundings.

The final section of this paper proposes sites of inquiry that become visible with the introduction of this concept of the material. I reflect at length on one. Drawing on a forthcoming article on the subject,⁹ I define a category of computer interfaces referred to as See-Through Graphical Interfaces. The category includes devices like Herczka and Frid's "Reverse Avatar," Augmented Reality, Head-up Displays, World War II military gunsights and others. What these interfaces share is their use of a graphical interface connected to a computational device to enhance knowledge over the material. Because of a tendency to focus on technologies of the virtual, new media research has mainly overlooked this class of computing devices, and thus left out an important history of computing technologies.

Hauntology of the Real: The Virtual as Ghostly Supplement

The virtual made an early appearance in post-structuralist and deconstructive accounts of the rise of new media technologies and attendant cultural and economic transformations. In *Specters of Marx* Derrida links the virtual to our experience and conception of the real, specifically the manner in which the virtual constitutes our understanding of the real, but is overlooked in our perception of it.¹⁰ This absence constitutes a gap in our understanding of the real; a gap, which in the course of his investigation, is unveiled as a blind spot that constitutes knowledge in Western thinking. In what follows I reveal how despite the recognition of the role of the logic of supplementarity in Western thinking in the theorization of the virtual, the definition of the virtual itself was contingent on an exclusion of a concept of the material.

To gain insight into the excluded status of the virtual, Derrida associates the virtual with ghosts, those immaterial beings that haunt the living yet are excluded from them. "What is a ghost? What is the effectivity or the presence of a specter, that is, of what seems to remain as ineffective, virtual, insubstantial as a simulacrum?"¹¹ Despite their marginal status, Derrida observes that Shakespeare's ghosts are frequently characterized as being in possession of knowledge or understanding that surpasses the everyday: "A specter... is unreal, a hallucination or simulacrum that is virtually more actual than what is so blithely called a living presence."¹²

As ghosts have the ability to upset the natural order of things because of their possession of knowledge that surpasses the living, the virtual, when acknowledged as integral to the constitution of knowledge about the real, similarly has the potential to destabilize what we understand about it.

Derrida destabilizes the assumption that the real is the locus of activity and meaning with his insistence that the immaterial forces of new media are increasingly central to the formation of the real. Derrida associates the virtual with a variety of contemporary developments, including "spectral effects, the new speed of apparition (we understand this word in its ghostly sense) of the simulacrum, the synthetic or prosthetic image, and the virtual event, cyberspace and surveillance, the control, appropriations, and speculations that today deploy unheard-of

⁹ John Kim, "The Origin of the See-Through Graphical Interface: World War II aircraft gunsights and the status of the material in early computer interface design," *Convergence* (forthcoming).

¹⁰ Jacques Derrida, *Specters of Marx : The State of the Debt, the Work of Mourning, and the New International* (New York: Routledge, 1994).

¹¹ *Ibid*, xviii.

¹² *Ibid*, 13.

powers.”¹³ The nature of electronic information is an immateriality that is becoming central to contemporary social, economic and cultural developments in the West. Indeed, for Derrida the coinage “virtual reality” best captures the nuances found in his redeeming of the concept of the virtual. It is not just a technological device that enables the creation of immersive computer worlds, but the neologism also captures the virtual’s relationship to the real in contemporary society: reality is possessed by virtual processes to such an extent the virtual has come to govern developments in the West. The virtual is a supplement to the real in that the virtual is integral to it, but has been excluded from consideration.

Derrida’s characterization of the virtual is emblematic of a variety of postmodernist readings of contemporary media culture during the period. In his review of this work, Mark Poster compares Derrida’s and Jean Baudrillard’s respective positions on the virtual in order to highlight their preoccupation with the concept.¹⁴ In contrast to Derrida, Baudrillard’s reading of virtual reality as a metaphor for our cultural condition is an extension of his earlier ideas on simulation. Without going into too much detail, Baudrillard contends that electronic media, consumer capitalism and commodity culture have come to replace religion and other traditional sources of value that once grounded truth and meaning. Because it retains an antiquated sensibility in which words had stable or fixed referents, Baudrillard rejects the term “reality” as an accurate characterization of postmodern culture. With the triumph of electronic media and consumer capitalism, simulation is preferable to reality, because signifiers have become unhinged from their referents. In this context, Baudrillard sees virtual reality as nothing less than the technological realization of simulation.

