

# The Fibreculture Journal

DIGITAL MEDIA + NETWORKS + TRANSDISCIPLINARY CRITIQUE



## Issue 18 : Trans

edited by Andrew Murphie, Adrian Mackenzie and Mitchell Whitelaw



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## About the Fibreculture Journal

The Fibreculture Journal is a peer reviewed international journal, first published in 2003 to explore the issues and ideas of concern to the Fibreculture network.

The Fibreculture Journal now serves wider social formations across the international community of those thinking critically about, and working with, contemporary digital and networked media.

The Fibreculture Journal has an international Editorial Board and Committee.

In 2008, the Fibreculture Journal became a part of the Open Humanities Press , a key initiative in the development of the Open Access journal community.

The journal encourages critical and speculative interventions in the debate and discussions concerning a wide range of topics of interest. These include the social and cultural contexts, philosophy and politics of contemporary media technologies and events, with a special emphasis on the ongoing social, technical and conceptual transitions involved. More specific topics of interest might include:

- :: informational logics and codes
- :: the possibilities of socio-technical invention and sustainability
- :: the transdisciplinary impacts of new media technologies and events in fields such as education, the biosciences, publishing or knowledge management
- :: information and creative industries, media innovation, and their critique
- :: national and international strategies for innovation, research and development
- :: contemporary media arts
- :: new forms of collaborative constitution made possible by contemporary media
- :: software and hardware develops in relation to the social
- :: networks :: media change, convergence and divergence
- :: the use of contemporary media in socio-technical interventions

The Fibreculture Journal encourages submissions that extend research into critical and investigative networked theories, knowledges and practices.

The Fibreculture Journal values academic scholarship in the field, and demonstrates this through the publication of refereed articles. The journal is fully supportive of Open Access communities and practices, and is committed to contemporary metadata provisions and uses. It is also open to expanded notions of scholarship which might include collaborative hypertexts, database compositions, and low-band electronic installations that experiment with the philosophy, politics and culture of information and communication technologies.

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## The Fibreculture Journal: Issue 18 2011 – Trans.

### Editorial : Issue 17 2011 Unnatural Ecologies

1

Andrew Murphie  
University of New South Wales

Adrian Mackenzie  
Lancaster University

Mitchell Whitelaw  
University of Canberra

### FCJ-120 Other Ways Of Knowing: Embodied Investigations of the Unstable, Slippery and Incomplete

9

Petra Gemeinboeck  
College of Fine Arts, University of New South Wales Sydney

Rob Saunders  
Faculty of Architecture, Design and Planning, University of Sydney

### FCJ-121 Transversalising the Ecological Turn: Four Components of Felix Guattari's Ecosophical Perspective

35

John Tinnell  
Department of English, University of Florida.

### FCJ-122 Anxious Atmospheres, and the Transdisciplinary Practice of United Visual Artists

65

Vince Dziekan  
Faculty of Art & Design, Monash University, Melbourne

### FCJ-123 The Transversal Generic: Media-Archaeology and Network Culture

92

Kristopher Gansing.  
transmediale – festival for art and digital culture,  
School of Arts and Communication, Malmö University

FCJ-124 Interactive Technologies as Fields of Transduction 118

Christoph Brunner.

Zurich University of the Arts & Concordia University, Montreal.

Jonas Fritsch.

Department of Information and Media Studies, Aarhus Universitet.

FCJ-125 From Representation to Sensation:  
The Transduction of Images in John F. Simon Jr.'s 'Every Icon' 146

Troy Rhoades.

Concordia University, Montreal.

FCJ-126 The Becoming Environmental of Power:  
Tactical Media After Control 177

Michael Dieter

Media Studies, The University of Amsterdam.

FCJ-127 Concrete Software:  
Simondon's mechanology and the techno-social 206

Simon Mills,

De Montfort University, Leicester.

FCJ-128 A Programmable Platform?  
Drupal, Modularity, and the Future of the Web 232

Fenwick McKelvey.

York / Ryerson Universities, Toronto

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issue 18 2011: Trans

## Editorial

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Adrian Mackenzie  
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It is now perhaps a commonplace that digital, networked and informational media are extremely transient. They diversify in form and function at a dizzying rate. At the same time, they transit and fuse “social” and “natural” differences in a manner which reconfigures all the worlds involved. It is also perhaps a commonplace to suggest that some established powers have found it difficult to come to grips with this (although this is perhaps beginning to change). For many, from seriously challenged newspaper proprietors to established media disciplines, it might be time to pause for breath, if only for a moment—to regroup and adapt established practices and ideas, to count the survivors from among the old media worlds of just a few years ago.

While occasionally sympathetic, this issue of the Fibreculture Journal questions this approach. If we pause for breath, it is to take in the new air. This issue draws on the accelerated evolutions of media forms and processes, the microevolutions in the social (and even the natural sciences) that dynamic media foster, even the way in which “new” media lead us to reconsider the diversity of “old” media species. Summed up simply here under the sign/event of the “trans,” this issue catalyzes new concepts, accounts of and suggestions for new practices for working with all these processes.

We hope that as they meet, the ideas and practices discussed here become joyfully invested in something like a wave of ‘speculative pragmatism’ (Masumi, 2011a; see also 2011b).



This issue diffracts something of this wave, embracing and thinking through what must be embraced and thought through, establishing new forms of critique, or new forms/concepts of design, in order to infra-act with the emergent worlds of contemporary media. It rethinks the forces and ephemeral forms of digital and networked media via a “radical empiricism”. Relations and dynamic ecologies come first, before fixed forms and established disciplines or business models.

If we sometimes turn to the past in this issue it is to follow Foucault’s very well known suggestion that ‘power is not homogeneous but can be defined only by the particular points through which it passes’ (Deleuze, 1988: 25). In the passed, there is a—

*... certain form of local and specific struggle whose relationships and necessary unity could no longer come from a process of totalization or centralization, but rather, as Guattari put it, from a transversality. These two aspects, the practical and the theoretical, were closely linked. (24)*

Several articles deal with this question of local and specific struggles in what we might call the ‘trans-situational’ (Masumi, 2002: 217) diagram of power (here power meaning as much what is capable of being done as what constraints or formations might surround this).

The first article in this issue, Petra Gemeinboeck and Rob Saunders’ ‘Other Ways Of Knowing: Embodied Investigations of the Unstable, Slippery and Incomplete’ perhaps captures everything that this issue was intended to be. It aims for a ‘politics of transmateriality’, not only in theory but in a series of practices/artworks. These works include highly original robotics pieces in which somewhat “neurotic” robots find themselves in a situation which is quite literally ‘unstable, slippery and incomplete’ (thus the robotic neurosis that arises). In Zwischenräume [In-between Spaces], a robotic installation still in the making, ‘a group of autonomous robots punch holes into the walls’ of a gallery ‘to inspect what’s outside, signal each other, and conspire’.

Kristoffer Gansing, in his ‘The Transversal Generic: Media-Archaeology and Network Culture’, ports François Laruelle’s concept of the generic into a testing of the limits and movements of media archaeology. He suggests there is now a ‘generic archaeological impulse’ that is often key within the use of media, and that this means “new” media are increasingly concerned with pasts, not the future. This—along with its ability to rethink media definitions, relations and actual instances with an archaeologist’s attention to specificity—perhaps makes the emergence of media archaeology so important. Yet Gansing suggests that the take up of

the 'generic archaeological impulse' in general culture (and as part of contemporary Capital within the cultures of digital and networked media) also leads us to question some aspects of media archaeology from within. In the process Gansing discusses a number of key media art works (such as *Google Will Eat Itself*). He also provides a fascinating thinking through of that most humble of media technologies, the overhead projector.

Michael Dieter takes on the question of struggle, the local and transversality quite directly in 'The Becoming Environmental of Power: Tactical Media After Control'. In an extremely subtle reading of both Foucault's security dispositif and De Certeau's concept of 'practices', Dieter provides a welcome rethinking of priorities of relation between strategies, tactics and general politics, insofar as these involve tactical media. The stakes are high. Dieter contextualises media-related activism within 'what Brian Massumi has described as the globally amplifying threats for large-scale disruption characteristic of the becoming environmental of power'. He aims to give 'a different conceptual approach for critical media art projects in terms of ontopolitical problematics'.

In 'Programmable Platform? Drupal, Modularity, and the Future of the Web', Fenwick McKelvey gives a detailed account of the modular nature of Drupal, alongside an account of Simondon's concept of information. McKelvey explores the nature of the 'programmability' of platforms such as Drupal, and of 'programmability' in general. He does so via a consideration of both his general commitment to FOSS and one specific instance of this at the juncture of the technical and the social—an internship at Rosario, Argentina with a women's rights organization in the city.

All the articles in this issue of the *Fibreculture Journal* give voice to the transformative nature and powers of contemporary media's new worlds and engagements, even as these so often stutter and stumble. This issue critically explores the specific dynamics of digital, networked and informational media in the light of the constant transformations, micro and macro, that are these media's very power, if also their difficulty. The articles address these media's own ecologies of ongoing transformation, and/or their co-evolution with other worlds (social and political worlds, natural worlds, the worlds of science, or art, of pleasure, of philosophy and theory).

To give this precision, we sought articles for this issue, theoretical or analytic, critical and/or propositional, that engaged with contemporary media worlds within the parameters (or "conceptual parametrics") of three concepts: transduction, transmateriality, transversality. We began from the assumption that the lifeblood of digital, networked and informational media is to be found in transductions (the relay of forces, for example in a corkscrew, in

the modulation of a video signal by audio data or in the formation of a crystalline structure) (Mackenzie, 2002 and Shaviro, 2006). 'Transmateriality' is a term recently developed by Mitchell Whitelaw—one that allows us to think very specifically about the complex yet insistent materiality that works within transductive events, including those involving contemporary media, which are so often seen as somehow only immaterial. If computing allows for an 'incredibly dynamic, pliable set of techniques for manipulating the material environment' (Whitelaw, 2009), then transmateriality suggests 'the extension of transduction to an understanding of the material relations and transformations involved in a computing immersed in the material world'. In this, computers are taken to be 'material machines dedicated to propagating a behavioral illusion, or call it a working model, of immateriality' (Kirschenbaum, 2005; see also Kirschenbaum, 2008). 'Transmateriality is an attempt to "ground" the digital without losing sight of its (let's say) generative capacities' (Whitelaw, 2009). Through all this runs an obvious transversality, from which it seems much of contemporary culture, and some of media disciplines and industries, tend to run but from which they cannot hide. 'Transversality' is a transformative mobility—for better or worse—through different systems (that can be at once technical, but also social, political, natural). It could be seen perhaps something of a conceptual or pragmatic choice (to think or act 'transversally'). So it has something of an ethical dimension. However, it also makes an onto-genetic claim: to think or act transversally is to more effectively immerse ourselves in the kind of ongoing and real onto-genesis that is the world. Transversality tends to be lateral, rather than hierarchical—or rather it eschews, as it undoes, both the vertical and the horizontal. A transversal connection does not just connect fields or sets of pre-existing relations. It transforms the things/events that are brought into connected networks.

All these 'trans' indicate events that are at once material, technical and social. This issue did not require submissions to engage with the thinkers behind these ideas. Rather, transduction, transmateriality and transversality were meant as catalysts for experiments in radical empiricism, for immersions in the dynamic relations that distribute themselves within new media worlds.

Yet part of this catalysis of radical empiricism has involved important and detailed accounts of key concepts and thinkers of things "trans". John Tinnell's 'Transversalising the Ecological Turn: Four Components of Félix Guattari's Ecosophical Perspective' is a more than timely and thorough account of the ecosophy of Félix Guattari. Tinnell suggests that Guattari's work on ecosophy has been strangely neglected at times, as has its relation to his also strangely neglected work on 'post-media'. Thinking these together gives us a different understanding of 'transversality', one that might help accomplish the now crucial task of thinking environment and media ecologies together. Tinnell suggests that 'Guattari's conception of post-media is true to his idea of the "new aesthetic paradigm", which, at a basic level, involves the explosion of artistic techniques and mentalities into arenas of social practice and institutional

politics'. By 'taking a post-media stance towards emergent media, we can think the new and think it collectively, but only to the extent that we develop digital practices capable of producing a new (ecosophical) relation between individual subjectivity and the collective thought' and, of course, the environment.

Gilbert Simondon's work is taken up by several articles in this issue. Simondon's work on transduction and individuation is finally being taken up on a larger scale within thinking on a range of media and other issues. So we are pleased to provide what we think is an important contribution to this taking up of Simondon's work, here in thinking about media issues. In a dramatic and original rethinking of the interaction design of what they call 'interactive environments'—Christoph Brunner and Jonas Fritsch's 'Interactive Environments as Fields of Transduction' effectively transversalises interaction design. They move what is already a dynamic field of work beyond the phenomenological, embodied interaction, and certainly many of its previous more cognitivist theoretical iterations (as useful as all these might be). In doing so, they move interaction design towards a consideration of field as such. They discuss Rafael Lozano-Hemmer's artwork *Voz Alta*, and an interaction design experiment they themselves undertook, *Impossible Room*, in order to lay out a radical "template" for rethinking the very nature of interaction design. As part of the basis for this template, they detail Simondon's thinking on information, emotion and more.

Simon Mills' 'Concrete Software: Simondon's mechanology and the techno-social' gives a detailed account of Simondon's often ambiguous relation to the social. Mills rethinks Simondon's better known work on the associated milieu and concretization via the lesser known work on human cultural progress in 'The Limits of Human Progress: A Critical Study' (Simondon, 2010). He analyses the Foreign Exchange Market and the Twitter API in glorious detail along these lines. Mills' important and different understanding of Simondon and the social makes room for Simondon as a thinker who allows us to 'capture the reality of the ongoing operation' of 'recursive relations'.

Troy Rhoades, in 'From Representation to Sensation: The Transduction of Images in John F. Simon Jr.'s 'Every Icon', gives a highly precise and detailed account of a specific series of occasions of transduction, between art and science, in John F. Simon Jr.'s well-known internet art work. In the process Rhoades allows us to rethink while maintaining the relations between science and art, and gives what has to some extent been a missing account of the "body" and the "thing", as these concepts were deployed by Deleuze and Guattari in *What is Philosophy?*. This allows us to rethink body and thing, and art and technology in terms of transduction.

Vince Dziekan's 'Anxious Atmospheres: the Transdisciplinary Practice of United Visual Artists' rethinks the transdisciplinary—especially as this works, in both practice and theory, between traditional arts such as architecture, design and electronic arts. Dziekan has a specific interest in 'reinterpreting the aesthetic conditions associated with exhibition'. He gives a detailed account of the way in which London-based art and design practice United Visual Artists, or UVA, create responsive installations that bring alive the transdisciplinary (along with a rich transversality and transmateriality).

In thinking through various events as "trans"—via the concepts and practices associated with transduction, transversality, and transmateriality, the issue first argues for the urgency and necessity of taking the complexity of transversal events and relations into account at the junctures of technology, the social and the environment. Second, the Trans issue gathers what is effectively a new wave in thinking about media differently, particularly about the way that digital and networked (although not only digital and networked) media further, complicate and sometimes simply allow us to understand and engage with things/events that are "trans".

Each of the articles in the Fibreculture Journal 18, Trans issue demonstrates that any individual/individuating/social or natural ecology is to some extent a network, and any network involves an ecologies of transversals. Crucially, the micro-reconstitution of relations is as important as, if not more so than, the macro-reconstitution of somewhat illusory states (see Fuller, 2010; Murphie, 2006; Raunig, 2008).

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## Editors' Biographies

Adrian Mackenzie (Centre for Social and Economic Aspects of Genomics, Lancaster University) researches in the area of technology, science and culture. He has published books on technology: *Transductions : bodies and machines at speed* (London: Continuum, 2002/6); *Cutting code: software and sociality* (New York: Peter Lang, 2006; and *Wirelessness: Radical Empiricism in Network Cultures* (Cambridge, MA: MIT Press, 2010), as well as articles on media, science and culture. He is currently working on practices, ethics and politics of collaboration in biology.

Andrew Murphie (University of New South Wales, Sydney) <<http://www.andrewmurphie.org/>> works at the junction of contemporary and future media and social change, cultural theory and theories of perception/the events of thinking. He also has interests in interaction design, education, new publishing, electronic arts and music, and the history of modeling media and cognition, and its social impacts. He is the Editor of the open access, online journal, the *Fibreculture Journal* (<http://fibreculturejournal.org/>) and co-author, with John Potts, of *Culture and Technology*. Recent chapter publications include: 'Performance as the Distribution of Life: from Aeschylus to Chekhov to VJing via Deleuze and Guattari', 'Differential Life, Perception and the Nervous Elements..on the Technics of Living', 'Deleuze, Guattari and Neuroscience' and, with Lone Bertelsen, 'An Ethics of Everyday Infinities and Powers: Félix Guattari on Affect and the Refrain'. Andrew also works with Senselab in Montréal.

Mitchell Whitelaw (Canberra University) is an academic, writer and artist with interests in new media art and culture, especially generative systems and data-aesthetics. His work has appeared in journals including *Leonardo*, *Digital Creativity*, *Fibreculture*, and *Senses and Society*. In 2004 his work on a-life art was published in the book *Metacreation: Art and Artificial Life* (Cambridge, MA: MIT Press, 2004). His current work spans generative art and design, digital materiality, and data visualisation. He is currently an Associate Professor in the Faculty of Arts and Design at the University of Canberra, where he leads the Master of Digital Design. He blogs at *The Teeming Void*.

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## FCJ-120 Other Ways Of Knowing: Embodied Investigations of the Unstable, Slippery and Incomplete.

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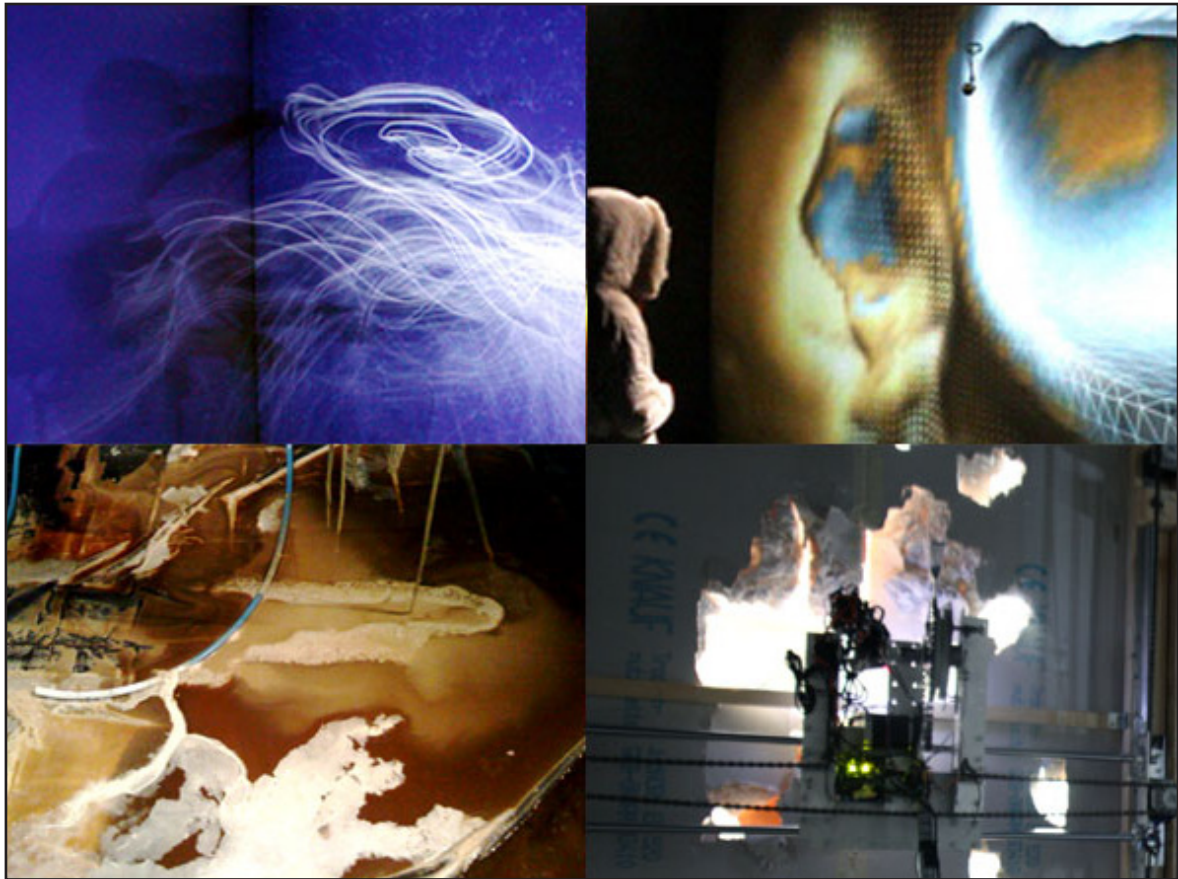
Rob Saunders.