With Virtual Reality and all its consequences, we have passed over into the extreme of technology, into technology as an extreme phenomenon. Beyond the end, there is no longer any reversibility; there are no longer any traces of the earlier world, nor is there even any nostalgia for it.¹⁵

Because virtual reality environments are constructed by the hands of human designers, all experience within them is the playful construction of postmodern culture. In virtual reality, simulation becomes reality; the word made immaterial flesh.

In both Derrida and Baudrillard’s work the concept of the virtual is overdetermined, referring to a wide swath of epochal economic and cultural changes. Their versions of the concept destabilize prevailing conceptions of the real that do not take into account the epistemic transformations occurring with the virtual’s rise. They seek to dispense with a materialist understanding of the world in which meaning is associated with the appearance of phenomena. For Baudrillard, the claim that all reality is virtual reality is based in his insistence that reality is constructed out of virtual, immaterial processes, including the flow of electronic images, commodity culture and financial capitalism. Because it overlooks immaterial processes, a materialist understanding of the world does not recognize how reality has been dematerialized with the advent of simulation. For Derrida as well, the virtual is the supplement to the real in that our notion of reality is founded on the endemic exclusion of the immaterial. Derrida undermines a materialist position with his insistence that the real is always already determined

¹³ Ibid, 54.

¹⁴ Mark Poster, *What’s the Matter with the Internet* (Minneapolis, MN: University of Minnesota Press, 2001).

¹⁵ Jean Baudrillard, *Perfect Crime* (London: Verso, 2008), 35.

by the virtual, but precisely because these immaterial processes are hidden from view, they remain excluded from intellectual speculation.

For both, attention is shifted to the virtual as the locus of activity that constitutes meaning. Next two additional definitions that were influenced by post-structuralism's theorization of the virtual are considered. Though they differ in terms of subject matter, the accounts share a preoccupation with foregrounding a concept of the virtual and demonstrating how the virtual has been integral to social, cultural and economic transformations in which we are in the midst. In this research the virtual comes to define new media research and no longer be peripheral to their study.

The History of Technologies of the Virtual

In the years since Derrida and Baudrillard's speculations on the virtual, theorists have refined the concept's usage to such an extent that it no longer aspires to characterize epochal cultural or philosophical shifts. An influential version of the concept is found in the description of perceptual changes and technological innovations that have been involved in the rise of interactive, immersive media environments.¹⁶ The virtual has been applied to the construction of computer-generated environments, such as videogames and Virtual Reality, but it is also located in the rise of panoramas, camera obscuras and other early media devices integral to the development of contemporary spaces of immersion. In her historical study of the rise of the virtual, Anne Friedberg charts its history from Renaissance perspective devices to today's Graphical User Interface (GUI). Renaissance painters used enframing devices, a kind of picture frame, as a window onto physical space as an aid to painting according to the laws of perspective. For Friedberg, today's GUI finds its origins in these Renaissance devices in that the GUI has become a metaphorical window onto information space, a virtual space that no longer needs to obey the laws of perspective.

If we venture a different look at this history and consider the status of the material, we can recognize how it has been elided from accounts of technologies of the virtual. In this history of new media, there has been an emphasis on the historical and perceptual development of the virtual in the creation of ever more sophisticated immersive and interactive mediated spaces, which Friedberg and Grau refer to as "spaces of illusion." Their historical work addresses the separation of the virtual from one's physical environment in technologies, like the GUI or video games, in which code comes to "define the entire informational or perceptual environment for the user."¹⁷ Though it draws on the physical world for metaphors (such as the window, the desktop, etc.), the GUI does not have to have any correspondence to our surroundings or the laws that govern it. These studies of technologies of the virtual frequently culminate in an extended examination of the promise and potential of Virtual Reality, which is further evidence of the primacy of a concept of the virtual in this research. VR seems the realization of what was inherent in earlier media forms: the technology speaks to the possibility of the creation of fully immersive and interactive virtual worlds and thus, the supersession of the real by the virtual.¹⁸

¹⁶ See Anne Friedberg, *Window Shopping: Cinema and the Postmodern* (Berkeley, CA: University of California Press, 1994); and Oliver Grau, *Virtual Art: From Illusion to Immersion* (Cambridge, MA: MIT Press, 2004).

¹⁷ Jay Bolter et al., "New Media and the Permanent Crisis of Aura," *Convergence: The International Journal of Research into New Media Technologies* 12, no. 1 (2006), 22.

¹⁸ Friedberg (2006) does consider the influence of the virtual over our physical environment in her examination of how architectural details came to mimic forms found in cinema, such as the use of

Consider again, Stanley Cavell's philosophical musings quoted earlier. I suggested that they can be read as an early definition of the virtual with Cavell's emphasis on the screen as a barrier. The "world" to which he refers is one of cinematic projections--a virtual world created out of imagery projected onto the silver screen. There is, however, a crucial ambiguity in his use of the word, identifiable now that we've considered the status of the material in the literature on the virtual. It could also refer to the world outside the theater, that is, one's physical environment. Here, in the darkened room of the theater that which is screened from me is the world that I inhabit, the material world. This ambiguity reinforces a claim about the virtual suggested earlier: screens capture our gaze in fixed attention. So drawn into this immaterial world, we are screened from our surroundings on the other side of the projections' borders and theaters' walls.

The virtual has been instrumental in promoting an understanding of the perceptual and technological changes that have taken place with the rise of modern media, but only those technologies that fit into this particular account of the virtual have been included. In other words, the virtual has been instrumental in producing a kind of teleological thinking that sees new media's history written from the vantage point of the virtual. It is a history premised on the leading role that the virtual has had at the exclusion of other concepts that might lead to different historical and theoretical insights. We can see this tendency continuing in research on emerging technologies. In recent investigations of mixed reality interfaces, for example, there is a tendency to conceive of interfaces like Augmented Reality as an outgrowth of earlier technologies of the virtual. Jason Farman notes how in Augmented Reality the material is subsumed by a virtual or informational dimension.¹⁹ In Augmented Reality and related mixed reality type interfaces, one's physical surroundings becomes an "information interface" (Farman 43-44) in that one's geographical location becomes an indexical marker to online information accessible by mobile computing devices. Augmented Reality is an interface technology that is enabling the material to be colonized by information through the transformation of the material into a marker of virtual information. In that the virtual is privileged over other possible explanations, this characterization is evidence of the continuing emphasis on the virtual in research on contemporary interface designs. In an examination of Augmented Reality-type interfaces below, I argue against this position in a historical overview of the technology in World War II military devices. Instead of a transformation of the material into information, such interfaces enhance one's knowledge over the material by overlaying graphical information into users' view of their immediate physical surroundings.

Embodiment and the Materiality of Informatics

In contrast to the two areas reviewed above, the research on new media and embodiment applies a different set of theoretical presumptions in terms of how it conceptualizes the virtual. There have been two interrelated positions in this area of research: the claim that our interactions with digital communications leads to a kind of disembodiment because of the immateriality of information; and research on how the body and information technologies mutually constitute each other, because information technologies extend human's perceptual capacities. Though they differ in terms of how they understand the virtual, what they share is a conception of the

horizontal windows in buildings that referenced cinema's wide format projections. But her analysis is less an account of the material, than an example of the virtual's influence over ideas and forms found in our physical environment.

¹⁹ Farman, *Mobile Interface Theory : Embodied Space and Locative Media*.

material as coextensive with the human body at the exclusion of a concept for the material as outside of the perceiving subject.