Faculty of Architecture, Design and Planning, University of Sydney.

*'... unceasingly we are bombarded with pseudorealities manufactured by very sophisticated people using very sophisticated electronic mechanisms. I do not distrust their motives; I distrust their power. They have a lot of it. And it is an astonishing power: that of creating whole universes, universes of the mind. I ought to know. I do the same thing. ... However, I will reveal a secret to you: I like to build universes that do fall apart.'* —Philip K. Dick (1995: 262)

One of the most curious characteristics of computing processes and the medium of the digital is that they evoke, reinforce, produce and nourish two disparate positions of understanding us and the world: the reductionist, generalised and objective; and, the situated, partial and multiple. The first looks at and constructs the world in terms of what is known and can be described, while the latter embraces the unknown, uncertain and messy. Often, the two polarise along the border between objective knowledge, stripped of its body and deprived of our bodies, and situated knowledges, emerging from embodied processes and enacted, experienced or known in embodied ways. In this article, we will explore how the latter, the situated, indeterminable, always partial, is produced and made tangible by digital processes, and how these processes always unfold in—and rely on—embodied, specific and experiential conditions. As researchers, working across digital media, installation and computational creativity, we encounter, think, and experiment with these processes through our creative practice. Like Philip K. Dick, we, too, like to build realities that are unstable. The discussion will revolve around the specifics of four installations: two, so-called, virtual environments, Uzume and Maya–Veil of Illusion, and two robotic environments, On Track and Zwischenräume. [1] [2] [3] [4].





Uzume, Maya–Veil of Illusion, On Track, and Zwischenräume (clockwise from the left)

Uzume (2002) is a virtual environment in which participants become bodily immersed in a three-dimensional, human-scale dataspace. Maya (2004), a tele-immersive installation, extends the data space and the participants' presence across two remote, networked sites. The coded instructions that produce Uzume's chaotic time-space and Maya's noisy, elastic data passage are shaped by corporeal processes; from the participants' movements to the machine's sensing and processing hardware. Introducing mechanic and robotic agencies, the installations On Track (2009) and Zwischenräume (2010) expand the material simulation of coded terrains into the messy milieu of our physical environment. On Track presents an unusual mix of materials whose interferences and interactions propel the orchestrated degeneration of a gooey, hiccupping choreography. Zwischenräume's intrinsically motivated auto-destructive evolution relies on the machine being structurally coupled with its environment. The specificities of these artworks are anchored in the material in both the works' specific conditions of embodiment, agency and performativity, as well as the audiences' aesthetic experience as they become bodily involved—playfully exploring, solicitously courting or more or less unwittingly complicit. Mitchell Whitelaw's concept of transmateriality puts forward that 'the digital is, of course, always and inevitably embodied; that concepts like 'data' are functional abstractions for describing the propagation of material patterns through material substrates'. However, the material patterns and the sensations and aesthetics they produce, 'are profoundly shaped by data acting as if it were symbolic and immaterial' (2008).

This conjunction is exactly where our investigation, both here and in our works, aims to inject itself. Our methods of intervention into this operational complot foster the qualities of the unstable, slippery and incomplete by, for example in *Uzume* and *Maya*, deploying non-linear dynamic systems and coupling of data and body or, in *Zwischenräume*, by provoking the collision of transmaterial forces through the structural coupling of machine and architectural environment. We look at the relationship between the machine agents, their enacted reality and its embodied, temporary inhabitants as a material ecology that evolves through mutual perturbations, rather than pre-scripted illusory control. Ecology here refers to a dynamic mingling of processes, matter, beings and things, and their co-evolution (Fuller 2003, also see Varela 1979 and Bennett 2010). The processes developed and propelled in these works manifest in entanglements and perforations of the contact surface or sheet of induction, where digital materialities and natural materials collide. It is where 'embodied interaction and engagement ... enter the fray', as Anna Munster puts it, where bodies—human or machine—affect and are affected by other bodies, where it gets messy, and 'conflicting proximities of body and machine' (2006:160) emerge. What is particular about the artworks we discuss here is that the fray is not an inevitable consequence, but a desired aim. Transductions, transmaterial flows and transversal relations are at play within all four artworks: whether emerging from or propelling the interplay between internal dynamics and external forces, the enactment of agencies (human and non-human), or the performative relationships unfolding over time. We will explore these concepts from within the works; understanding them as investigative playgrounds for material thinking, able to produce alternate, multiple and slippery ways of knowing.

## Locating the Virtual in Corporeal Processes and Material Specificities

The virtual environments *Uzume* and *Maya*—*Veil of Illusion* foreground the materiality of the virtual by rendering their actualised space semi-stable, constantly on the verge of becoming other. Both aimed to challenge common assumptions about the non-physicality of 'virtual realities' and how it legitimises a determined control over the body's messy and noisy conditions. *Uzume* was implemented for a four to six wall CAVE Virtual Reality (VR) System. The CAVE allows users to experience real-time generated, three-dimensional data spaces. Participants are required to enter a cube the size of a small room, defined by 4 to 6 projection screens, and to be coupled to the VR system by means of a head sensor, mounted on a pair of LCD shutter glasses, and, commonly, one to two hand sensors. The immersive, spatial interface of the CAVE was essential for *Uzume*'s development, for it allows the interface room to be simultaneously inhabited by a digital data space and the participants' body and the digital space to be sculpted by the body's movements. It seems fair to say that the medium of VR has long lost its initial fascination, and yet interesting to this exploration is its dynamic coupling of body and data, which enables, according to Mark Hansen, 'a production of space in the body,

or better, a bodily spacing' (Hansen, 2004:162). [5]. Most CAVE environments exceed the physical bounds of the virtual reality theatre, while its limited physically inhabitable space becomes the vehicle to travel through the virtual surrounds. Often, the means of navigating this vehicle is a handheld joystick-like hand sensor, whose buttons also provide the interface for interacting with objects, avatars and any other behaviours inscribed into the world. In contrast, Uzume's environment is bound to the physical limits of the CAVE theatre and participants need to move around inside this small room and gesture with their two hand sensors to interact with the virtual space. The most unusual characteristic of this space is that none of its behaviours are scripted; its dynamic nature makes it appear wilful, eluding any control, even the illusion of control.



Uzume by Petra Gemeinboeck, Roland Blach and Nicolaj Kirisits, video documentation extract. (video available in online version)

Immersed in Uzume, an abstract, dynamic and sensitively responsive environment surrounds the visitor. Its whirly, transitory nature is based on spatial representations of the temporal behaviour of nonlinear, chaotic systems: strange attractors. [6]. As the participants move around inside the projection space (while their gaze and movements are constantly fed to the computational system), they traverse the attractors' parametric fields that are mapped around their body and thus affect the environment's current state. The behaviours adapt over time based on the system's history and the interplay between its internal dynamics and the

constant stream of data supplying the participant's position and movements. Each line materialising the attractors' trajectories is connected to an invisible particle grid that also reacts to the participants' presence. The effect is similar to moving in a viscous medium, gently warping the whirly lines when moving inside them. This elastic connection also made it possible to slowly push and pull the chaotic entities. Thus, the environment responds sensitively in endless fluid variations to each individual visitor. Due to the indeterminability of the system's response, communicating with Uzume is similar to pursuing a dialogue without knowing the language of the other: although we can make sense of the other's gestural language, we are always subjected to the uncertainty of our interpretation; the actual meaning is never revealed, never completely decoded, never fully confirmed. While Uzume's environment grows increasingly familiar during the process of this dialogue, it is never the same, never known, but rather perpetually surprises, confuses and provokes its human inhabitant. Every movement of the participant causes a myriad of changes in the whirling environment: in shape, scale, density, speed, position, and even the potential for change (computation of new trajectory points per frame). Uzume continuously adapts to the curiosity and playfulness of its human opposite, and, at times, it appears to unfold like an extension of their bodies. Yet it's not only the whirling trajectories that adapt; over time the participants 'learn' to interpret their expressivity as gestures and dispositions that reflect the history of their encounter. There's a transversal agency at work, a constant reconstitution of relations that can only emerge from such an unscripted, irreproducible dance of forces.

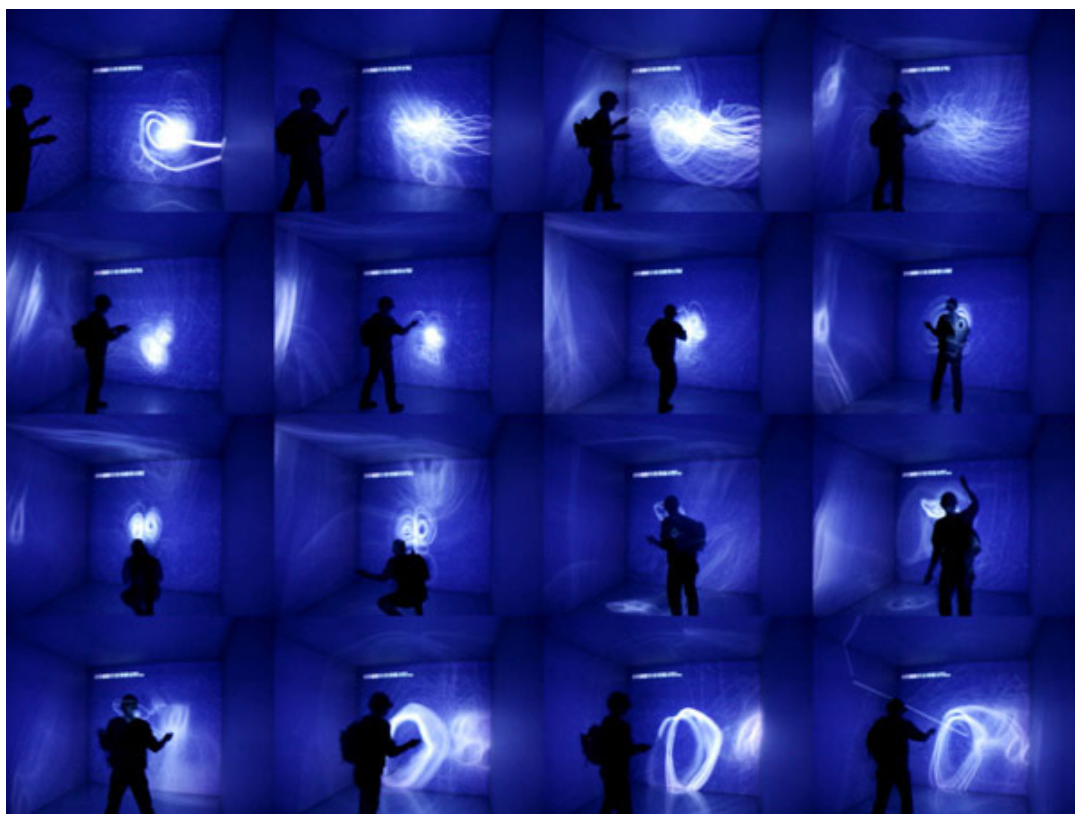
The work's dynamic material enactment was inspired by Henri Bergson's notion of motion that precedes space: 'Space is not a ground on which real motion is posited; rather it is real motion that deposits space beneath itself' (Bergson, 1991:217). Uzume's space only unfolds in conjunction with an experiential body that implicates its temporal movement, and body, space and time are inescapably coupled to one another in this evolution. Immersed in the abstract 'nothingness' of this virtual reality, it is our bodies that constitute the performative intersection, along whose contours the negotiation between the real and the virtual unfolds. 'What's on the screen is an icon. What's behind it is a set of permutations and algorithms and logical possibilities. None of these things are the virtual. It seems to me that the virtual is that slipperiness of experience. It has to do with the relation and what happens in between' (Dove and Massumi, 1999:30). A technological interface such as the CAVE allows for coupling the body with algorithmic permutations and logical possibilities. And yet, in Uzume, the connections in-between happen where it becomes slippery and at the same time specific.

The medium's objective to simulate a space inhabitable by human bodies through the discrete manipulation of supposedly immaterial data opens up an intriguing conundrum. Uzume's chaotic nature pushes this impossible relationship by binding its material expressions to an evolutionary path always specific to its history and open to external forces. Uzume's inhabitants often either moved in concert with the environment's whirly movements, as if aiming





Snapshot of Uzume in the CAVE at the Fraunhofer IAO Stuttgart.  
Photo by Victor S. Brigolaq



Sequence showing Uzume's whirly transformations. Photo by Victor S. Brigola

to trace them, or attempted to intervene with and shape them by forcibly gesturing with their sensors or devoutly pushing and pulling the multiple contours of their surrounds. Thus, the intangible environment certainly has a material affect, and the specificities of this material affect ground virtual realities in embodiment, which, according to Katherine Hayles, 'always is contextual, enmeshed within the specifics of place, time, physiology and culture, which together compose enactment' (1999:196). An 'art with feedback' evolves in a field of complex dynamics between all actors involved: the computational agent(s), human participants as well as the environment(s) they share. [7]. The realisation of the computational system, or agent, includes the interface with the machine's hardware and software, its expressive and performative potential, as well as its porosity, that is, the degree to which it is able to relate to the other actors. The participants' embodiment brings with it a history of social, gendered, and cultural experiences, which together shape their experience, expectation, degree of affectedness, etc. Coupled, the participant and computational system mutually affect each other and are embedded within the material conditions of their shared environment, its spatial configuration, air circulation, or lighting condition, etc., all interacting with and affecting the nature of the installation and the agents' place within. While this complex interplay is at work in all CAVE environments, questions of materiality, specificity, and embodiment have not featured prominently in the history of Virtual Reality. The installation *Maya-Veil of Illusion* (*Maya*), likewise, uses stereoscopic, real-time projection systems; here the system networks two sites to span a shared virtual space in-between. The tele-immersive installation is concerned with the illusion of control and remote presence within the context of shared virtual environments. Immersed in *Maya*, participants are networked and mapped to one another, which allows them to 'step through the looking glass' and to be present on the 'other side'. Yet *Maya*'s 'veil of illusion' takes on the role of a tactile transformer in-between, interfering with and, thus, unveiling the promise of fidelity.

The (multi-)inhabitation of shared environments exposes the obscure nature of remote data transfer. It is not clearly comprehensible for a participant where the (apparently) incoming data has arisen, where outgoing data is being sent, and how it is transformed en-route. Naturally, the fidelity of the space as a shared experience is thus brought into question: how can a shared virtual experience be trusted when it is constructed from such intangible and malleable stuff as streams of binary digits? In *Maya*, the detachment of the data from its inhabitants, and the material noise this produces, drives the dynamic process that literally shapes and reshapes the shared space it spans. *Maya* presents a fluidly-dynamic mirror surface; a two-way mirror, whose two sides are split apart to produce an elastic and only apparently transparent looking glass on each remote site.

A three-dimensional skin-like membrane of interconnected particles shapes the surface. It transforms based on a physical simulation of force fields, aiming to make tangible the specific material conditions (and impossibilities) of shared virtual environments. *Maya*'s elastic boundary alludes to the performative act of traversing to the other side: 'boundaries are set and specified in the act of passage' (Massumi, 1993). Performing as the avatar

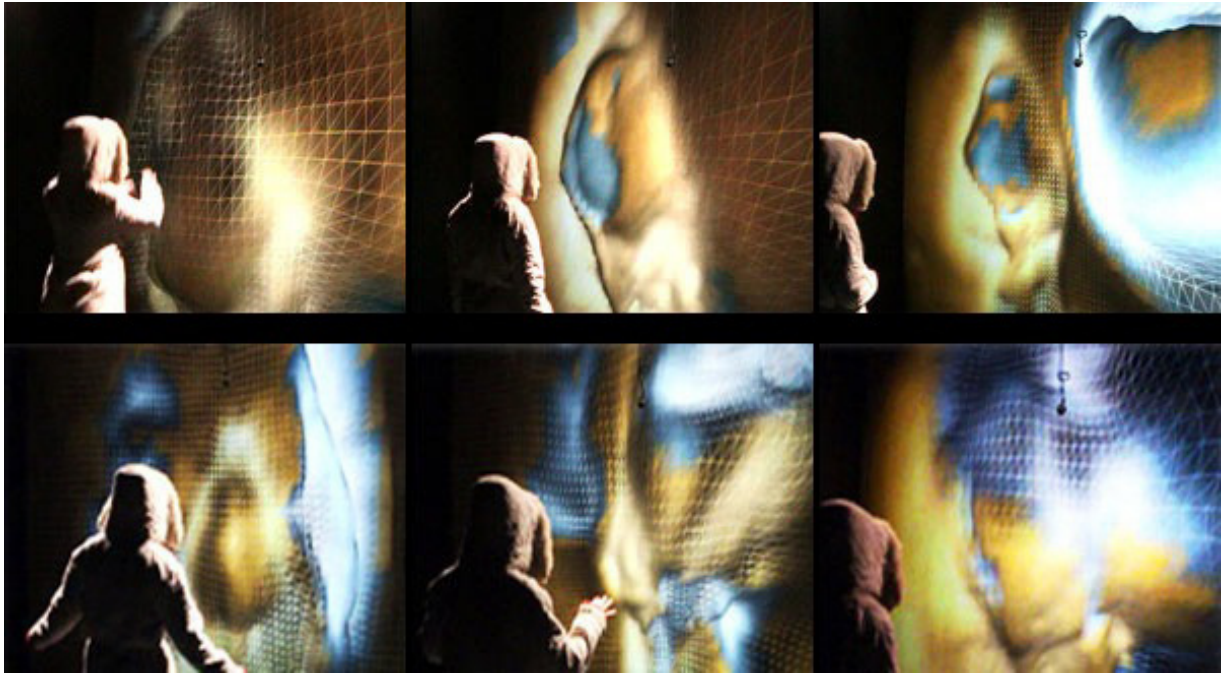


Maya-Veil of Illusion by Petra Gemeinboeck, video documentation extract. Full video available in online version of the paper.

that participants share on both sites, the veil also acts as a performative boundary in-between that enacts the transversal and the transmission of data. It is an avatar that not only mediates but also proactively co-shapes the participants' remote dialogue. As the participants move towards the screen, Maya's virtual veil extends and seems to allow one's body imprint to reach to the 'other side'. Yet the more one tries to touch the other, the more the digital body distorts, gets entangled with the other bodies, and eventually becomes other. The work interfaces with its participants based on a transduction from light to force: to detect, track and interpret participants, a camera eye captures the light-reflection of the environment, thus reading and reinterpreting the participants as varying luminance values. Due to the stereoscopic display of the three-dimensional veil, the veil appears to bubble and swell into each participant's space, so that the participant's touch, re-enacted by the digital passage effectively colonises the other side.

The work problematises the system as a transparent extension of our bodies. Maya's only apparently transparent veil marks the ends of an imaginary passage that takes on the role of a third, unknown performer in-between. The system's internal dynamics introduces the forces



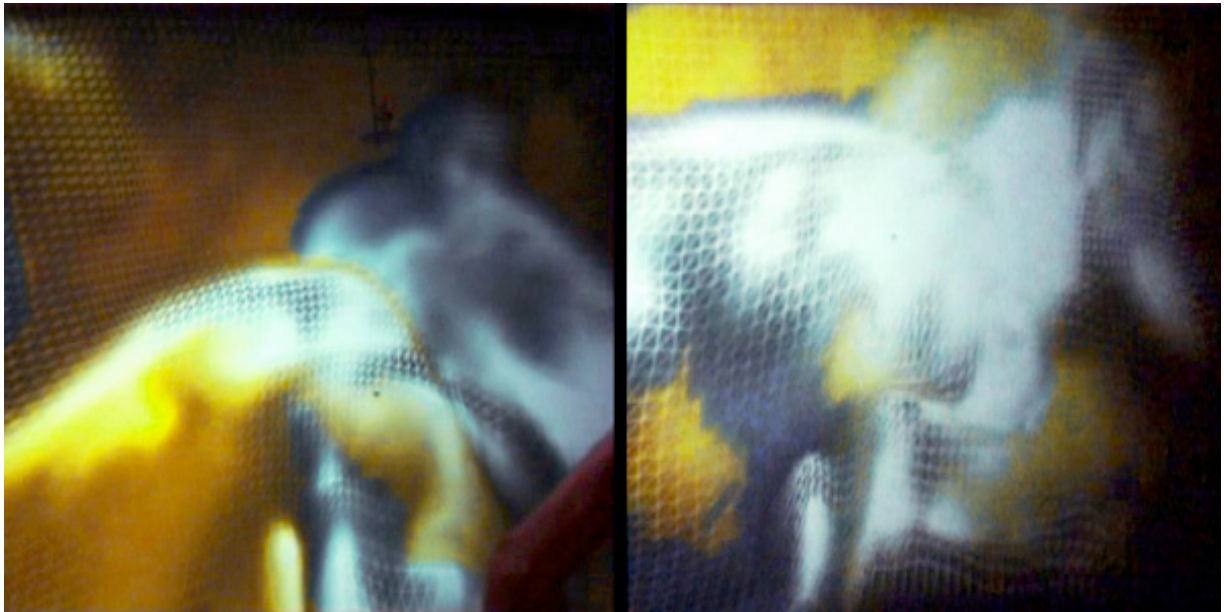


Maya—Veil of Illusion at the Electronic Visualisation Lab, UIC Chicago.

that continually reconstitute the veil and its transversal agencies, whereas the material specifics of digital processing and transmission determine the local differences on each remote site: while Maya's two sides evolve based on the veil's force play, each side differentiates itself from the other based on the local system's interpretation of both local and remote inputs. The deviations between the two sites result from—in fact, exploit—the situated materiality of the two systems: network delays, caused by noise in the network and necessary delays in compensating for them, varying light conditions at each physical site, and the differences in integral time steps of the local computing process. As such, Maya's passage from one side to the other makes the transmaterial tangible; both sides of the passage would perfectly mirror each other, if their digital material wasn't anchored to physical. The resulting rippling and bubbling interlacing fragments, mirroring different places, reminds of something that suffers from 'disturbances of memory and the failures of recognition' (Deleuze, 1985:55).

To reveal and make tangible the system's reinterpretations of and interferences in the participants' communication, Maya also presents an unusual spatial constellation: The environment is programmed as to enable participants to 'enter' the veil from any remote location, and yet, conceptually, the passage and its two end surfaces need to be displayed on one site. The two mirror sides are turned inside out and positioned opposite of each other to materialise the passage in-between. This, perhaps paradoxical, locally installed shared environment allows for participants to experience the situated materiality of data networking processes and to become aware of and explore the transmutations in-between.





Maya- Veil of Illusion, both sides of the passage (gold corresponds to local data, blue to remote data).

## Hiccupping Performers and Suspicious Machine Agents with a Hammer

The works *On Track* and *Zwischenräume* extend our discussion linking dynamic systems with the concepts of specificity, embodiment and slipperiness. However the dynamic relations of these machinic assemblages evolve in the unforeseeable interplay between the materialities that constitute them. In fact, their core aim is to performatively enact this dynamic interplay by materially manifesting the ways in which it affects all agents involved. In contrast to *Uzume* and *Maya*, which evolve based on the mutual relationships between human bodies and the dynamic system and its material enunciation, *On Track* and *Zwischenräume* only interact with people in the sense that the audience is part of the environment that the machine agents are embedded in and intervening with.

The slippery, smelly performance of *On Track* by *In Serial* emerges from the interactions and interferences between a mechanical mop, a troupe of robotic brushes and spilling viscous fluids. The unusual mix of materials and approaches that characterizes this work's poetically messy articulation is the result of the coming together of four artists from different backgrounds. [3]. The work develops an ironic lens through which to look at human endeavour, its overly complicated mechanisms and procedures, and their vulnerability to a slipperiness already built in. A disaster-prone scenario unfolds as the protagonists—apparently set to



On Track by In Serial, at the Thessaloniki Biennale 2009.  
Photo by PRINZGAU/podgorschek.

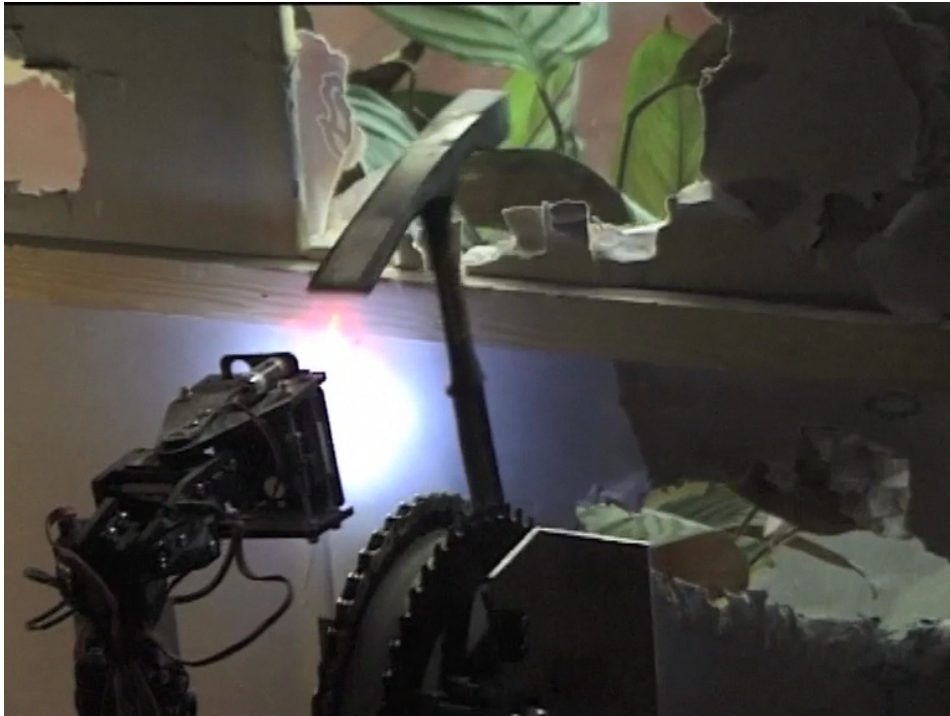
clean—spill, interrupt and hinder each other, creating an ever more slippery mess in intricately choreographed ways. On Track's machinery materialises notions of the recurrent, futile and instable in an assemblage of four interacting actors (some of which already are complex assemblies themselves), at whose core lie repetitiveness, interference, constraint and deterioration. A slowly swinging mop is joined by a troupe of autonomous robotic brushes that bring a nervous, teetering energy to the scenario. Opposing and extending the mechanic and pendulous, the robotic brushes bear something more human; laden with intent and sensation, they perform complex choreographed agitations. The dialogue between the two, carried through infrared signals, only serves to interrupt the robot's movements and thus to interfere with the brushes' impossible assignment. To propel the narrative of slippage and hindrance, two further 'systems' were in play. Five large industrial buckets are filled with viscous liquids, latex, fish glue, and other slimy substances. The buckets are leaking and supply an ongoing provocation for the mop that with each swing, mixes them together with pigments to create a congealing trail of puddles and crust. The robots themselves are trapped on platforms mounted above the buckets. Confined by their elevated cells, they are abandoned to gesture restlessly and in frustration, teeter at the precipice. Doing so, they are constantly rocking the buckets, thus they unknowingly contribute to the creeping mess (Gemeinboeck et al, 2010).

On Track performs the issues that it seeks to critique rather than representing them. Rather than being representational, according to Irit Rogoff, '[p]erformance comes into its own in the name of an unease, in the arena of a promise of something that is yet to come, yet to be articulated and of agency yet to be recognized, yet to be named' (1998). The work's performance continuously forms—and breaks—where all its actors collide. Following Andreas Broeckmann's definition of the machinic as an aesthetic principle, it seeks 'process rather than object, ... dynamics rather than finality, ... instability rather than permanence' (1997). While the constant material collisions lead to a big, gooey mess overall, many of the traces of the transductive forces produced in this assemblage of material processes can be found at the rim of the programmed, mechanic and the other materials, whether crafted (wooden platforms) or stirred (fluids and pigments). The motions of the brushes, for instance, constantly chafe against the lacquered wood and the increasingly tattered surface causes the robots to slip. It is where the programmed and choreographed meet the messy and unknown, that 'other ways of knowing' (Maharaj, 2002) can unfold: where movements deviate, stutter and synchronization slips, and the fluids coagulate. The installation *Zwischenräume* (Interstitial Spaces) is part of a series of machine installations that embed autonomous robots into the skin of our built environment to investigate the performative potential of material agency. The creative research project deploys robotics as a medium, consisting of a collective of autonomous, embodied and intrinsically motivated agents capable of enacting and communicating their evolving desires in embodied ways by re-sculpting their environment. It understands the robotic medium and its specificity as a 'product of interaction between different elements in an assemblage of material processes', rather than in the sense of purity or norm. (Maras and Sutton, 2000:102).



On Track by In Serial- Video available in online version of the paper.





Zwischenräume by robococo (Petra Gemeinboeck and Rob Saunders).  
Video available in online version of paper.

This first work, *Zwischenräume*, embeds a group of autonomous robots into the architectural fabric of the everyday life, as both a sculptural manifestation of and investigative lens into the politics of surveillance. Perforations of electronic monitoring and remote control, commonly perceived as immaterial, are made tangible in the form of an autonomous sculptural 'un-walling' process that marks and wounds our environment. Incorporated into the wall itself, a collective of robots punches holes to inspect what's outside, signal each other, and conspire. Each robot, moving across the plane of the wall, is equipped with a hammer, surveillance camera, and a contact microphone. The architectonic environment serves as the agents' body, and also becomes their milieu for communication and intervention: producing cracks, holes and scars, they develop strategies to survey, provoke, and conspire. Intrinsically motivated to explore the environment and study its inhabitants, the agents process movements, colours and faces to create an adaptive model of the surrounds (Gemeinboeck and Saunders 2011). In contrast to the agents or agential spaces previously introduced, these self-motivated agents don't only respond to changes in their environment but also proactively intervene. The hammer is not only used to create holes for the camera eye to see but also becomes an instrument for signaling each other. They network audible and tangibly with each other by rhythmically knocking against the wall; which, even though more gently executed, inflicts serious injuries to the wall's skin over time. The sculptural practice developed in *Zwischenräume* turns the wall of the gallery into a medium for intervention; re-constituting the space of the gallery as an event. The need to exploit the audience's ignorance

and confusion makes the staging of this intervention immanently site-specific. Ideally, the existing architecture is mimicked to house the robots that then (appear to) break through the, taken for granted, security offered by a familiar wall. The aim is to engage the audience in the intimate complicity that connects us with the machinic ecologies we create. Thus, it is the spectacle of the intervention into the architectural fabric that we are interested in, rather than the spectacle of the intervening machinery. In the first exhibition, the surveillance machinery transformed a cozy living room scene into a capricious, suspicious voyeur [9].



Zwischenräume at the Electric Avenue, MuseumsQuartier Vienna, two weeks into the exhibition.

The means of marking and wounding our environment have been adopted from two military references that, once entangled, have shaped the material forces of this embodied surveillance. The work develops a political relationship between the stealthy invasion of digital surveillance and urban combat tactics in which Israeli soldiers were literally instructed to walk through private walls to ambush their enemies (Weizman, 2006). In *Zwischenräume*, the forceful penetration of the wall enacts the haptic force of surveillance as it is most powerfully demonstrated in DARPA's project 'Combat Zones That See' [8]. Our work embodies

surveillance's transmaterial force of seeing, or as Brighenti (2010:185) puts it, 'the gesture that seizes' by literally carving the machinic gaze into the fabric of our built environment. Making the gaze tangible, exposes the politics of transmateriality: Mitchell Whitelaw's notion of transmateriality where data acts 'as if it were symbolic and immaterial' (2008) becomes political in digital surveillance, where the 'acting as if' is intentionally exploited. Surveillance relies on the illusion under which the extraction of data, the flow of data, and the extracted, transferred data itself are perceived as symbolic and immaterial. The intangibility of data flows allows digital surveillance to operate in the first place, while, arguably, the (extracted) data disguised as symbolic and immaterial helps securing the public's indifference



Zwischenräume, behind the scenes.

Beneath Zwischenräume's surveillance narrative lies a broader critical investigation of the relations, dependencies, and tensions between what is often perceived isolated as technology, nature, culture and society. The installation almost literally enacts the drama played out between cultural and physical forces, and this force play is not only propelled but also motivated by the machines' desires. As it problematises the paradoxical ground common to both, intervention and surveillance, it not only makes tangible the surreptitious powers

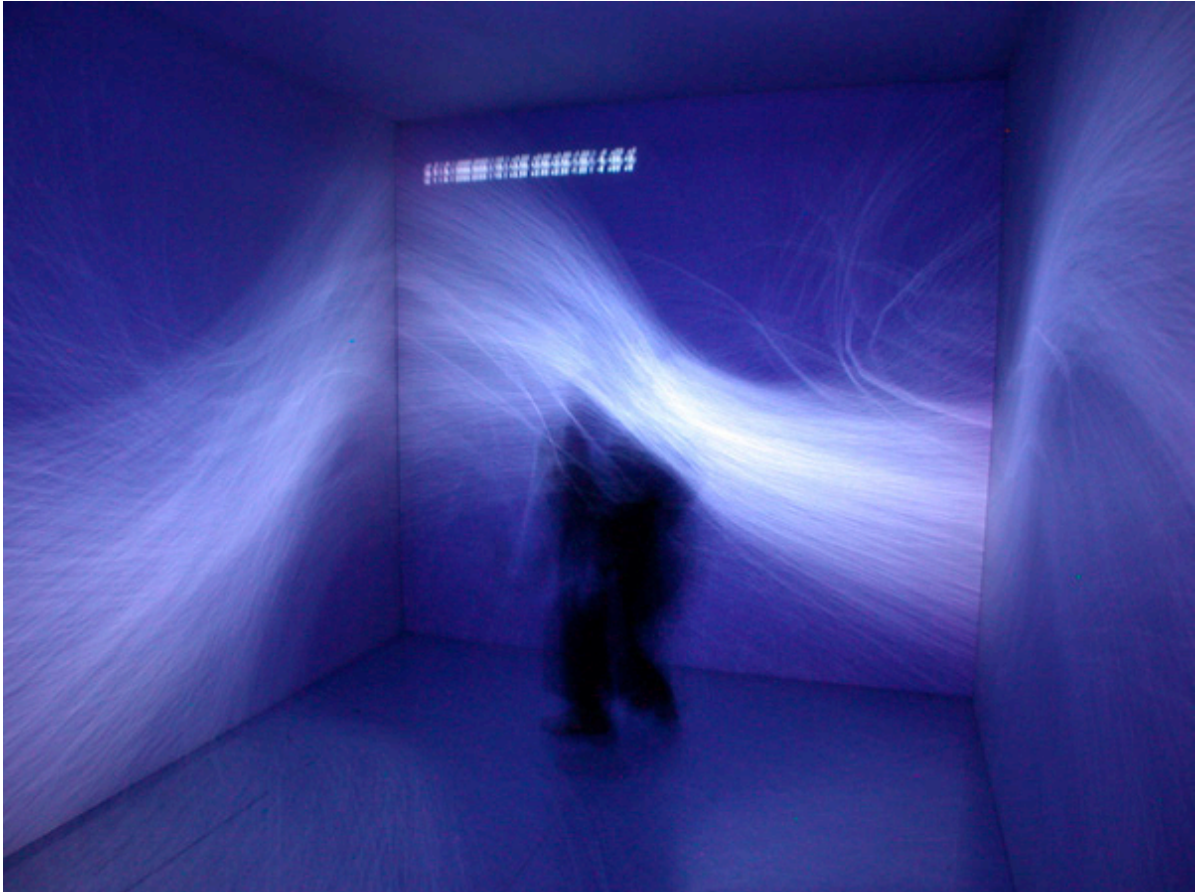


of digital control, increasingly perforating our everyday life (Crandall, 2005; De Landa, 1998; Haraway, 1991), but also highlights the scale to which our cultural identity, the need to affect and control our natural environment, and technological innovation condition and consequently constitute each other. In the work, these relations of interdependency are played out in the feedback loop between the environment, with its specific material conditions, cultural context, and inhabitants, and the specifics of the agents' agency, resulting from their autonomy and embodiment. Looking, reflecting and acting become mutual processes that propel the relationship between the machinic inhabitants and their human environment, as much as between the human inhabitants of the machinic environment. The agents' embodiment (as part of the wall) evolves based on their interactions, and consequently, their agency affects processes out of which they are themselves emergent. This performative entanglement resonates with Karen Barad's argument that agency is 'a matter of intra-acting; it is an enactment, not something that someone or something has' (2003:826-7).

## Partial, Material and Situated Knowledges

The work's transmaterial flows and affects, transformation of agencies, and the constitution of transversal relations happen where different agents, human and non-human, meet; where data and bodies dynamically couple and affect each other. In the following we will take a closer look at how these transmaterial minglings and congealing agencies produce multiple perspectives and alternate situated knowledges. The works' specific material enunciations, the ways in which they dynamically couple with bodies, and the transversal relations they produce, cut across and challenge some old and long-engrained boundaries, separating mind from body, human from nonhuman, and culture from nature. These demarcation lines and their underlying Cartesian ontology also brought upon us the distinction between matter and information (see Hayles 1999), which has deprived the digital of its materiality and in many ways defined the medium's potential. The way, in which the artworks and their experimental playgrounds outplay these boundaries, is by deliberately producing unstable conditions and embroiling matter, processes, and human actors in this maelstrom of constant becoming. Davis has depicted the productive effect of Philip K. Dick's radical and often destructive interferences: 'In a world of manufactured illusions, the gremlins of entropy—malfunctions, interference, decay—can paradoxically liberate us by gouging holes in the smooth surface of simulation; these corrosive gaps create the space for breakthroughs and insights, imaginative or real' (2005). The 'gremlins' of our works are the slipping logics of nonlinear systems or distributed agential forces of colliding materials: Uzume's chaotic habitat and Maya's noisy and bubbling data passage, On Track's messy mix, and Zwischenräume's forceful inscriptions of the machines' gaze. All four release, what may appear as wilfulness, an agency unintended or an 'other' that unsettles our expectations and assumptions. At the same time, they open up a space for a different set of questions and relations that seek, in Donna Haraway's words,

'perspective[s] from those points of view, which can never be known in advance, which promise something quite extraordinary, that is, knowledge potent for constructing worlds less organized by axes of domination' (1991:192).