In her account of the former position, Emily Apter argues that we leave our bodies behind (that is, at the computer terminal) in online interactions. For Apter and others, this is a disembodiment that is potentially liberatory, because we can free ourselves from the rigid markers of the body's constraints (i.e. race, gender, disability). This celebration of disembodiment is rooted in the belief that humans could escape the essentializing forces that construct the body through the use of digital technologies. Digital technologies can enable a "postidentitarian politics rooted in the obsolescence of racial and ethnic categorizations."²⁰

While Apter depicts the body and informational systems as in opposition, Katherine Hayles has posed a more dynamic way to conceive of this relationship. Instead of portraying technology as a disembodiment force, Hayles has insisted that human and information systems are in a co-evolutionary dance, which she has referred to as an "intermediating dynamic."²¹ In earlier work, especially the "The Materiality of Informatics," she offered a preliminary version of this idea with her insistence that the human body exists as a kind of constraint on the formation of information systems, because technologies are only adopted when they can be integrated into existing human functioning through a dual process of "inscription" and "incorporation."²² She uses the example of the development of audiotape with its capacity to record and objectify the human voice. Its adoption "changed the relation between voice and body" producing a "new kind of [posthuman] subjectivity" she identifies in examples of modernist fiction and poetry.²³

This insistence that information systems only develop within the constraint of the materiality of the body has exercised influence on research in this area. It has shifted discourse to ways in which the human body is a site for the inscription of informational systems. In *Materializing New Media*, for example, Anna Munster explicitly relates the two in her observations about the embodying tendencies of new media.²⁴ Munster observes the manner in which the body, rather than excluded or disembodied in one's use of various new media technologies, is directly involved in the interaction. Indeed, in various places Munster uses the term material interchangeably with the body and the corporeal. The "materializing" of new media (to which the title of Munster's book refers) is precisely the inclusion of the body's physio-motor capacities or physical presence in new media interactions.

In his study of embodiment and new media, Mark Hansen has traced this interest in the body to a more general "turn to the body" in cultural theory, culminating in the 1990s with the development of the "cultural constructivist paradigm."²⁵ The adoption of cultural constructivism in feminist and queer writings on technology then gave rise to the figure of the cyborg reclaimed as a synecdoche for emancipation from the reigning essentialisms that dominate racial, ethnic, gender and sexual categories. Despite characterizing her manifesto as an "ironic political

²⁰ Mark Hansen, *Bodies in Code* (New York: Routledge, 2006), 142.

²¹ N. Katherine Hayles, *Electronic Literature : New Horizons for the Literary* (Notre Dame, Ind.: University of Notre Dame, 2010), 48.

²² N. Katherine Hayles, *How we Became Posthuman : Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago, Ill.: University of Chicago Press, 1999), 193.

²³ *Ibid*, 208.

²⁴ Anna Munster, *Materializing New Media : Embodiment in Information Aesthetics* (Hanover, N.H.: Dartmouth College Press : Published by University Press of New England, 2006).

²⁵ Hansen, *Bodies in Code*, 5-6.

myth,”²⁶ Donna Haraway’s fantastical depiction of the cyborg in “A Cyborg Manifesto” accelerated into a proto-utopianism surrounding late twentieth and early twenty-first century information and communication technologies. From the internet to cellphones to prosthetic enhancement of the body, new digital technologies became the site of growing fascination, because they were perceived as making possible a liberation from the constraints of the everyday. Work, like Apter’s, comes out of this belief in the liberatory potential of information and communication technologies.

Hansen shares with this work a conception of the body that renders it as a raw materiality that is given extension or enhancement with information and communication technologies. But dissimilar to cultural constructionists, Hansen grounds his work in an updating of a phenomenological account of perception, specifically a reassessment of Merleau-Ponty’s notion of the “technics” of human embodiment. For Merleau-Ponty, technics refers to any technologies that enhance human perceptual capabilities. Hansen’s approach to human perception is an effort to illustrate how technology is “always already embodied,”²⁷ that is, human perception always already bears the mark of technological enhancement. The body’s perceptual capabilities are the frame within which media technologies are developed and integrated into human perception.