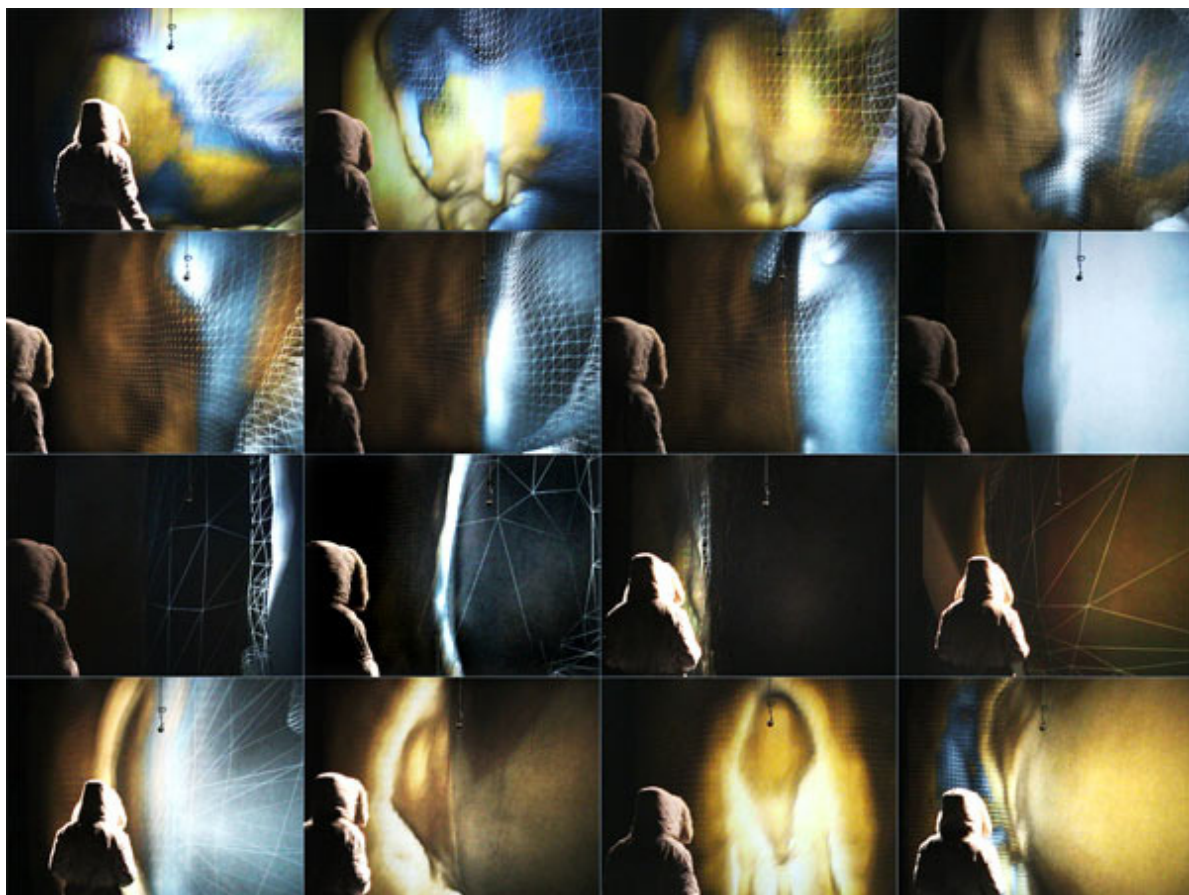


Uzume, continuously becoming body. Photo by Victor S. Brigola.

Both, Uzume and Maya intervene into standard data-body or body-data-body transductions by making them fragile, slippery and indeterminable. Uzume's materiality unfolds in the continuous process of becoming-body, that is, the between of a series of differentials, the interval. Derrida calls it 'spacing': 'the becoming-space of time or the becoming-time of space (temporization)' (1982:13). The attractors' abstract mathematical space of possibilities becomes the basis for the induction of time, out of which 'tangible' space emerges. Space, as we experience it in Uzume, appears like a trace, a living trace, always flowing and never forming an encrusted surface. It is, to borrow from Elizabeth Grosz, 'neither clearly space nor time but a kind of leakage between the two, the passage of the one into the other' (2001:110). Maya's becoming-body, on the other hand, is of folding, a turning inside out. Bound to and bouncing off the boundaries of the passage, that which was coming from outside (remote) suddenly appears to emanate from the inside (local). The inversion of forces



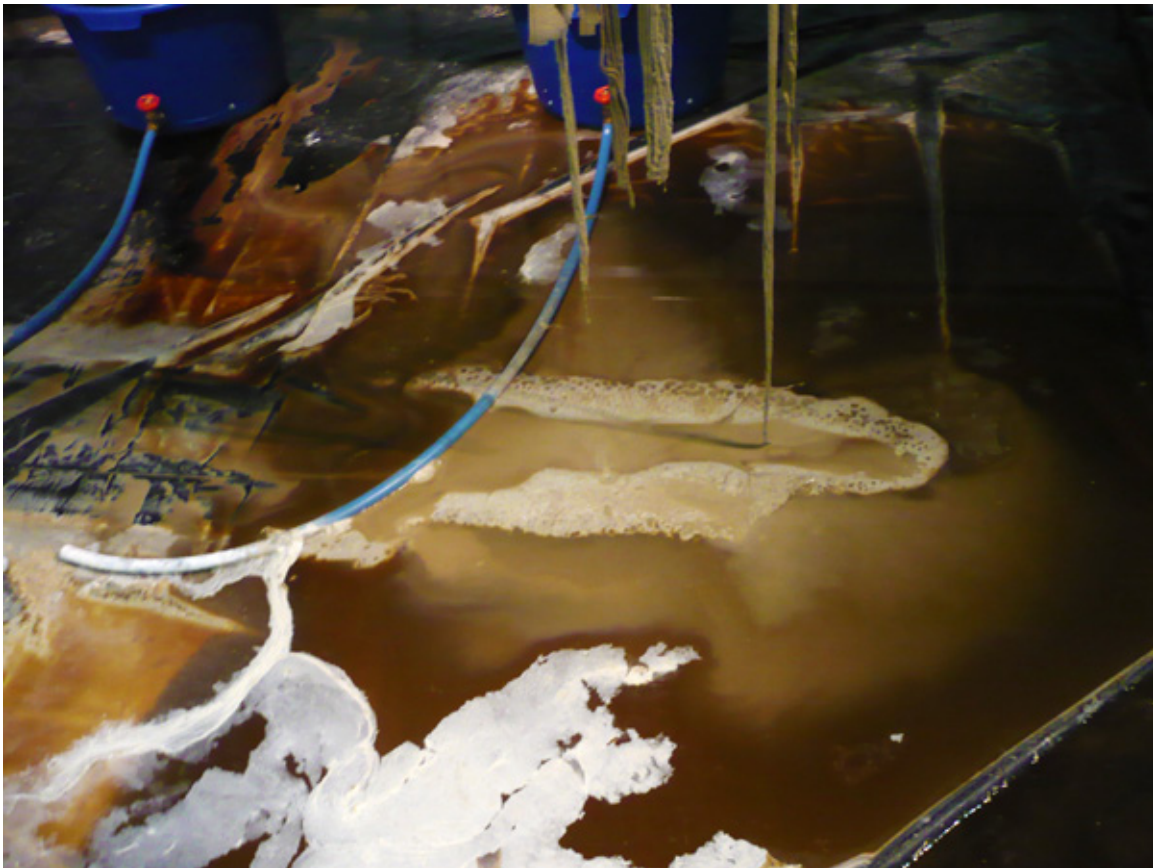
closes the passage. It only opens, violently, at the point at which the membrane's force play becomes unbalanced and eventually unstable. The force field collapses, shattering the mirror surface and resolving the passage into black nothingness. Yet the confines of this passage are not immediately imaginable or accessible. To traverse this spacing boundary requires one to understand that there is no passage. This is how we arrive at Alice's Wonderland: 'By sliding, one passes to the other side, since the other side is nothing but the opposite direction. ... It is by following the border, by skirting the surface, that one passes from bodies to the incorporeal (double)' (Deleuze, 2001:10).



Sequence of Maya—Veil of Illusion, skirting the surface and sliding to the other side.

Notions of the 'virtual' may be re-enacted by the material enunciations of a (VR) system, but they are certainly not fabricated by technology. Rather, we imagined Uzume and Maya to be an 'encounter between bodies that releases something from each and, in the process, releases or makes real a virtuality' (Grosz, 2001: 69). Any existing relationships and with it, any assumptions and expectations from the works' authors and co-authoring audience, are constantly probed, unfixed and renewed. Their specific material manifestation is, in Erin Manning's words, 'a transmutation of process-becoming-form' (2009:126), always partial,

multiple, and impossible to reproduce, rather than the enactment of a reality that reproduces and reaffirms what is already known. What the artworks are able to do is to open this uncertain spacings and fragile entanglements up to us to insert ourselves, and render them an intensive embodied experience. Locating a digital aesthetics, Anna Munster talks about 'the way in which digitality provides a set of lived circumstances in which our senses encroach upon us in a different way' (2001). Similar to the 'virtual', Guattari's notion of the 'machinic' as an assemblage of heterogeneous forces in a continuous state of becoming and transforming each other, affords us a perspective that is as much imaginary and experimental as it is technical. His abstract machines install themselves transversally to all heterogeneous machine levels, the material, cognitive, affective and social (Guattari 1995:35). Rather than simply (re)forming matter, they open up a milieu for experimentation. They are, as Manning puts it, 'processes (of) in-formation, continually, rhythmically recasting the heterogeneous processes out which they themselves are emergent' (2009:105-6). The concept of the machinic opens up an arena in which to locate both, the body-system couplings in Uzume and Maya and the disaster-prone entanglements of *On Track* and *Zwischenräume*. All their heterogeneous processes always unfold in the present; without the comfort of rehearsal.



*On Track* by In Serial. Detail showing coagulating mess. Photo by Marion Traenkle



Zwischenräume, images from inside the wall, captured by the robots.

On Track and Zwischenräume challenge a view of machine performers whose agency is bound by their material embodiment, and provoke us to explore them as an 'immanent, collective entanglement of material enunciations that operate on, shape, and transform the world' (Salter, 2010:xxxiii). The works open up the transversality of assemblages that owe their agential forces to the vitality of the materialities and dynamic spatio-temporal relations that constitute them (Bennett 2010: 34-5). On Track's fragile alliances of agents, whether mechanical-programmed or fluid-gooey, are partly choreographed and preprogrammed and partly emerge from the interferences between agents themselves. Aside from the leaking and mixing of liquids and the abrasions of surface materials, the agents don't actually transform in this 'dance'. Rather, their agential forces are released in the undeterminable interplay between different movements, rhythms and material interferences. Causing hiccups, leaks and failures, the system's entropy increases, and it's the agency of the interlinked agents that undergoes transformation. Infrared signals broadcast by the ever-passing mechanic mop cause the robots to stutter, and—together with tiny rounding errors in their internal clock—their synchrony dissolves. The buckets leak, rocked by the robot brushes and their sudden, breaking rhythms, and fluids coagulate around puddles. The mop keeps mixing and dispersing the fluids until they turn into a sticky, smelly amalgamate, and it itself gets stuck.



Matthew Fuller, using the concept of the 'machinic phylum' as a lens into complex medial systems, brings forward the ecology-making forces of the dynamic and nonlinear. '[S]timulating each other to new realms of potential', they produce '[n]ot a whole, but a live torrent in time of variegated and combinatorial energy and matter' (2003:171). [10]. *Zwischenräume*, an installation that literally injects itself into the environment, evolves based on the tension between the static, discrete and the dynamic, adaptive. This heterogeneous process, however, does not animate what is otherwise without agency, but rather intervenes into the wall's agency and performativity. It disrupts and diverts the trajectory of the environment's material history and renders it negotiable. Coupling the machines' autonomous agency with the structural agency of the wall opens up a space for Barad's 'congealing of agency' (2003:828), where the different agential forces not only co-evolve but perform together; a material mingling that transversally affects the cultural agency of the architectural boundary and links to the political agency of both, erecting a wall and breaking it.

The works' transversal relations unfold with the dynamic and emergent forces, situated in a specific material and cultural context. That's where it gets slippery. The deterritorialising effect is two-fold: One, the forces perpetuate across digital and physical terrains and willfully cut across the boundary between human and nonhuman agency. The coupling of data and body in *Uzume* and *Maya* provide intimate glimpses of untamed digital wildernesses and discomforting views upon our everyday illusions of control. The collision of programmed choreographies and material contingencies in *On Track* creates a stage for entropy to be played out. *Zwischenräume's* enactment of autonomous agencies and material tensions manifest as open wounds in once trusted borders. The second challenged territory is that of control and hierarchical views. Rather than offering the comfort of repetition and security of control, the works put us in a position, where we have to abandon control over the process and its effects. Both the authors, by setting this process in motion, and the audience, by becoming collaborators, accomplices or intervenors, are caught up in this dynamic lattice of relations of interdependency. We are placed inside this unfolding process, rather than operating from a safe position outside that provides control and overview. There is no outside position. But there are new alliances to be made. Conventional production of knowledge separates the subject from the object and distances the process of production from its specific context. In contrast, the unscripted, situated and potentially messy enables a production of knowledge that, as Sarat Maharaj's puts it, wires 'into transformative interaction' and gets 'into shaping matters, into conductivity with experience' (2002:80). It is by exploiting the noise in the system and by seeking the specific, indeterminable and irreproducible that the thinking with and deploying of digital technologies can open up new perspectives and engender new aesthetic experiences. The contingencies, slippery passages and series of transforming possibilities enabled in this heterogeneous process, to borrow from Erin Manning, 'produces not simply a change of state; it invents a new process' (2008). What we here produce and encounter are not so much answers, causes and effects that will always be the same, but rather questions, deviations and 'unexpected openings' (Haraway, 1991: 196) that will

always be different. At the heart of our four works (systems), is that they need to happen, or be executed, to use a more technical term, in real-time for us to know what they do, what can happen. 'Mapping [themselves] during take-off' and constantly re-mapping themselves en-route, what results 'cannot be spelled out in advance of the processes of [their] making' (Maharaj, 2004). Whether it is the non-linear dynamics in Uzume and Maya or the unforeseeable results from the material interactions in On Track and Zwischenräume, without them being enacted, that is, situated in space and time, relating to the environment, and becoming-body in response, precipitate, we cannot know which of the many possible performances they will produce, which relations they will create during the process. This unfolding in real-time, that is, the time of our bodies, and in real space, that is, the space we share with them, their actions within our environment and interactions with our bodies, makes them specific.

## Biographical Note

Petra Gemeinboeck is Senior Lecturer in Interactive Media Arts at the College of Fine Arts, University of NSW. Petra's practice in machine performance, interactive installation, and virtual environments explores the ambiguities and vulnerabilities in our relationships with machines, making tangible the desires and politics involved. Her works have been exhibited internationally, including the Ars Electronica, Thessaloniki Biennale, Archilab, MCA Chicago, ICC Tokyo, OK Center for Contemporary Art, and the Centre des Arts Enghien at Paris. Rob Saunders is Senior Lecturer in Design Computing at the Design Lab, University of Sydney. With a background in Artificial Intelligence, Rob's research centres around creative application of computing and the computational modelling of creativity. Using techniques from machine learning, robotics and surveillance he explores the role of curiosity in creative processes and develops models of creative systems at individual, social and cultural levels.

## Notes

[1] Uzume (2002), by Petra Gemeinboeck and Roland Blach. Nicolaj Kirisits has composed the real-time soundscape. <http://www.impossiblegeographies.net>

[2] Maya-Veil of Illusion (2004) by Petra Gemeinboeck. <http://www.impossiblegeographies.net>

[3] On Track (2009) by In Serial (Linda Dement, Petra Gemeinboeck, PRINZGAU/podgorschek and Marion Traenkler); the robotic performance was developed in collaboration with Rob Saunders. <http://www.inserial.net>

[4] Zwischenräume (2010) by robococo (Petra Gemeinboeck and Rob Saunders). <http://www.robococo.net>

[5] The aim of this article is not to introduce a critical account of 'Virtual Reality' and its technologies. For a critical discussion of virtual reality within an artistic, theoretical and technical context see earlier writings of Petra Gemeinboeck (2001-2009).

[6] The trajectory of an attractor represents the series of successive states through which a dynamic system proceeds over time. Strange attractors are semi-stable, 'living' on the borderline between instability (that is to blow up to infinity) and stability (collapsing into a singular equilibrium point) and show the unique property that they never travel through space on the same trajectory. As dynamic systems are sensitive to their initial conditions, very small differences in initial values result in very different behaviours. The chaotic property makes it essentially impossible to make any long-term predictions about the behaviour of a dynamic system.

[7] In 1964, Stanislaw Lem, a science fiction author and researcher in cybernetics, has developed the vision of an artificial reality system: the 'Phantomatic'. The system was capable of creating mutual connections between 'the artificial reality' and its recipient. In Lem's words, 'the Phantomatic is an art with feedback' (translated by author).  
- Lem, Stanislaw. *Die Entdeckung der Virtualität* (Frankfurt am Main: Suhrkamp, 1996), p. 158.

[8] DARPA stands for U.S. Defense Advanced Research Projects Agency. Their project 'Combat Zones That See' embeds thousands of cameras into the urban terrain, aiming for surveying and analysing the moves of each resident based on state of the art artificial visual intelligence: [http://en.wikisource.org/wiki/DARPA\\_Solicitation\\_Number\\_SN03-13:\\_Pre-Solicitation\\_Notice:\\_COMBAT\\_ZONES\\_THAT\\_SEE\\_\(CTS\)](http://en.wikisource.org/wiki/DARPA_Solicitation_Number_SN03-13:_Pre-Solicitation_Notice:_COMBAT_ZONES_THAT_SEE_(CTS))

[9] The first exhibition took place in the Schauraum Angewandte, located in the Electronic Avenue of the MuseumsQuartier in Vienna, Austria, June 8–July 27, 2010. As the gallery space was bounded by glass walls and a wall with a large window, it was necessary to stage the environment to be intervened, as well as the intervention itself. The small, transparent gallery space was turned inside out and transformed into a private, living room scene oriented towards the public space outside the gallery (see figure 8).

[10] Matthew Fuller refers here to Manuel De Landa's account of Deleuze and Guattari's concept of the 'machinic phylum'.