The reason for the interdependence of human perception and media technologies that enhance it is due to the difference between the body and the realm of sense data, two phenomena that differ in form. According to a neo-Bergsonian account of perception, sense data is the realm of the virtual, because visual and auditory stimuli are immaterial when they enter perception. Sense data becomes “actual” or “real” by means of human perception which attends to and fixes images in memory.²⁸ The body, it can be said, gives reality to the virtuality of the image through embodied perception. Put differently, the distinction between the body and the virtuality of sense data is a gap, which needs to be bridged in order for sense perception to occur. Media technologies, such as film, computers, and virtual reality, bridge this gap by extending the body’s perceptual capabilities into the realm of the virtual.

Thus, when Hansen writes that “virtual reality comprises something of a reality test for the body,”²⁹ he is referring to this difference between the materiality of the body and the virtuality of sense data. Virtual reality is a reality test for the body, because visual images are given actuality by the perceiving subject. In positing the body’s difference from the virtual in this way, Hansen’s work is comparable to other theories of embodiment which conceive of the body and new media as in opposition with the body the domain of materiality and media that of virtuality.

Slavoj Žižek’s critique of cultural constructionism can help identify what is limited about the depiction of the body as the locus of materiality. Employing language familiar to deconstructionists, Žižek insists that cultural constructionism is founded on an “exclusion / foreclosure that grounds this very horizon.”³⁰ The effort to unmask and resist all essentialist positions regarding the body forecloses the possibility of recognizing the existence of a background from which subjectivity arises. For Žižek, this excluded background is capitalism,

²⁶ Donna Jeanne Haraway, *Simians, Cyborgs, and Women : The Reinvention of Nature* (New York: Routledge, 1991), 149.

²⁷ Hansen, *Bodies in Code*, 59.

²⁸ *Ibid*, 123.

²⁹ *Ibid*, 5.

³⁰ Judith Butler, Ernesto Laclau and Slavoj Žižek, *Contingency, Hegemony, Universality : Contemporary Dialogues on the Left* (London: Verso, 2000), 108.

which for the purposes here is less relevant, but by applying his argument to the role that the body has in the literature on embodiment and new media, a related critique can be made. In this work the differences between material/virtual, inside/outside, and body/environment are reified to such an extent that the subject is considered material and everything outside the subject (because it enters the body as sense data) is virtual.

Zizek's accusation that cultural constructionism fails to acknowledge the existence of a background which makes possible subjectivity is applicable to the research on embodiment in that it relies on an idea of a gap between the body and the virtual, which overlooks the extent to which there is a determining background or environment that makes possible the materiality of the body. That the boundary between the body and environment is porous is familiar to cultural theory. Gender, for example, is a performative act made up of behaviors learned via sense perception. As Judith Butler has argued, the border between the inside and outside is blurred, as external norms or forces constitute the individual and have determining effects on the subject's body in terms of how it expresses itself and functions as a gendered being.³¹ If external norms and forces have a role in constituting the materiality of the body, then any simple opposition between body and environment overlooks the complexity of the body's materiality.

Returning to Zizek's critique, we can conclude that theorists of embodiment do not properly acknowledge the existence of background forces that grounds the materiality of the body. In contrast to other areas of research in new media, the research on embodiment offers a conception of the material, but it is one that is too restrictive. The material is portrayed as coextensive with the perceiving subject, and what is outside the subject is consigned to the realm of the virtual. This position does not recognize that the construction of the body presupposes the existence of forces external to it that ground the possibility for its materiality. In the next section I offer an alternative formulation of the material, one that posits its presence outside the perceiving subject and foregrounds the media's role in enhancing knowledge of the material.

Re-Materializing New Media Studies

Derrida's observation about the exclusion of the virtual from intellectual speculation must be reconciled with the concept's centrality in new media research. The virtual is not only presumed to inhabit the everyday, but it has a role in radically reshaping it. The concept has moved from periphery to center, from exclusion to inclusion, and continues to exercise a significant influence on the way in which we understand media culture. In enabling researchers to trace tendencies in the historical development of the new media, it has simultaneously constrained inquiry because it has been founded on an endemic exclusion of a concept of the material external to the perceiving subject. The material has been conceived of as the supplement to the virtual with the material perceptible in its disappearance. In contrast to the virtual, the material has not been given sufficient consideration as a constitutive element in our interactions with media technologies. To move beyond accounts of the disappearance of the material, its total mediation, or association with the body, we must recognize ways in which our perception of it both conditions and is influenced by our interaction with media technologies. Developing a substantive understanding of the material can open new ways to investigate the media in ways that have been overlooked till this point.