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## FCJ-121 Transversalising the Ecological Turn: Four Components of Felix Guattari's Ecosophical Perspective

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Over the past decade, the humanities disciplines have played host to an explosion of ecologically themed transformations, which continue to open up new (sub)fields of research and teaching. The development of the ecological turn in English studies (conceived broadly to house the study of literature, composition, film, and new media) resonates with the general evolution of the eco-humanities; indeed, English departments have led this movement in many respects. A survey of English's recent appropriations of ecological ideas (and their failings) establishes a point of departure for rethinking the eco-humanities. Ecocriticism, with its reputable journals and popular conferences, has no doubt become the most institutionalised of English's eco-fields, while more pointed approaches continue to gather loosely around terms such as green cultural studies, ecofeminism, ecocomposition, and ecomedia studies.[1] At the turn of this century, much of the early work in ecocriticism was devoted to 'naming the most important works in the field and elaborating the reasons why they matter more than others' (McNamee, 1997: 14). Contemporary leaders in ecocriticism continue this "green" canon-building project, issuing pronouncements similar to Libby Robin's 2008 declaration, 'We need a literature that enhances understanding of relations between people and nature, of how we notice change personally, and how such global changes affect places we know intimately' (Robin, 2008: 292). The growth of ecocriticism, however, has attracted an increasing number of critical attacks, the most significant of which have been waged by literary theorists who, despite their objections, share the ecocritical desire to respond to ongoing ecological crises. In particular, these theorists assail ecocriticism for its reluctance to engage with issues raised by contemporary theory. [2] Timothy Morton goes as far as saying that ecocriticism 'consciously blocks its ears to all intellectual developments of the last thirty years...ecocriticism promises to return to an academy of the past' (Morton, 2007: 20). And yet, none of the leading books associated with ecocriticism (not even

the famous "ecocritiques" by Dana Phillip or Timothy Morton) seem interested at all in the work of Gilles Deleuze and Felix Guattari. That the eco-humanities generally shares this gap in knowledge seems very bizarre, especially given the explicit ecological focus in Guattari's later writings and given Deleuze's claim in the late 1980s that he and Guattari wanted to write a (last) book on their philosophy of Nature. We should wonder now, with great pertinence, where Deleuze and Guattari's philosophy would lead the ecological turn, which, along with the digital turn, promises to be a formative influence for humanities disciplines in the twenty-first century.

If there is a unifying theory that connects most ecological approaches across the humanities disciplines, certainly that theory is Arne Naess's widespread notion of deep ecology or "ecosophy". As Gary Genosko (2009: 86) points out, Guattari's writing on ecosophy never refers to Naess and his development of the term. That said, certain statements by Guattari throughout *The Three Ecologies* (e.g., 'Ecology must stop being associated with the image of a small nature-loving minority...') may arguably function as indirect references to, if not critiques of, Naess's project (Guattari, 2008: 35). At a fundamental level, the mission of Naess's ecosophy is to expand the sphere of objects with which people identify. He believes that 'identification elicits intense empathy' and that humans remain indifferent to that which they take to be utterly different than themselves (Naess, 1995: 15). To support this position, Naess shares a personal anecdote about a flea that suddenly landed in a sample of acid chemicals, which Naess was studying under a microscope. He claims, 'If I was alienated from the flea, not seeing intuitively anything even resembling myself, the [flea's] death struggle would have left me indifferent' (Naess, 1995: 15). This anecdote, a vital illustration of Naess's thought, brings us to the most important difference between his ecosophy and the ecosophy of Felix Guattari. Naess calls for an expansion of the self via identification ("Self-realisation"), whereas Guattari (and Deleuze) valorise autopoietic processes that perform a dissolution of the self via disjunction ("becoming-other"). In other words—in a Guattarian reworking of the flea anecdote—I would not look for elements of the flea that remind me of myself; rather, I would receive the flea in its alterity and encounter aspects of the fleas that are completely different from myself, so as to "become-flea": to introduce the flea's manner of existence into the way I think and live. [3] Initially, the difference between Naess's identification and Guattari's autopoiesis may seem trivial. This minor difference, however, actually lays out two divergent, even conflicting, paths for diagramming the production of subjectivity. 'Guattari's concern,' writes Genosko, 'is not self-realization through widening of a pre-given self, but processes of singularization that resist the frames of reference imposed by an identity' (Genosko, 2009: 87). Consequently, an eco-humanities inspired by Guattari's theory of ecology would look very different than the familiar Naessian project of Nature appreciation. A living monument to Naess, ecocriticism typically invokes ecology as a strictly environmentalist discourse. This position tends to prioritise the thematic study of literary representations of Nature, often espousing, at the very least, a desire to distance one's self from technological advancements and other complexities of modern urban life.

On the other hand, Guattari's ecosophical perspective promises to remotivate the ecological turn in the humanities towards radical transformations in the production of subjectivity and concepts that carry with them the potential to sustain a more transversalised conception of identity. [4] Janell Watson summarises the quintessential thrust of transversality against the tradition of normative models of the human psyche:

*Familiar topologies such as the semiotic triangle, the conscious-preconscious-unconscious, the ego-id-superego and the Oedipal triangle must be expanded, extended, and opened up. Connections between them must be retraced. Their borders and boundaries must be effaced and erased, or at least made more porous. Above all, these expanded, redrawn and reconnected topographies must be set in motion...*  
(Watson, 2002: 23)

Transversality, as can be surmised Watson's insightful work on Guattari, moves hand in glove with the activity of metamodeling. Models such as the Oedipal triangle purport a representational, standardised map of the psyche designed for the clinical evaluation and diagnosis of individual patients. [5] Metamodels, on the other hand, adopt a more playful and constructivist stance towards modeling; here the ultimate aim is singularity rather than standardisation, and this entails appropriation from a multitude of models in order to avoid being "stuck" within the entropy of a dominant model (Watson, 2008). As Guattari writes of schizoanalysis, transversal thinking 'does not choose one modelisation to the exclusion of another'; rather, transversality is about creating lines of flight among various models, 'making them...operative within modified assemblages, more open, more processual, more deterritorialised' (Guattari, 1995: 61). As such, transversality is a radically ecological concept in that it pushes us to constantly (re)articulate things at the relational level of their interactions. With Guattari, then, we are not enlarging the selfhood model—we are developing the metamodels and practices of emergent subjectivities. Inspired by Guattari instead of Naess, we would become less interested in the representational paradigms of nineteenth century realism (which are often celebrated by leading ecocritics) and more interested in modernist and contemporary aesthetics of collage and montage; rhetorical acts of aesthetic invention would become as important, if not more important, than pseudoscientific methods of literary hermeneutics.

Though Naess coined the term "ecosophy", he does not think through the semiotic implications of the word as fully as Guattari does. Ecosophy is not the same thing as eco-philosophy; it is not simply the redirection of the philosophical tradition towards ecological concerns. To think ecosophically is to rethink philosophy in our contemporary moment defined by the convergence of nature and culture, ecological crises, globalisation, and the Internet. Born of his transversal conception of subjectivity, Guattari's ecosophical perspective suggests for (eco)humanities scholars a unique constellation of concepts adequate to these emergent situations;

it offers an alternative to the standard "normal science" approach by which critics apply old ideas to the same type of texts, only now in the spirit of environmentalism. By analogy, then, the proper aim of ecosophy (and a properly transversal eco-humanities) is not to produce a more energy-efficient light bulb or a hybrid car, but to reconfigure subjectivity and to remake academic and/or social practices altogether. While scientist and social scientists rightfully pursue advancements in green technology and debate environmental policy issues, humanities scholars should aim to further our understanding of ecological problems in ways that are unavailable to the technocratic perspective. Guattari's ecosophy suggests that humanities scholars should concern themselves first with ontological advancements. Thus, in addition to green buildings, hybrid vehicles, environmental legislation, etc., we need to rethink traditional notions of selfhood and, at the same time, invent practices designed to facilitate an ontology consummate to contemporary ecological concerns, as well as the emergent relational modes proliferating with the expansion of global capitalism and digital media. Of profound importance to these latter issues is Guattari's notion of the "post-media era"—his ecosophical vision of the potentialities afforded by emergent media technologies—which I expound upon later in this essay.

While much work in ecocriticism tends to avoid poststructuralist theory in favor of deep ecology, leading Guattari scholars have begun to survey the ecological implications of the philosopher's notoriously complicated writings. Readers new to Guattari should be cognisant of three basic ways in which the tenets of his ecosophy conflicts with more popular appropriations of ecology. First, affirming his belief in the inseparability of nature and culture, Guattari contents throughout his later writings that what we call the ecological crisis is not simply an environmental disaster, and that ecology is not limited to the natural environment. For Guattari, 'The ecological crisis can be traced to a more general crisis of the social, political and existential', which 'involve[s] changes in production, ways of living and axes of value' (Guattari, 1995: 119/134). Furthermore, Guattari differs from the early leaders of ecocriticism who tended to work from the popular belief that ecological thought is simply an idealistic, utopian project committed to preserving Nature's pure, harmonious, and delicate balance. In Guattari's radical ecology, the ecological point of view beholds the world as a dance between chaos and complexity—a multitude of productive syntheses between nomadic parts that exist independent of any fixed structure or transcendental whole. There is no larger "natural" order, no transcendent grand scheme according to which beings manifest. The ecology of ecosophy is neither that of popular environmentalism nor environmental science. Whereas environmentalism (like Naess) attempts to strengthen the bond between humans and the natural environment, which are articulated as two discrete and relatively stable categories, Guattari's ecosophy rethinks this relationship in terms of dynamic assemblages of enunciation without assigning humans, nature, or culture a fixed role or place in the production of subjectivity. In this way, we might think of ecosophy as performing a metamodeling with respect to environmental models such as the ecosystem. While the model of the ecosystem was first drawn by environmental scientists, a generalised ecology extends relational

modes of thinking implied by this model across disciplinary boundaries with hopes to enrich the study of any number of paradigmatic problems—most notably the production of subjectivity in Guattari's case.

Moreover, in metamodeling environmental ecosystems, by bringing them into contact with mental and social ecologies, one can rethink the ethos of management and regulation that has pervaded the largely scientific discourse of environmental ecology. Indeed, the challenge of Guattari's ecosophy is not to regulate the forces of the world into some idealised, harmonious balance, but rather to engender institutional and ontological conditions that encourage people to encounter the world as a series of open and ongoing syntheses between partial objects (as opposed to regarding phenomena as objects-in-themselves, complete and isolatable). This challenge informs and is informed by passages in *The Three Ecologies* and *Chaosmosis* where Guattari discusses nascent subjectivity and machines (see below). Guattari's view of ecology is especially unique in that he claims to be working from an "ethico-aesthetic paradigm" rather than from scientific or pseudo-scientific paradigms. For Guattari, ethico-aesthetic paradigms do not necessarily deal with art as we traditionally conceive it, but seek to incorporate an aesthetic order—an artist's 'way of assuming their existence'—into the existential territories of everyday life, within and beyond the studio or the museum. [6] He insists that the decision to engage subjectivity on a scientific basis or an aesthetic basis carries important ethical implications; Guattari of course asserts that attempts to "scientifise" subjectivity lead to its reification, while ethico-aesthetic approaches mobilise subjectivity 'in its dimension of processual creativity' (Guattari, 1996: 198). To be clear, Guattari's turn towards ethico-aesthetic paradigms does not constitute a rejection of science so much as a pointed critique of the 'use of reductive models and general laws, at the expense of singularity and complexity' (Watson, 2009: 97). Ultimately, I will suggest that it is this autopoietic node of Guattari's ecosophy that most powerfully distinguishes his approach to ecology.

Though recent scholarship on Guattari is quick to mention his notion of ecosophy, only a few of these books and essays contain elaborations of Guattari's ecosophy that are specific to the larger ensemble of concepts quintessential to his philosophical outlook. Genosko and Watson stand out of course as two scholars who have taken immense steps towards recognising the (potential) impact of Guattari's contributions on the contemporary study of ecology, subjectivity, and media. More typically, however, humanities scholars commenting on Guattari's engagement with ecology rarely venture beyond his most explicitly ecological book, *The Three Ecologies*, and are therefore likely to miss the transversal connections among the otherwise disparate domains of ecology, subjectivity, and media that he developed throughout his later writings. While it is accurate in some sense to summarise Guattari's ecosophy by mentioning his three interrelated ecologies (i.e., mental, social, and environmental), such summaries do not convey the full potential of Guattari's ecosophical perspective, which he seemed to regard as the crowning accomplishment of his philosophical career. To appreciate the theoretical



weight of *The Three Ecologies*, one must explore the ways in which this short book intersects with Guattari's larger body of work. In what follows, I offer an exploration of ecosophy in the context of *The Three Ecologies* and Guattari's other writings such as *Chaosmosis* and selected essays from *The Guattari Reader*, as well as the collaborative works *Anti-Oedipus* and *What is Philosophy?*. Indeed, Guattari's ecosophy is a concept that, like all concepts, configures the 'constellation of an event yet to come' and 'renders components inseparable within itself' (Deleuze and Guattari, 1994: 19/33). But given its (unfinished) state at the time of Guattari's sudden death, ecosophy remains a concept whose components need to be rendered further. The four sections below strive to construct a "zone of neighborhood" or "threshold of indiscernability" wherein these four components (i.e., nascent subjectivity, machines, post-media, and autopoiesis) become seen as the vital constituents of ecosophy's conceptual consistency. Only then can we mobilise ecosophy towards the invention of the event yet to come, the people yet to come, or at least, the eco-humanities yet to come.

## Nascent Subjectivity

At the end of *The Three Ecologies*, Guattari claims that we must, in responding to the 'major crises of our era', invent new practices that are conducive to what he calls 'nascent subjectivity' (Guattari, 2008: 45). Of course, the project to resingularise subjectivity does not center upon the individual—Guattari prefers to speak of components of subjectification rather than posit a "subject"—but it makes pragmatic sense to start the discussion at this molecular level and then move into molar dimensions, provided that one does not regard this movement as a linear progression along what Guattari sometimes calls a 'definitive schematic hierarchy'. We need to first of all to be concerned with the following questions: What exactly is nascent subjectivity? Why does Guattari place such a high premium on it? How would this nascent subjectivity put us in a better position to address contemporary ecological realities?

Like many of the concepts Deleuze and Guattari have developed, nascent subjectivity in *The Three Ecologies* is at once a rephrasing and a reworking of terms that appear earlier in the two philosopher's oeuvre. In fact, one of the best ways to comprehend Guattari's difficult terminology is to trace the evolution of the names he ascribes to particular conceptual territories, always paying attention to how each change in wording advances his overall line of thought. In this case, it will help to read *The Three Ecologies* in parallel with Guattari's first collaboration with Deleuze, *Anti-Oedipus*, specifically the early passages in which they introduce 'the residuum subject'. The notion of the residuum subject presents a useful starting point for grasping the significance of Guattari's theoretical move from the subject to components of subjectification, which is so vital to his later writings on ecosophy. Considered

as an isolated phrase, 'the residuum subject' implies that the subject, or one's subjectivity, is simply what remains or gets left over, in the sense of a residue. Thus begging the question: of what substances or processes is the subject a residue?

By Deleuze and Guattari's configuration, in contrast to the Cartesian cogito, an individual's thoughts do not constitute the full measure of his or her being. The subject is less the product of his or her own thought and more the residue of the social machinery in which he directly and indirectly participates, for the boundaries of "private" thought are drawn through the sociohistorical apparatus (an emergent assemblage of desiring-machines):

*This subject itself is not at the center, which is occupied by the machine, but on the periphery, with no fixed identity, forever discentered, defined by the states through which it passes...the subject is born of each state in the series, is continually reborn of the following state that determines him at a given moment, consuming-consum-mating all these states that cause him to be born and reborn (the lived state emerges first in relation to the subject who lives it).*

(Deleuze and Guattari, 1983: 20)

By means of this passage, we understand why many of Guattari's later writings are devoted to locating what he calls 'existential refrains', a term that denotes the crucial and contended sites through which subjectivity is produced, negotiated, and learned. Far from considering subjectivity a pre-established individual phenomenon, Guattari contends that a 'polyphony of modes of subjectivation' are always at work in the (de)composition of an existential territory (Guattari, 1996: 199). Existential refrains can emerge anywhere, but some common areas that Guattari emphasises include education, mass-media, the arts, sports, architecture, and the organisation of labor. Indeed, he does not oppose economic production to subjective or cultural production; the intersection of such refrains constitute complex existential territories that are ripe with transversal connections involving both material and semiotic work, civic and machinic flows, etc. (Guattari and Rolnik, 2008: 38). More specifically, refrains emerge 'when motifs are detached from the flux of components...acquiring the ability to generate a process of positive self-reference' (Genosko, 2009: 80). Because of this detachability, refrains can be ripped from intimate moments of singularity and in some cases become mapped over by repetitively drawn associations to 'the diversions of consumption'; for instance, through advertising a musical refrain (e.g., a few notes from a song) often becomes 'hijacked and affixed to automobile tires or boxes of breakfast cereal' (Genosko, 2009: 80).

The eco-logic of Guattari's argument in *The Three Ecologies* does not at all affix his thinking to the idea of a normative "ecological subject". In fact, he wants to 'ward off, by every

means possible, the entropic rise of a dominant subjectivity' (Guattari, 2008: 45). Guattari (2008:23) clearly asserts that he is not concerned with 'creating an unequivocal ideology', which would outline a set criteria for being-ecological—an occasional tendency in Naess's writing—and position himself as leader or guru. Instead, Guattari is much more interested in conveying the importance of generating a multitude of methods designed to inspire an ecosophical perspective on the production of subjectivity. From an ecosophical perspective, intensities precede both ideology and identity; one's work becomes more productive when attention is paid to molecular, intensive qualities (e.g., the universes of concepts, functions, precepts and affects elaborated in *What is Philosophy?*). [7] *The Three Ecologies* clearly builds from the same image of thought sketched by the residuum subject and incorporates Guattari's subsequent insights on refrain-intersection:

*Vectors of subjectification do not necessarily pass through the individual, which in reality appears to be something like a 'terminal' for processes that involve human groups, socio-economic ensembles, data-processing machines, etc. Therefore, interiority establishes itself at the crossroads of multiple components, each relatively autonomous in relation to the other, and, if need be, in open conflict.*  
(Guattari, 2008: 25)

Here, Guattari specifies some of the obscurities of *Anti-Oedipus*; in particular, the earlier image of the individual-as-residue is redrawn: the individual becomes a "terminal". Hence, one's subjectivity is not only a by-product of forces operative in the three ecologies (mental, social, environmental); subjectivity is always already immersed in the flow of existential refrains or vectors. The individual can no longer be seen separately at any point. To speak of an individual subject, natural as it seems, is to reinforce a reductive vocabulary of existence, which inhibits any actualisation of '[a] collective and individual subjectivity that completely exceeds the limits of individualization, stagnation, identificatory closure, and will instead open itself up on all sides' (Guattari, 2008: 44). Nascent subjectivity, then, is not an entity one can postulate once and for all; indeed, it is best described as a process whereby thinking emerges immanently in relation with the event, which it perpetually strives to encounter in the manner of a rhizome.

Furthermore, Guattari's preference for immanent thought can be traced back to Deleuze's 1970 critique of consciousness as it has been represented by the transcendence-oriented history of western philosophy. Deleuze writes, 'the conditions under which we know things and are conscious of ourselves condemn us to have only inadequate ideas, ideas that are confused and mutilated, effects separated from their real causes' (Deleuze, 1988: 19). Deleuze constantly reminds us that our thought always occurs in the middle of things; that is to say, the outside to which thought connects has already begun and exists prior to our

consciousness of it. Guattari's writing in the early 1990s addresses these illusions of consciousness in an era in which, despite growing awareness of environmental problems, 'we fail to grasp the contradiction in the fact that the factories producing our soaps are polluting our habitat' (Ulmer, 2005: xxvi). Given the absolute immanence of nascent subjectivity, humanities scholars today should redirect the tradition of thinking the human subject as a discrete element towards new projects that create concepts and design methods, in conjunction with new technologies, which expand the scope of subjectivity, or, in other words, increase our capacity to affect and be affected by immanent forces in the world.

The subject-as-cogito (i.e., the isolated individual personified by Descartes' "idiot") has become an inadequate foundation for thinking and acting in the context of twenty-first century developments, such as globalisation, ecological crises, and the proliferation of the digital medium. In order to comprehend global multitudes—and participate effectively in emergent political and rhetorical situations—future generations will need to be capable of experiencing themselves disjunctively, in the sense of an emergent and processual assemblage. In an article submitted to *Le Monde* just weeks before his death, Guattari writes of a desire to 'bring individuals out of themselves' via 'the invention of new collective assemblages', which, as he envisions already in the early 1990s, could become all the more viable with the 'new possibilities of interaction' afforded by computer networks; for this reason, he believes that networked personal computing bears with it the potential for (but by no means guarantees) 'a real reactivation of a collective sensibility and intelligence' (Guattari, 1996: 263). And so, though we begin at the level of so-called individual subjectivity, this is only the beginning of the issue because, for Guattari, the question of the individual is inextricably linked with trans-individual domains of flows, phyla, territories, and universes. [8] Existential refrains are laid out by collective machines, which are themselves dialogically related to the available modes and technologies of production.

## Machines, Not Structures

Guattari stipulates that his ecosophical perspective is 'at once applied and theoretical, ethico-political and aesthetic' (Guattari, 2008: 44). Nowhere is this blend more evident than in his discussions of machines, which are informed by numerous disciplines from second-order cybernetics to modernist art, as well as concepts set forth by Lacan and Deleuze. [9] Guattari uses the term "machine" to refer at once to actual and virtual properties. (He is not simply pointing to the technical appliances that the term often refers to in everyday conversation.) Machines are actual in that the word denotes existing institutions, groups, and practices, but machines also address the virtual possibilities of collectivity and thus function as a theoretical metamodel. In his assessment of the contemporary psychological landscape, Guattari

(1995: 58) claims that 'individual and collective subjectivity lack modelization' and, further, that this lack explains the stasis of many social movements, including environmentalism. For this reason, Guattari insists that the development of alternative diagrams for the production of subjectivity (in contrast to Oedipal model, for example) must become 'an immense site' of theoretical work and lead to 'the invention of new practices' (Guattari, 1995: 58).

Without the existential recomposition (e.g., the subject to components of subjectification) that theoretical metamodels engender, the ecosophical project of nascent subjectivity becomes lost to itself. Nascent subjectivity is entirely dependent on the capacity to install one's thinking into 'a constantly mutating socius' (Guattari, 2008: 45). In this sense, the 'effects of the machinic phylum on subjectivity' detailed in *Chaosmosis* should be read right alongside of the challenges and tasks Guattari proposes at the conclusion of *The Three Ecologies* (Genosko, 2009: 70). Ultimately, Guattari's machines (be they desiring, celibate, abstract, aesthetic, etc.) have two crucial, praxis-oriented objectives: (1) to help "the individual" install himself into collective dimensions (becoming-machine); (2) to help institutions and groups evolve autopoietically through processual encounters with—and complex articulations of—disparate sources of alterity (nascent subjectivity at the collective level).

In many ways, Guattari's version of the machine could be regarded as an appropriate figure or emblem for poststructuralism. Breaking with the (dogmatic) sign systems of structuralism, Guattari's focus on machines also performs an important inversion of phenomenology's tendency to 'reduce the objects under consideration to a pure intentional transparency' (Guattari, 2008: 25). And yet, though he explicitly distances his thought from structuralism and phenomenology, Guattari does retain important traces of each these intellectual movements. His writing on machines incorporates a preference for studying contextualised structural objects, but the methods he advocates (schizoanalysis, transversality, etc.) clearly emphasise the need for "spontaneous receptivity", a quality esteemed by many phenomenologists, which encourages us to encounter each phenomenon in its heterogeneity rather than overwrite its expression according to the structure of our own interpretative frameworks. In grasping Guattari's important theoretical distinctions between machine and structure, one should acknowledge, as Watson aptly notes, that the two terms are 'inseparable' and 'dependent on one another' as a conceptual pair, in much the same way as we might say of poststructuralism and structuralism (Watson, 2009: 39). Thus, the notion of structure must play a crucial role in discussions of the machine, even though Guattari writes about structures with evident disdain.

For Guattari, machines pose at least three qualitative differences to "structures" (the obvious emblem of structuralism). First of all, machines express an affective logic of intensities (or "pathic logic"), while structures operate according to the logic of discursive sets. Discursive sets presuppose a separation between subject and object, and for this reason, 'The truth of



a proposition answers to the law of the excluded middle: each object appears in a relationship of binary opposition with a 'foundation' (Guattari, 1995: 28). With the logic of intensities, the relationship between subject and object remains open or in question; therefore, the machine 'extracts complex forms from chaotic materials' because 'there is no extrinsic global reference' (Guattari, 1995: 28). Indeed, the logic of intensities is the flow quintessential to ethico-aesthetic paradigms. Structures, however, smack of scientific paradigms in that they slow down or bracket chaos and alterity in order to erect a referent (Deleuze and Guattari, 1994: 118). To combine the terms of *What is Philosophy?* with *Chaosmosis* (published in consecutive years), machines-as-philosophy seek to articulate a 'consistency specific to' chaos or alterity, whereas structures-as-science use the referent to 'actualize the virtual,' and, by extension, to define sources of alterity through reference to known variables (Deleuze and Guattari, 1994: 118). [10]

From the polarity above, we can clearly distinguish machines and structures in terms of their opposing attitudes towards alterity or difference. A structure defines difference only in relation to itself, while machines 'direct us towards a more collective machinism without delimited unity, whose autonomy accommodates diverse mediums of alterity' (Guattari, 1995: 42). The machinic drive for autopoiesis necessitates a process of undergoing all the heterogeneous elements operative in the event, which "heterogenises" the machine clean of any dominant, unifying, or universal trait (Guattari, 1995: 39). Machines initiate processes of resingularisation precisely by allowing themselves to breakdown as they disjoin and rejoin to form new configurations immanent to the singularity of the event. As such, machines offer strong metamodels for negotiating refrain-intersections through the invention of 'new ecological practices', upon which Guattari comments in *The Three Ecologies*, 'their objective being to processually activate isolated and repressed singularities that are just turning in circles' (Guattari, 2008: 34). In fact, as Watson reminds us, the rationale and language Guattari employs to describe eco-praxes hold much in common with his writing on schizo-analysis, and we may see them as intricately related projects (Watson, 2009: 184).

Moreover, as a consequence of these two prior distinctions, machines embody an awareness of their own fluidly and finitude, whereas structures, like Guattari's diagnosis of 'capitalist subjectivity', are 'intoxicated with and anaesthetized by a collective feeling of pseudo-eternity' (Guattari, 2008: 34). In addition to dividing human experience of the socius into rigid categories (e.g., nature vs. culture), structures naturalise the divisions they construct by 'stabilizing the maximum number of existential refrains' (Guattari, 2008: 34). Given our knowledge of machines and structures in *Chaosmosis*, we can (re)approach *The Three Ecologies* to gain an even greater command of this crucial opposition:

*The principal common to the three ecologies is this: each of the existential Territories with which they confront us is not given as an in-itself [en-soi], closed in on itself, but instead as a for-itself [pour-soi] that is precarious, finite, finitized, singular, singularized, capable of bifurcating into stratified and deathly repetitions or of opening up processually from a praxis that enables it to be made 'habitable' by a human project. (Guattari, 2008: 35)*

This passage in particular—its language of 'in-itself' (structure) and 'for-itself' (machine)—speaks to the important role of Jean-Paul Sartre's theory of groups in Guattari's thinking on disjunctive collectivity, which his machines diagram.

Gary Genosko has already demonstrated the degree to which Guattari's early distinction between subjugated groups and subject groups is an appropriation of Sartre's writings on seriality and fusion. For our purposes, it is also useful to consider machines and structures in this context. Guattari inherits Sartre's passion for thinking about group behavior precisely because he shares Sartre's hatred of seriality, which Fredric Jameson defines as 'the mode of human interaction which corresponds to the domination of the practico-inert' (Jameson, 1974:147). [11] In other words, a population is subjugated by seriality whenever they relate to one another automatically via behavior that is mass-proscribed by an elite, seemingly invisible authority. On the other hand, according to Genosko, a subject group 'has liquidated its seriality and come together in "the flash of a common praxis"' (Genosko, 2008: 60). Subject groups connect in response to an event rather than the mandates of a leader or doctrine. Subject groups illustrate a disjunctive mode of collectivity in their priority for a processual engagement in dynamic encounters with sources of alterity, rather than the stability and dominion of a self-asserted structure. For Guattari, this mode of group subjectivity—like the machine—signifies a solidarity that occurs without the dogmatic influence of any leaders. Furthermore, the subject group measures its collectivity not by the amount of people participating in the group, but rather on the quality of difference articulated among group members, as well as the group's capacity to register the enunciations of (non)human assemblages outside of the group. [5] Consequently, a subject group attentive to its own ecology—the diversity of its (ephemeral) constituency and the broader institutions and environment with which it interacts—is quick to (re)shape itself in response to a wide spectrum of mental-social-environmental forces. When "isolated" structures are brought into working proximity, structure breaks apart, and this disjunction is necessary for true collectivity. Again, this is a monumental insight of Guattari's ecosophy: relationships of mutual constructivism and acts of co-creation are predicated upon commitments to disjunction—the processual breakdown of structures into machines.

Genosko makes a critical point that Guattari's distinctions between machine and structure, subject group and subjugated group, are "non-absolute" (Genosko, 2008: 60). For instance, an institution or group that operates à la the machine is not necessarily machinic by nature—it could devolve at any moment into the seriality of a structure. But the same holds true of the inverse (i.e., structure to machine), and this conviction is the cause of Guattari's optimism regarding the potential impacts of remaking social practices. In critiquing what he calls "Integrated World Capitalism" (IWC), Guattari simultaneously sets up a contrast against which to invent eco-praxes and he specifies a target discourse at which to direct ecosophical interventions. Throughout *The Three Ecologies*, Guattari suggests a generative opposition between the ecosophical goal of nascent subjectivity and the limits of IWC's "capitalist subjectivity":

*A capitalist subjectivity is engendered through operators of all types and sizes, and is manufactured to protect existence from any intrusion of events that might disturb or disrupt public opinion. It demands that all singularity must be either evaded or crushed in specialist apparatuses and frames of reference. Therefore, it endeavors to manage the worlds of childhood, love, art, as well as everything associated with anxiety, madness, pain, death, or a feeling of being lost in the Cosmos...IWC forms massive subjective aggregates.*

(Guattari, 2008: 33)

On none of these "subjective aggregates" is IWC more dependant than mass media. In fact, Guattari likens mass media to poison and mutant algae as he illustrates its tendency to pollute mental ecology and erode social ecology. Doubtlessly alluding to mass medial conditions and his image of the television spectator, he claims, 'It is not only species that are becoming extinct but also the words, phrases, and gestures of human solidarity' (Guattari, 2008: 29). When Guattari (2008: 38) calls for a 'value-systems revolution', which would 'reevaluate the purpose of work and of human activities according to different criteria than profit and yield', he is at once announcing the need for a revolutionary way of using media technologies. If, as Genosko (2009: 70) insists about Guattari's project, 'the most important stake is the development of a new kind of subjectivity' (and if we also remember Guattari's contention that new telematics and computer technologies are vital to contemporary productions of subjectivity), then media is arguably the most important target of ecosophy today.

## Towards Post-Media

Digital theorist Gregory Ulmer has recently claimed that electracy is the principal site of the emergence of group subjectivity—a mode of experience that interfaces 'between individual

and collective' (Ulmer, 2005: 115). As a pedagogy of new media, electracy purports 'to do for the community as a whole what literacy did for the individuals within the community' (Ulmer, 2005: xxvi). Unprecedented both in degree and kind, the new collaboration called for by electracy will require, throughout its development, the testing of numerous concepts derived and appropriated from poststructuralist theory. With Guattari's work in mind, we can formulate some urgent questions for electracy, and these questions also posit urgent connections between ecological and digital approaches to the humanities. For instance, what happens to our understanding and experience of the digital apparatus when we adopt the theoretical components of ecosophy (e.g., nascent subjectivity and the machine)? Guattari does not answer this question in his own work; however, he does leave a number of provocative signposts—particularly in his select use of the term "post-media". Post-media, as I will suggest, names a potential mode of cultural production that makes ecosophical use of digital media technologies.

Post-media remains a relatively underdeveloped area in scholarship invoking Guattari, probably because Guattari develops the concept only in passing, elusive and intermittingly, throughout his later works. [12] Unlike schizoanalysis or geophilosophy, post-media is never the subject of entire chapters. Still, post-media (or "the post-media era") stands out in Guattari's writing as an optimistic horizon to which his other key concepts repeatedly refer:

*Only if the third path/voice takes consistency in the direction of self-reference—carrying us from the consensual media era to the dissensual post-media era—will each be able to assume his or her processual potential and, perhaps, transform this planet—a living hell for over three quarters of its population—into a universe of creative enchantments.*

(Guattari, 1996: 104; my emphasis)

*An essential programmatic point for social ecology will be to encourage capitalist societies to make the transition from the mass-media era to the post-media age, in which the media will be reappropriated by a multitude of subject groups capable of directing its resingularization.*

(Guattari, 2008: 40)

*Technological developments together with social experimentation in these new domains are perhaps capable of leading us out of the current period of oppression and into a post-media era characterized by the reappropriation and resingularization of the use of media.*

(Guattari, 1995: 5; my emphasis)

We can already notice from this sample that Guattari's "post-media" carries connotations that evade Lev Manovich's 2001 definition of the term. For Manovich, post-media signifies a change surrounding artworks and the nature of mediums in contemporary, digital milieus. On one hand, the Internet makes multimodal communication the norm; hence, it becomes difficult to categorise net art (which often combines photography, video, text, images, and sound) under the traditional logic of genre typology (i.e., identification via medium: sculpture, drawing, painting, etc.). According to Manovich, 'if one can make radically different versions of the same art work...then the traditional strong link between the identity of an art object and its medium becomes broken' (Manovich, 2001). In other words, as more artworks commonly exist across different mediums, the idea of the medium—though still important in the formation of meaning—can no longer be appealed to in sorting out various artworks from each other. In Manovich's terms, post-media is synonymous with post-medium.

By contrast, Guattari appears to be less focused on the typology of art proper, as his use of post-media evokes a broader sense of social transformation. Although Guattari and Manovich identify a similar historical cause (i.e., the proliferation of new media and its accessibility to non-corporate entities), Guattari's conception of post-media is true to his idea of the "new aesthetic paradigm", which, at a basic level, involves the explosion of artistic techniques and mentalities into arenas of social practice and institutional politics. Innovative, aesthetic uses of media technology become a way to generate nascent subjectivity and machinic collectivity: 'One creates new modalities of subjectivity in the same way that an artist creates new forms from the palette' (Guattari, 1995: 7). Guattari points to several examples in the field of psychoanalysis that demonstrate how new media may be used in parallel with his theory of the new aesthetic paradigm. For instance, he refers to a practice in which the therapist acts out or improvises "psychodramatic scenes" with the patient while a video camera records both of them. Therapist and patient then watch and discuss the video playback of the scene; here, the audiovisual affordances of video make possible a new mode of relating to the production of one's subjectivity—just as early alphabetic writing systems established a new relationship between people and language. These video-enabled practices, according to Guattari, often furthered patients' treatment programs by emphasising the fluid, creative dimensions of a subjectivity that is always in production, always open to manipulation and mutation, in opposition to "realist" or representational models of the subject (Guattari, 1995: 8). Guattari argues that, in cases like these, 'the inventiveness of the treatment distances us from the scientific paradigms and brings us closer to an ethico-aesthetic paradigm' (Guattari, 1995: 8). Post-media, then, continues a pre-digital mission to transform subjectivity; as such, media technologies are employed (and considered vital) because they generally provide the most accurate means to diagram nascent subjectivity. In essence, the desire to use the technology is motivated by the theory, and the development of the theory is itself influenced by technological developments. It is very tempting to think—and certainly not unreasonably so, given grammatological research confirming the correlation between literate societies and analytical thought processes—that a society equipped with new media



is in a better position to sustain a lived experience of nascent subjectivity, provided, of course, there are concurrent efforts to develop post-media practices by which to engage these technologies.

While Guattari sketches several prototypes for post-media practices in writing about his activist and clinical work, humanities scholars still need to unpack the theoretical underpinnings of his vision before we can really be in a position to initiate, facilitate, or even evaluate its realisation. From the onset, we must be clear that post-media for Guattari does not allude to an era devoid of media or its effects; Guattari agrees with Paul Virilio when he claims, 'the increased speed of transportation and communications and the interdependence of urban centres are equally irreversible' (Guattari, 2008: 29). While Guattari is very against mass media, he is anything but a technophobe. Verena Conley rightly points out that '[u]nlike many post-68 French theorist, Guattari does not use a Heideggerian blue print...[h]e advocates the construction of new subjectivities with technology' (Conley, 2009: 120). In Guattari's work, mass media is conceived as a stance—an ideological use of media technology that is in no way inherent to or determined by the medium. In his essay 'Toward an Ethics of the Media', Guattari identifies four 'series of factors' that he believes will give shape to a 'coming perspective', from which to begin envisioning post-media futures (Guattari, 2002: 18). Without rehashing them here, these four series of factors speak largely to the possibility for new kinds of relationships among traditionally stratified groups arising commensurate with new levels of interaction in writing, education, and politics. Guattari's speculations about post-media take a more rigorous theoretical turn in *Chaosmosis*, wherein he problematises our habitual attitude towards the technologies (e.g., radio, television, computers) that have now become fixtures of everyday life in many parts of the world. From the stance of mass media, especially from the consumer's point of view, a television or a computer is regarded as a technical machine—the machine as a subset of technology' (Guattari, 1995: 33). Guattari calls for a reversal of this relationship, such that his expanded conception of the machine (see above) becomes a 'pre-requisite for technology rather than its expression' (Guattari, 1995: 33).

Thus, if we take this reversal to be a critical gesture of the post-media stance, the user finds herself recast into an altogether different set of relations with media: technical machines become machinic technologies. And so, rather than seeing the computer as a structure whose operations demands technical expertise above all else, the post-media user would approach the computer as a technology in progress (i.e., always 'in the process of being reinvented'), whose operations affect and are affected by machinic assemblages of a 'constantly mutating socius' (Guattari, 2008: 45). That is to say, under the logic of post-media all users maintain a potential to invent the practices by which people relate to new media, while, at the same time, there is a basic awareness that the hardware and software of new media wield a powerful stake in the production of human subjectivity. Digital media—considered as machinic technologies rather than technical machines—constitute "complexes of subjectivation:

multiple exchanges between individual-group-machine" (Guattari, 1995: 7). In other words, with digital writing systems, we are "not confronted with a subjectivity given as in-itself, but with processes of the realization of autonomy, or of autopoiesis" (Guattari, 1995: 7). Neither the writing of the programmer nor the writing of other contributors of a given digital writing system can be said to be the sum of a single individual's choices; once writing enters into the complexity of such systems, theoretically speaking, writing becomes less the product of single-minded rhetorical intentions and more a dynamic variable whose semiotic life affects and is affected by patterns of movement across an intermingling if not deterritorialising ecology of collective assemblages of enunciation.