In order to make a definition of the material manageable, it is important to put in place clear boundaries. A concept of the material has been utilized in a wide variety of disciplines, including philosophy, political economy, geography and theology. Each field, of course, offers a

³¹ Judith Butler, *Gender Trouble : Feminism and the Subversion of Identity* (New York: Routledge, 2006).

version of the concept that is specific to its epistemological position. The definition offered here does not try to integrate these diverse approaches, nor even explicitly engage with them. Though it draws on some of these fields, this definition is appropriate to the study of the media, one that foregrounds the manner in which the material both conditions and is produced in our interactions with the media.

The material is understood here as the presence of objects, structures, and others that comprise one's immediate surroundings. Immediate is meant here in the sense of physical proximity, or the objects, structures and others that are within the range of one's perceptual senses. This can include things that are perceived with the aid of devices that augment sensory perception, such as eyeglasses, telescopes, megaphones and shotgun microphones, provided they can also be experienced without augmentation with minimal effort. An example of an experience that is immediate, but augmented, is the use of high-powered binoculars to look at trees at the edge of one's physical surroundings. Because one could move closer to them in order to see them without the aid of the binoculars, it is included in the definition of one's immediate environment. Video chatting with friends on the other side of the world might give one a powerful feeling of closeness to them, but they are not physically proximate without great effort and time.

The latter example brings to mind an important distinction: physical proximity is often conflated with, but should not be confused with, perceived or felt closeness. It is important to distinguish between them on a conceptual level. Felt closeness does not have to involve physical proximity. One can feel an attachment to a place, for example, despite the fact that one may never have visited there. The difference between proximity and closeness employed here is a technical distinction not an evaluative one -- what is not being suggested is that the preferability of one over the other. The media have a power to shrink one's sense of distance and time to such an extent that one can feel close to things and others who are far away, but the definition here concerns physical proximity.

A related problem exists in recent intellectual efforts to reclaim the material. In fields as diverse as anthropology, geography, and others, there has been a call to return to a material analysis of things and objects, in order to distance research from the perceived excesses of the social and cultural constructedness of phenomena. Sometimes referred to as the "materialist return,"³² this position skirts close to a longing for an immediate, lived experience of the world that is oftentimes nostalgic for a perceived closeness of objects and environment. A problem with the materialist return is its epistemological basis. This sense of closeness is grounded in a presumption that meaning emanates from the objects and things itself. Critical of a similar tendency, the nineteenth-century German philosopher Arthur Schopenhauer took to task a comparable materialist position, one in which "everything objective, extended, active, and hence everything material" is regarded "as so solid a basis for its explanations."³³ Schopenhauer is suspicious of this position for it imagines the material as a ground from which truth derives with materialist philosophy's task to uncover this meaning.

The definition of the material offered here, however, does not assume that the material is the ground of meaning. Like the virtual, the material is embedded in diverse systems of signification and is the confluence of complex forms of meaning, histories and cultural legacies

³² Sarah Whatmore, "Materialist Returns: Practising Cultural Geography in and for a More-than-Human World," *Cultural Geographies* 13, no. 4 (2006), 600-609.

³³ Arthur Schopenhauer et al., *The World as Will and Representation*. (Cambridge; New York: Cambridge University Press, 2010), 50.

of which one may not be aware. These systems of signification constitute the way in which one evaluates, understands, sentimentalizes and relates to one's physical surroundings. The media is one system of signification that has a role in constraining and enabling one's experience and understanding of the material. Though the material is defined here as that which is in our immediate physical surroundings, the forces that condition the material itself can be non-local and immaterial.