Of course, the post-media stance owes its viability to the decentralisation of the means of media production and dissemination brought about by the commoditisation of personal computing; however, it would be a dangerous reduction to mistake the mere technocratic fact of decentralised media production for the cultural achievement of a post-media sensibility. Indeed, theorising post-media enables us to see just how well mass media has already adapted to the "emancipatory" conditions of Web 2.0. Before hastily celebrating the transgressive qualities of any emergent media ecologies, we would do well to note Michael Godard's insistence that the shift from mass media to post-media is anything but a sudden or superficial matter:

the post-media era is...not something that can be given in advance; it is instead a process of the production of subjectivity, the becoming of a collective assemblage of enunciation whose starting point is the emptiness and coerciveness of the normalising production of subjectivity that the mass media currently enact. This already gives us some indications as to what aspects of digital network culture might be able contribute to this emergence of a post-media sensibility and which elements in contrast merely help to add sophistication and diversity to normalisation processes under the guise of interactivity.  
(Godard, 2011)

In fact, some of the most striking examples of mass media 2.0 can be found on popular websites dealing with ecological crises and the green movement. Guattari's ecosophical perspective on media and globalisation offers a framework with which to analyse some recent surges of this emergent online genre, which we may call the "green list". To begin with a basic definition, the green list is a form of Web 2.0 writing whereby Internet users enumerate a clear and simple list of steps or tips intended to promote an eco-friendly lifestyle. In its most common manifestation, however, the green list—whether authored by individuals or corporations—becomes a testament to IWC, mass media, and consumerism. As the brief discussion of green lists below will suggest, the Web 2.0 environment is entirely susceptible to mass media colonization, and we therefore must aim to develop oppositional, post-media

pedagogies in order to realise any of the revolutionary potential that scholars typically attribute to digital authorship. [13]

Guattari provides the perfect preface for my mini-critique of the green list when he speculates on the prospects of 'computer-aided design':

*The machinic production of subjectivity can work for better or for worse...It's impossible to judge such a machinic evolution either positively or negatively; everything depends on its articulation within collective assemblages of enunciation. At best there is the creation, or invention, of new Universes of reference; at worst there is the deadening influence of the mass media to which millions of individuals are currently condemned.*

(Guattari, 1995: 5)

On one hand, green lists apparently pop up as so many signposts directing consumers to the market's "socially responsible" transitions, marking the promise of "conscious consumerism" under a new kind of capitalism. Launched by a few environmental journalists in 2007, The Daily Green has quickly become 'one of the most trusted sources on the Web for news and information about going green' with the mission to 'broaden the audience for earth-friendly living by showing how going green is relevant to everyone' (Daily Green, 2009). A section of their website called 'top going green tips' offers ten 'idiot-proof' steps every user can implement immediately to 'get started on a green path' (Daily Green, 2009). These steps, many of which are common to most green lists, include: stop idling in your car, turning off computers when not using them, switching to green energy for your home, doing laundry with cold water, carpooling, and paying bills online (Daily Green, 2009). Each of these tips constitute a gesture towards sustainability in that they effectively control the damage of cultural habits that waste natural resources on account of laziness or inefficiency.

On the other hand, all of the tips assume, no doubt encourage, a basic continuity: people will continue to define themselves (and their relation to environmental concerns) through consumerism. The explicit message is to commute to the corporate office with a coworker, or to share one car for a trip to the mall with a group of friends—keep amassing bills, but pay them online now. By taking, as a given, activities associated with working and spending in the name of the commodity, green lists protect institutions like malls and transnational corporations by maintaining them innocently in the background. Figuratively speaking, corporate institutions are the pervasive white space in between each eco-friendly tip; they issue the invisible motives that prompt each tip and they linger as the implicit destinations for which green lists prepare their readers. Rather than question the mall or the corporation, green lists insist that consumers must become more efficient in their consumption of the

capitalist commodity. As such, green lists function as training manuals meant to help consumers help corporations survive the growing awareness of humanity's contributions to the ecological crisis. This crisis is of course particularly due to the rampant spread of American consumer culture during the last fifty years, which is now being exported more than ever throughout the world.

While plenty of green lists are published in isolation from one another on the web, there are a number of major Web 2.0 style hubs for this genre that act as databases, organizing lists according to topics such as "green cuisine" or "green cleaning". First of all, just as there is a studio executive behind each Hollywood feature film, many green list databases are subtly sponsored by corporate entities. A true manifestation of Guattari's nightmare of IWC, the database The Great Green List is sponsored, albeit discretely, by a company called Earthsense. [14] Though the site's amateur appearance is meant to resemble the template-format of a grassroots, public wiki, all submissions to The Great Green List must pass review by an editorial staff hired by Earthsense. Moreover, many green list hubs, including The Great Green List, feature product promotion hyperlinks that send users directly to online shopping areas. In April of 2009, The Daily Green hosted a link (atop every single page of their website) that sent users to a Radio Shack promotion. (Hence, this "neutral" green list hub frames and feeds straight into a corporate buying site.) Clicking on the Radio Shack link, users learn that the promotion offers a Radio Shack gift card to anyone willing to exchange used electronics for store credit (PC Informant, 2009). Perhaps such deals do lead to some reduction of the 20 to 50 million tons of electronics waste that accumulates around the world each year, though non-profit organizations already offer free and convenient services for recycling electronics.

Nevertheless, applying Guattari's writings on capitalist subjectivity, I would argue that these promotions shorten the experienced life cycle of the company's products by furnishing consumers with incentives to part with electronics before they reach the end of their technical-functional life cycle (or as soon as impulse decides it is a nice day to upgrade to the latest model). Implicitly, these promotions grease the skids for more efficient patterns of consumption, encouraging an even quicker rate of product turnover and fueling the capitalist mode of production's expansion into new global markets. We should also note the acceleration that accrues to the shopping experience, which is now more aptly a buying experience. Shopping time is eclipsed as less profitable waste, for here the path is laid out for consumers around the world—without waiting in line—to use their "old" computer (if you already own it, then it must be old) to purchase the newest computer, all the while feeling like a good, socially responsible capitalist: they "made" money and "saved" the environment. If left to the green list conventions, this is what the concept of sustainability becomes for citizens whose native tongue is the language of consumption. Indeed, IWC's hypertextual green lists are literal relays to the commodity, and they are much improved from the printed pamphlets of early

capitalism, which merely spelled out the what, where, and why of commodity expenditure.

Assuming the collective assemblages of enunciation of post-media should contrast with the commercial logic evident in green list hubs, we need to return to the question of post-media in search of a more analogous and desirable comparison. Without going into much detail here, I want to suggest a space of potential synthesis between post-media pedagogies and the contemporary art practices theorised as "relational aesthetics" by curator and critic Nicolas Bourriaud, himself an expert on Guattari's work. Speaking from his encounters with contemporary art, Bourriaud asserts that an artwork's primary value is its status as a "social interstice" (Bourriaud, 2002: 16). Appropriating the term from Marx, Bourriaud explains, 'The interstice is a space in human relations which fits more or less harmoniously and openly into the overall system, but suggests other trading possibilities than those in effect within the system' (Bourriaud, 2002: 16). For Bourriaud, art acts as a social interstice to the degree that it 'creates free areas, and time spans whose rhythm contrast with those structuring everyday life' or 'encourages an inter-human commerce that differs from the "communication zones" that are imposed upon us' (Bourriaud, 2002: 16).

Translating the concept of social interstice into humanities education, one can imagine how academic projects could be designed, with the resources of digital media, to act as an interstice for proposing ideas on the basis of a 'social and aesthetic "profitability"' and for exploring ways of relating to new media that deal with non-commercial forms of exchange (Guattari, 2008: 42). One promising example of humanities education becoming-interstice is the Critical Media Lab (CML) at the University of Waterloo, founded in 2008. Marcel O'Gorman, director of the CML, describes the program as 'a research-creation incubator that links researchers in the Faculty of Arts [and humanities graduate students] with the people and tools necessary to apply critically reflective work at the R & D level of technological production' (O'Gorman, 2008). By virtue of the institution's transversal relations to groups inside and outside the university, participants in the CML work on innovative media projects that speak to values beyond commercial profitability, doing so in a language of product/experience design that makes critical theory/thinking manifest to diverse publics. [15] This pioneering work furthers our thinking about the prospects for developing post-media practices in the context of humanities education, precisely in the sense that it suggests the necessity of creating institutional spaces that foster critical intervention into media (and subjectivity) at the level of its production, rather than just a consumerist imitation of the mass media forms, as is the case with green listing. Such endeavors demand a notion of creativity—applied to the formation of both specific projects and collective institutions—that traverses multiple ecologies, not simply transposing content from one domain into the pre-established form of another domain.



## Autopoietic Creativity

Claiming that tertiary descriptions usually revert back into dualisms, Guattari prefers four-term frameworks, 'The fourth term stands for an *n*th term: it is the opening onto multiplicity' (Guattari, 1995: 31). Autopoiesis is the *n*th component of ecosophy. Autopoiesis, often summarised by Guattari as a dance between chaos and complexity, characterises the passage back and forth between nascent subjectivity, machinic collectivity, and post-media. Near the end of *Chaosmosis*, Guattari evokes a condition omnipresent in his worldview of self-organising, partial objects: 'Something is detached and starts to work for itself, just as it can work for you if you can "agglomerate" yourself to such a process' (Guattari, 1995: 132-3). One can think of autopoietic creativity as the capacity to yield one's self to chaos and, in doing so, undergo the event so as to channel the advent of nascent subjectivity. (Guattari calls this process an "event-advent".) The task here is to 'grasp alterity at the point of its emergence', to create in concert with sources of alterity (i.e., the machine, post-media), rather than overwriting alterity in favor of default, *apriori*, or transcendent representations (i.e., the ego, mass media) (Guattari, 1995: 117).

In opposition to "whole over parts" models that characterise more popular notions of ecology, Guattari's conception of autopoiesis—the logic of parts without wholes—may actually provide a more thoroughly ecological account of the relationality involved with dynamic open systems. Wholes can become problematic when they are posed in terms of transcendence; literary scholars like Dana Phillips and Timothy Morton have already illustrated how environmentalist constructions of Nature—posed as a whole magically thought to transcend culture—severely limited the efforts of early ecocriticism. Thus, an ecology without Nature, to borrow Morton's phrase, would employ a logic of parts without wholes; here, there are no discrete, transcendent wholes upon which to ground or stabilise an (eco) system because the so-called constituent parts always retain their partiality. With processual disjunction comes constant connection and reconfiguration, and there is no whole to impose stability by restricting the relationality of the partial objects. One of the greatest strengths of Guattari's autopoietic methodology is that it initiates, at a conceptual level, a processual disjunction of discrete elements. In fact, for Guattari (and Deleuze), thinking becomes more "holistic" to the degree that transcendent wholes (especially the discrete entities of oedipal psychology) are continually broken down into partial objects along a plane of immanence on which they engage and reengage in infinite productive syntheses with other partial objects.

This autopoietic mode is of course absent from the so-called "ecological subject" of deep ecology, which retains an ever-expansive Self at the front and center of its ontology. An eco-humanities adapted to Guattari's ecosophy would thus replace Naess's "Self-Realization" with autopoietic creativity, making autopoiesis a new core value at the heart of the humani-

ties. Furthermore, the virtual ecologies of digital media make the Internet, for instance, an ideal pedagogical scene for humanities courses to introduce autopoiesis, which, as Guattari suggests, is a far cry from our oedipal habits. In this sense, autopoietic creativity should be regarded as a crucial skill for the development of both ecological literacy and media literacy. We must learn to teach autopoietic creativity and, in doing so, autopoietise the academic research and writing practices of the humanities tradition.

Transversal connections among recent scholarship suggest a promising starting point. In particular, Guattari's ecosophical imperative to intervene at a micro-social level finds pedagogical expression in the tenets of ecocomposition set forth by Sidney Dobrin and Christian Weisser, namely that 'student writing should be directed beyond the limited scope of classroom assignments to address larger, public audiences' and that writing should be taught as a vehicle 'to affect change, to bring about awareness' in the mental, social, and environmental ecologies of which students are a part (Dobrin and Weisser, 2002: 58). Additionally, Ulmer has already theorised some ways in which the digital humanities class can act a kind of online consultancy. [16] Under this approach, students work heuristically through an intensive web-based project, experimenting with digital authoring software in order to inject humanities (often poststructuralist) perspectives into the discourse surrounding public policy issues. As the pedagogical genres of electracy continue to develop, teachers should begin to build networks between their classes and larger, public audiences with the goal of circulating academic work among relevant social organisations or political bodies. [17] Of course, the primary value of any student project should lie in its capacity to facilitate learning experiences specific to a given discipline; one risk of doing service-learning projects (via partnerships with non-academic organisations) is that the service can undermine the learning. Thus, in designing institutional spaces and collaborative projects for the post-media era, one should mind Guattari's distinction between machines and structures: create an autopoietic network that learns like a machine.

For example, Guattari's theory of group subjectivity via machines could be applied to present efforts to alleviate the disciplinary isolationism that continues to cripple many research universities. Scholars who aspire to collaborate across multiple fields should aim to create transdisciplinary machines rather than interdisciplinary structures. With transdisciplinary machines, the objective is not necessarily to incorporate the study of science (its objects and methods) into the study of, for instance, cultural or aesthetic texts. Such "inclusive" maneuvers result, more often than not, in a homogenisation on both fronts. In the case of ecocriticism, as Dana Phillips points out, both ecological science and literary analysis often become reduced to ideological critique. Therefore, rather than encouraging humanities scholars to somehow acquire an additional expertise in scientific inquiry (and vice versa), cross-disciplinary efforts would do well to recast some energy to the co-creation of transdisciplinary machines (i.e., evolving sets of processes committed to institutionalising the production of

a group subjectivity). This transversalist mode of working valorises an ensemble of heterogeneous scholars, each sounding their mastery of instruments unique to their respective disciplines, playing in concert with one another at the same venue (i.e., collaborating on the same problems and projects). [18] If we apply this analogy to much of the work that currently parades under the banner of interdisciplinary, then we find the projection of an impossible ambition: to command expertise in seemingly every academic field—to become, in short, a one-man band.

Furthermore, concerning teaching, I would argue that by creating networks for the ecosophical circulation of student writing, we may open up pedagogical interactions that otherwise get left to chance when students merely post their work onto vast Web 2.0 platforms. If we can publicise aspects of the learning process—thereby ‘accommodating diverse mediums of alterity’—our various academic communities (e.g., courses, collaborative scholarly projects, etc.) will operate much closer to the disjunctive collectivity that Guattari’s machines diagram. By building into the work autopoietic relations to extra-academic perspectives, academic discourse will be inevitably challenged to become different in response to different problems and different rhetorical situations. The motive to create these opportunities goes hand in hand with the imperative to extend complex humanities perspectives into the public sphere—particularly those domains where competing discourses threaten to overwrite or displace the humanities. As Deleuze and Guattari assert, over the course of the twentieth century, commerce has all but replaced philosophy in the creation of concepts (Deleuze and Guattari, 1994: 16). Yet the circulation of electrate projects will bring us much closer to the political conditions of the post-media era, which, according to Guattari, will ‘require collective forms of administration and control, rather than a blind faith in the technocrats of the State apparatuses’ (Guattari, 2008: 28). Ultimately, autopoietic networks do not promote allegiance to a specific, existing political position; rather teaching autopoiesis constitutes an ethical ‘refoundation of political praxis’ (Guattari, 1995: 120). The eco-humanities of the post-media era, then, would be less directly concerned with environmentalist themes or values and more rigorously committed to the promotion of transversal thinking/learning, by which traditional objects of study become recast so as to foreground the ecological relationships within-among-between-across “isolated” entities.

Scholars and teachers working in the (eco)humanities occupy a unique position from which to invent the public spheres of post-media and to inspire students to proliferate disciplinary knowledge beyond academic conventions through electrate encounters with ecosophical problems. Collectively, our research will lead to the discovery of new paradigmatic problems that will reaffirm the vitality of our fields for thinking the digital apparatus in an age of general ecological crisis. Our pedagogical experiments with emergent technologies will push students toward new ways of understanding and experiencing media, but also toward new ways of putting academic research (even poststructuralism) to use in unconventional rhetori-

cal situations. As Guattari suggests—and this may seem counterintuitive—theory across the humanities disciplines can become more experimental and more creative if we cultivate methods for appropriating computers as equipment to think with:

*Computers, expert systems and artificial intelligence add as much to thought as they subtract from thinking. They relieve thought of inert schemas. The forms of thought assisted by computer are mutant, relating to other musics, other Universes of reference.*

(Guattari, 1995: 36)

In taking a post-media stance towards emergent media, we can think the new and think it collectively, but only to the extent that we develop digital practices capable of producing a new (ecosophical) relation between individual subjectivity and the collective thought. From this perspective, anticipated in Guattari's writing, the eco-humanities and the digital humanities become rhizomatically bound towards one another through the concept/project of ecosophy.

## Biographical Note

John Tinnell is a PhD student specialising in post-structuralist theory and digital media at the University of Florida, where he also serves as the webmaster for the English Department. Another one of his recent essays on Felix Guattari, ecosophy, and digital writing—which rethinks human-computer interaction in terms of autopoiesis as opposed to augmentation—is set to appear in the forthcoming collection *Ecology, Writing Theory, and New Media: Writing Ecology* (Routledge, winter 2011). He has also published a review of Deleuze/Guattari and Ecology in *Deleuze Studies* (2010) 4(1). His current project explores the rhetorical and grammatological significance of mobile media, particularly smartphone apps that mobilise visual search epistemologies, augmented reality browsing, and the global positioning system.

## Notes

[1] In 2002, Sidney Dobrin and Christian Weisser examined this tendency among composi-

tionalists and identified several key differences that distinguish “ecomposition” from ecocriticism, green cultural studies, ecofeminism, etc. In contrast to writing about nature (nature writing) or teaching environmentally themed texts (ecocriticism), ecomposition strives to rethink discourse (particularly the activity of its production) as an ecological process and points to the myriad ways in which writing affects and is affected by surrounding environments. Aware of ecomposition’s academic infancy, Dobrin and Weisser were quick to stipulate a pioneering quality about their work, ‘This book only begins to scratch the surface of a body of research that needs to be further explored’ (15). The first consistent use of the term “ecomedia studies” emerged during the 2009 ASLE conference, specifically in panel discussions categorised under the section heading “Ecological Media”. Though a small group of film and media specialists have begun to promote themselves as ecomedia scholars, they have yet to produce a book-length work which would, in effect, do what Dobrin and Weisser did for ecomposition. *EcoMedia*, Sean Cubitt’s 2005 book, perhaps bears a misleading title since Cubitt’s primary objective is to extract environmental themes from popular film and television. Cubitt’s book (and many other books like it) does not attempt to define ecomedia as a new field of study; he basically applies literary ecocriticism to the study of film and media.

[2] Dana Phillips and Tim Morton argue that ecocriticism’s ideological attachments to the pastoral worldview and false beliefs about literary representation render the movement too nostalgic and too naïve to sustain the most urgent dialogues to be had between English studies and ecological research.

[3] Of this process of “becoming-animal”, Leonard Lawlor writes, ‘Instead of a resemblance relation, the relation that defines becoming is pre-positional. I find myself positioned before the animal, but ‘before’ in fact means I am in proximity with the animal. I am among the others and they are in me. But just as imitation does not define becoming, neither does representation define the preposition of one for another. Instead, becoming consists in a zigzag structure: we become animal so that the animal becomes, not human, but something else. The zigzag is set in motion by emission and extraction of a function (deterritorialization). And finally, beyond the destruction of the molar form, deterritorialization, in order to be successful, must use the animal function to produce something. It must take the micrological function of the rat, for example, and write “like” a rat’ (Lawlor, 2008: 178-9).

[4] Guattari was in fact wary of popular and critical notions of “identity”, so much so that he tends to avoid using the term in his discussion of subjectivity and describes his own project as ‘a matter of a perspective on identity which has no meaning unless identities explode’ (Guattari, 1996: 216).