Sites of Inquiry

As an illustration of how this conception of the material opens pathways for research, I examine the historical role that certain computing interface technologies have had in mediating viewers' relationship to the material, a perspective that contrasts with how media and computing technologies have frequently been depicted within the frame of technologies of the virtual. In a forthcoming article on the subject I contend that devices as diverse as the Head-up Displays, Augmented Reality, and predictive gunsights should be classified as belonging to a distinct category of interface technologies, because of the manner in which they enhance knowledge over the material.³⁴ In contrast to technologies of the virtual, which have been utilized in the construction of virtual spaces of illusion, See-Through Graphical Interfaces overlay graphical information into one's field of vision. I refer to this class of technologies as See-Through Graphical Interfaces, because they are windows onto the one's physical environment.

The first See-Through Graphical Interface was the Mark II Gyro Gunsight developed for World War II British military aircraft. The gunsight, a predecessor to modern Head-up Displays, contained a number of innovations, including an analog computing device and a graphical interface, which consisted of a transparent projection screen on which information was displayed. A predecessor to today's Head-up Displays and Augmented Reality headsets, gunsight operators would target their weapons by looking through the transparent projection screen on which targeting information would be superimposed into their line of sight. The Gyro Gunsight was a "predictive gunsight,"³⁵ because it provided computed information on where to fire guns in advance of oncoming enemy aircraft.

Because it was a time of remarkable innovations that led to advances in film and computing technologies, World War II military research and development has been subject to extensive historical media research.³⁶ Despite this attention, predictive gunsights, like the Gyro Gunsight, have been omitted as a predecessor to contemporary computer interface design.³⁷ This oversight has much to do with the ubiquity of film and computing devices today (which naturally drives research interest to precursors of these technologies), but this omission is also a consequence of the prevailing theoretical interest in the virtual, which has conditioned researchers to be less receptive to interface designs that do not fit this particular frame. As

³⁴ Author's name removed, "The Origin of the See-through Graphical Interface: World War II Aircraft Gunsights and the Status of the Material in Early Computer Interface Design," *Convergence* (forthcoming).

³⁵ R. Wallace Clarke, *British Aircraft Armament*, Vol. 2 (London: Patrick Stephens Ltd., 1994).

³⁶ See Paul Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: MIT Press, 1997); Paul Virilio, *War and Cinema: The Logistics of Perception* (London: Verso, 1989); and Howard Rheingold, *Virtual Reality* (New York: Summit Books, 1991).

³⁷ There is a growing body of research on Mixed Reality interfaces, such as Augmented Reality, but none of this research has linked emerging technologies to these historical precedents. See Farman (2012); Bolter, et al. (2006); Benford and Giannachi (2011).

discussed in this article, a concept of the virtual has been employed to characterize the invention of media technologies that facilitate the creation of virtual spaces or to document the influence of immaterial processes. A concept of the material can open up research to different pathways of theoretical and under-examined sites of inquiry, such as the identification of a class of technologies like the See-Through Graphical Interface, which enhance knowledge or control over the material.

In addition to enabling researchers to revisit the history of computing technologies, a concept of the material can also open pathways of research to other subjects, such as the study of media and cultural practices that engage with the material. Site-specific media art is one area ripe for investigation in this regard. Media artists, such as Krzysztof Wodiczko, Janet Cardiff, George Bures Miller and others, have been crafting media installations that encourage participants to recognize details about site and its sociocultural conditions. Through the use of video projection and immersive, spatialized sound, and other media tactics, these artists attempt to engage viewers in an exploration of the material itself. One can imagine the concept's application to a variety of practices that aspire to open an encounter with the material as a challenge to the experience of the virtual in our cultural condition.

This article has documented limitations in the conception of the virtual in various domains of new media research. The virtual's prominence has been at the exclusion of a concept of the material, which has had implications for the types of historical and theoretical research written about the media. Such a critique should not be confused with a rebuke regarding the virtual's contributions to the analysis of contemporary culture. To the contrary, the concept has been indispensable to the identification and examination of virtualizing tendencies in mediated culture. The foregrounding of a concept of the material redresses a blind spot in existing research and demonstrates how the concept is crucial for recognizing what is at stake in media and cultural practices that enhance knowledge of and interaction with the material.

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