[5] Gary Genosko and Andrew Murphie provide a further critique of such models from the perspective of metamodeling: 'models operate largely by exclusion and reduction, tightly circumscribing their applications and contact with heterogeneity. The world of models is arid, lacking ambiguity and uncertainty. By contrast, metamodeling operations...introduce movement, multiplicity, and chaos into models' (Genosko and Murphie, 2008).

[6] Genosko (2009: 73) argues that the mental ecologies in Guattari's work owe more to artists and writers (e.g., Kafka, Beckett, Proust) than to psychoanalysts (e.g., Freud, Lacan, Klein).

[7] Guattari regarded so-called ideological critique as a framework unfit to grasp the productive dimension of subjectivity as it unfolds across integrated world capitalism (IWC): 'Ideology remains in the sphere of representation, whereas the essential production of IWC does not simply concern representation, but also a modelization of behavior, sensibility, perception, memory, social relations, sexual relations, imaginary phantoms, etc.' (Guattari and Rolnik, 2008: 38-9).

[8] See Janell Watson's chapter 'An Energetics of Existence' in her book *Guattari's Diagrammatic Thought* for the most thorough engagement with Guattari's diagrams of his four ontological functions (i.e., flows, phyla, territories, universes), which appear in *Cartographies schizoanalytiques* and *Chaosmosis*.

[9] As Janell Watson has shown, Guattari's early formation of machine and structure marks a quite concrete instance of his "writing between Lacan and Deleuze." In particular, Watson discusses how Guattari develops this pair of concepts with direct references to Lacan's object *petit a* and Deleuze's characterisation of structure in *Logic of Sense* (Watson, 2009: 39-41).

[10] This explication is by no means intended to function as a wholesale critique of science or a blanket statement about its aims, which is beyond the scope of this essay. I am merely alluding to what Deleuze and Guattari call the 'respective attitudes toward chaos' elaborated upon in their comparative analysis of philosophy and science in *What is Philosophy?* (Deleuze and Guattari, 1994: 117-133).

[11] Sartre's 'practico-inert' refers to conditions in which institutions structure social relations in a way that delimits human action, rendering freedom into a mere exercise of "dead possibilities". For an authoritative commentary, see Fredric Jameson's chapter "Sartre and History" in *Marxism and Form*.

[12] Verena Conley (2009: 123-126) and Janell Watson (2009: 176) both acknowledge the importance of the post-media era in Guattari's work, though Colony's engagement is strictly implicit. Michael Goddard is one of the only media studies scholars to deal at length with the post-media question in Guattari. Goddard's approach differs from mine in that his insights are drawn primarily from examining Guattari's participation with Italian free radio. At the end of his 2006 article, though, Goddard formulates a question that I will address later in the context of humanities education: 'The [post-media] question is one of how to compose networks of subjective auto-organization that are able to assume an autonomy from neo-liberal economic and military networks and their associated deadening of relationality, affect and desire in the direction of pure functionality and aggressivity' (Goddard, 2006).

[13] For a dynamic introduction to the discourse on the revolutionary potential of Web 2.0 authorship, see the collection of video lectures posted on the professional websites of digital ethnographer Micheal Wesch and media theorist David Gauntlett.

[14] Earthsense is a for-profit company that specialises in marketing research and branding with the mission of 'making sense of our world to provide "must-have" consumer knowledge that would make cause-related product, marketing and strategy efforts more effective...we focus on marketing that directly affects the bottom line' (Earthsense, 2009).

[15] The Critical Media Lab is perhaps this closest thing in humanities education today to the hypothetical organisation that Guattari envisions in 'Toward an Ethics of the Media': 'a new type of organism of production, adjacent to the private, supported by the state, but directly managed by the creators, and truly free and responsible for its projects' (Guattari, 2002: 19).

[16] For more on Ulmer's vision of this electrated consultancy, see the introduction ('The Emer-Agency') of *Electronic Monuments*. Here, Ulmer initially defines the EmerAgency as 'a deconstructed consultancy, meaning that it is simultaneously an immanent critique of conventional consulting and an experiment in an alternative mode that adapts arts and letters knowledge to a practice supportive of a virtual civic sphere' (xxxi).

[17] By incorporating Ulmer's logic of invention, the humanities can become more autopoietic by appropriating the creative arts project as a process-based affective learning experience. These "new aesthetic projects" would depart from the role that art projects typically occupy in courses such as creative writing, studio art, and film or video production. Traditional arts courses tend to structure all lecture and discussion around improving students' artwork, at-

tempting to polish the pieces according to the criteria of prospective artistic venues. The student is positioned as an artist-in-training. New aesthetic projects in general humanities education, however, would incorporate aspects of the art project as an experiential vehicle to enhance students' engagement with disciplinary questions. As rhetorically situated acts of aesthetic invention, new aesthetic projects promise to cultivate the affective dimensions so crucial to digital rhetoric, and they also promote a relational aesthetics that is not isolated from social or political contexts. As such, new aesthetic projects offer a unique approach for teaching and learning autopoiesis in relation to the digital apparatus.

[18] On the question of (trans)disciplinarity, Genosko writes, 'Although transdisciplinary ecology goes beyond the multi- and inter-disciplinary pretenders, it is not a higher-level synthesis or a transcendent solution' (Genosko, 2009: 70). While the formation of transdisciplinary machines mobilising ensembles of heterogeneous scholars appears to be the most promising cross-disciplinary strategy, it certainly renders false the idea of a universal vocabulary/methodology with which to build knowledge that would somehow synthesise and transcend all disciplinary knowledges. More likely, the transversality of transdisciplinary machines would promote a multitude of minor exchanges, leading to molecular changes in the way specific disciplines operate rather than to the eventual creation of something like an uber-discipline.

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## FCJ-122 Anxious Atmospheres, and the Transdisciplinary Practice of United Visual Artists

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*In the electric age all former environments whatever become anti-environments. As such the old environments are transformed into areas of self-awareness and self-assertion, guaranteeing a very lively interplay of forces.*

– Marshall McLuhan



Figure 1. United Visual Artists, Chorus (Wapping Project). Kinetic light installation. Wapping Hydraulic Power Station, Wapping Wall, London (15th June - 18th July 2010). Used with permission of United Visual Artists; Photo credit: United Visual Artists – James Medcraft.

This article initiates a course of research that takes as its focus the transdisciplinary practice of United Visual Artists (UVA). At the heart of UVA's distinctive art and design practice is a prevailing interest in testing the spatio-temporal relations that exist between site, the performed work and audience perception. Concentrating primarily on the example of their kinetic light and sound sculpture, Chorus, the following text will investigate the aesthetic conditions that underwrite the work's exhibition. By doing so, this enquiry will speculate on how the integration of digital processes and spatial practice embodied by this particular artwork operates transductively as part of its framing as a mediated exhibition experience.

Having set out a proposition in previous research for curatorial design—as a practicable application or method for curating developed in response to the emergence of what I have described as the multimedial museum—this foray into the work of UVA is being undertaken with the aim of furthering my investigative research into the relationship between virtuality and the art of exhibition. [1] In saying this, it is crucial from the outset that any such definition of the virtual not be delimited to the capacity of digital media and associated information and communication technologies to produce new, artistic forms of illusionism. Rather, the experience of virtuality needs to be understood as determined by its embeddedness in the real world, along with the capacity of social space to produce protocols for viewing and routines of audience engagement.

It follows then that this enquiry into UVA's design-based media practice will serve as a means to engage with how aesthetic conditions arise from the intersection of digital media and spatial practice. More directly, this particular investigation of their work will use Chorus as a focal point to interrogate how its exhibition might be shown to function analogously as a form of exhibition architecture:

*... conceived as situated at the intersection of the material and the virtual, as fundamentally mutable, continuously negotiating, adapting to, and interacting with equally dynamic and mutable physical, social and technological environments (Blau, 2010: 38-39).*

While the intent of this critical observation by architectural historian Eve Blau was directed at broadly characterising the disposition of practices represented in the most recent iteration of the Architecture Biennale at Venice [2], its indirect inference reiterates the relevance and currency of investigating the character of mediated aesthetic transactions promoted by UVA's transdisciplinary practice. As 'new and emerging technologies of communication and information transfer continue to widen the cognitive gap between modes of knowing the world—between information and experience—and to multiply their contradictions' (Blau,

2010: 39), I believe that it is timely to look more closely at how UVA's productions negotiate the transversal relationship between mediacy and spatiality. As this text will show, closer examination of the curatorial design associated with the exhibition of a series of iterations of Chorus has implications that I believe not only extend our understanding of current media art practice but also can be used to turn critical attention towards programme architecture, as a modus of contemporary curation formed from the mediation of perceptual and social relations.

In recent efforts to flesh out an expanded historiography of contemporary media art, numerous commentators have been drawn to the experimental artistic practices of the 1960s because of their apparent anticipation of contemporary concerns. These include the transformative effects of technology on human relations and electronic media's integration across all levels of social and cultural interaction. Of particular interest, the closely connected theorisation of intermedia and systems aesthetics have been viewed as particularly useful aesthetic programmes that extend the conceptualisation of virtuality, particularly as it has been articulated previously in techno-arts rhetoric of the 1990s. The latter, Mitchell Whitelaw (1998) has noted: 'amount[ed] to a kind of anti-systems practice... [that overlooks] the system, the concrete infrastructure, for a frantically overproduced internal space'. Whereas—according to Edward A. Shanken's recent interpretation of the short paper from which Whitelaw's observation is extracted—a systems-based approach precipitates a way of understanding the trans-materiality of digital technology. [3] In order to understand the aesthetic condition of virtuality as inextricably linked and situated in the real world demands:

*... a turn outwards... [that] raises questions about the intervention of art in the world... of agency... that threatens to spill out into everyday life... so as to evaporate completely, or rather to become imperceptible. (Shanken, 2009)*

As a reflection of the infiltration of information and communication technologies across all levels of society, new media art might be said to characterize the cultural expression of our technological times. Given the disparate range of artistic approaches that the term encompasses, it has proven more productive for commentators to approach their definition of the "art form" via "processes" that are exhibited through actualisation, rather than as medium-specific attributes. In doing so, creative practices employing technology become linked with a historical lineage of practices that emphasise the dematerialization of the art object. [4] Given the variable, distributed and collaborative natures most commonly ascribed to new media art, 'no matter the form of the artwork, the medium never matters as much as the context' (Graham & Cook, 2010: 83). Redefining social engagement of the audience with art, such processes challenge standardized, normative modes of interpretation and means of "publication" through exhibition. Strategically, by defining "(the art formerly known as) new media" as sets

of behaviours, this opens up a way of thinking about the implications that works utilizing digital technologies raise for a more general 'understanding of the behaviours of contemporary art precisely because of its participation in the creation of a cultural understanding of computational interactivity and networked participation' (Dietz, 2010: xiv). Consequentially, forms of contemporary practice that embrace open-ended forms of interaction and participatory involvement in the co-production of the work are placing even greater demand on curatorial tactics and methodologies. These are hoped to establish aesthetic conditions that provide supporting platforms for these dynamic and emerging forms of contemporary art.

From the standpoint of my earlier stated research interests, which gravitate to the intersection of new technologies with exhibition space, I submit that the exhibition plays a crucial role in determining the contour between cultural processes (encompassing both artistic and curatorial forms of practice) and the aesthetic conditions that influence the experience of the viewer. The exhibition operates as an interface actively mediating the dimensionality of artworks and viewing conditions that are coordinated across time and space. The artifact, the gallery's cubic environment and the museum's institutional apparatus are powerful manifestations that shape our perceptions and understanding, as well as the expectations that we place on art. The influence of such conventional structures on the forms—and resulting conformity—of artistic and curatorial practice should not be underestimated. Revealed in the light of new media technologies, the closed, circumscribed nature of exhibition-based practice traditionally affiliated with insulating formats and their associated conventions—whether of “White Cube” or “Black Box” varieties—is reconceived as an open, transversal coordination of elements constituted from material, technical, perceptual and social processes that have been brought into relationship with each other through their spatio-temporal activation. [5] The impact of digital processes has begun to transform art's exhibition complex through which the fundamental interdependence between art objects, gallery space and processes of museological framing is revealed. Particularly as spatial practice and digital mediation become increasingly integrated, new forms of aesthetic interaction and expanded forms of programme architectures will be needed that propose alternative ways for the multimedial museum to take shape.

In order to meaningfully address the nature of aesthetic experience associated with the exhibition of digitally mediated or technologically enabled artworks, the relational properties of technology need to be acknowledged. Moving from the idea of passive form to active formation entails rethinking the nature of media, away from the media-specific constitution of particular forms to a focus upon transductive relations. These relations take into account their organisation into technical assemblages or ensembles. Gilbert Simondon, who originally formulated the concept in his dissertation *The Mode of Existence of Technical Objects* of 1958, describes transduction as an operative process in which physical, biological, cognitive or social activities are set in motion within a given domain. [6] Or, as Adrian Mackenzie suc-

cinctly puts it, transduction 'account[s] for how things become what they are rather than what they are' (2002: 16). Addressing this problematic holds implications not only for a digital aesthetics but also more broadly for contemporary art practice in general, particularly in response to what has been posited as a "post-object" or "post-medium" paradigm shift. [7] Recent interest in establishing the basis for a hybrid discourse between new media and mainstream contemporary art attests to the renewed relevance of the systems approach that the art critic Jack Burnham articulated in his writing. Looking back to the future, Burnham's theorisation of a systems aesthetics describes a:

*... moment in history when artists working with and without high technology, were engaged in a post-representational, post-object practice concerned with provoking an awareness of the real as an extensive, relational, dynamic network of processes.*  
(Whitelaw, 1998)

While the predominant tradition in modernist aesthetics holds steadfastly to the notion that each distinct media has its own innate qualities, the emergence of experimental practices in the late 1960s signals the waning relevance of media-specificity as a means of critically engaging with art. Characterised by their multi-media and pluralistic approaches, these forms of practice precipitate a reappraisal of modernism's hierarchical aesthetic order. In their own distinctive ways, intermedia and systems aesthetics are representative of this shift. Their propositions—articulated most clearly by Dick Higgins and Burnham respectively—share an underlying observation that the new forms and novel formations associated with these experimental practices are reflective of socio-technical transformations taking place across "super-scientific culture". [8]

The conceptual basis for intermedia was set out in Higgins' influential text of the same name from 1966, which starts off with the prophetic statement: 'Much of the best work being produced today seems to fall between media' (2005; 1966: 170). He goes on to elaborate:

*For the last ten years or so, artists have changed their media to suit this situation, to the point where the media have broken down in their traditional forms, and have become merely puristic points of reference. The idea has arisen, as if by spontaneous combustion throughout the entire world, that these points are arbitrary and only useful as critical tools, in saying that such-and-such a work is basically musical, but also poetry. This is the intermedial approach, to emphasise the dialectic between the media.*



Figure 2. Dick Higgins, Intermedia Chart (1995) via external link: <http://stendhalgallery.com/wp-content/uploads/2011/02/p1021.jpg>

This dialectic between media can be visualised diagrammatically as the overlapping of artistic forms (mail art, concrete poetry, graphic music notation) and movements (conceptual art, action music, Fluxus). While Higgins was in his own right an early advocate of the use of computers as a tool for art-making (should we presume that computer art is indicated by one of the “question marks” represented in Higgins’ diagram?), it is another artist closely identified with Fluxus, Nam June Paik, whose creative approach to technology exemplifies this dialectic—and its innate transversality—most quintessentially. As Paik himself would write:

*Art history and musicology [have] suffered too long from the separation of the un-separable ... But if all arts merge into one, as [sic.] recent movement of Mix Media shows, then the study of various arts should merge too into one.*  
(2004; 1967)

However, much of the artistic work that would come to fall within the province of intermedia can be characterised as multi-disciplinary. This approach is best illustrated through the type of additive, recombinant media-mixing exemplified by highly theatrical forms, such as staged environments or performative installations. In this respect, does the enduring legacy of Paik perhaps have more to do with the transdisciplinary basis of his hybrid production? It is in this way that Paik’s approach to creative technology aligns with the systems-based approach formulated by Jack Burnham. The latter articulates a more thoroughly transversal response to artistic motivations in an advanced technological society. Reiterating the earlier quoted remarks of Higgins, Burnham (2005; 1968: 169) would write:

*A polarity is presently developing between the finite, unique work of high art, that is, painting or sculpture, and conceptions that can loosely be termed unobjects, these being either environments or artifacts that resist prevailing critical analysis.*

In effect, Burnham’s system aesthetics refutes the notion that the primary experience of art resides in material entities. Burnham would draw upon kinetic art [9], luminal art—distinguishing “articulated illumination systems” from “light sculpture”—and responsive environments to illustrate his contention that art’s functionality exists through relations between people and the components that make up their environment. [10] These particular modes of practice demonstrate his claim that a fundamental transition was taking place from an object-oriented to a systems-oriented culture, wherein ‘change emanates, not from things, but from the way things are done’ (Burnham, 2005; 1968: 165; my emphasis).

Contextualized by the praxis of “expanded cinema” across the 1960s and 70s, experimental forms of cinematographic installation also play an important part in redefining, indeed blurring the boundaries between image, sculpture and live performance. [11] As demonstrated by Anthony McCall’s “solid light” films—most notably his seminal *A Line* describing a Cone from 1973—the immediacy of light, in and of itself, in the projection process is predicated on the coexistence of image in space. Through the admixture of light and smoke-induced atmosphere, McCall conjures a sculptural density through which a purer, undiluted form of optic quality or illuminism is achieved. Not dissimilarly, the responsive light installations of UVA promote a transversal way of thinking about how light and space, the performative enactment of the work and participatory involvement of the viewer are each integral to the process of their reassembly, achieved through the medium of exhibition.

As part of the consequence of these re-evaluations of disciplinary boundaries, the situation, site or milieu comes to the fore. In its way, “site-specificity” opens up a multiplicity of spaces and contexts in which art can operate and find its most applicable form of exposition. The paradigmatic shift announced by this underlying post-medium condition replaces the specific formal traits and properties conventionally used to define media with a greater accommodation to the composite and inter-connected operations of an “apparatus” or system. According to Burnham (2005; 1968: 167):

*The components of systems—whether these are artistic or functional—have no higher meaning or value. Systems components derive their value solely through their assigned context. Therefore it would be impossible to regard a fragment of an art system as a work of art in itself—as, say, one might treasure a fragment of one of the Parthenon friezes.*

The medium, previously condensed to a form of material substance, is reconfigured as an assemblage of relations and varying materialities that are interdependent with the viewer. By encouraging ongoing transformation as a result of lateral mobility through and across different systems, the resulting transversal trajectory takes on a life of its own. The artwork recognised as pure, aesthetic unity is no longer a viable proposition under technologised and mediated conditions. As Nicolas Bourriaud notes in his highly influential *Relational Aesthetics* (which reprises a number of the propositions originally formulated in Burnham’s *System Esthetics*), the dialogic principle, or transivity, effectively becomes ‘the tangible property of the artwork’ (2002: 26). Form, reconstituted as such, emerges from this durational, unfolding encounter.

In the spirit of drawing transversal connections, I find it particularly relevant to the line of

enquiry being followed here to ask how these aesthetic conditions, which are most readily associated with the virtual realities of networked society, new technologies and the infosphere, are translating to the spatial realm through critical practices in contemporary architecture. Jean Nouvel's Red Pavilion, for one, is architecture that both expresses, and is derived from, public relations [12], while Kazuyo Sejima's direction of the most recent iteration of the Architecture Biennale at Venice sought to reveal architecture as a reflection of collective consciousness. [13] Titled 'People meet in architecture', the biennale was exemplified by Sejima's curatorial selection of collaborative and speculative projects, many of which functioned as controlled experiments variously involving acts of shaping space (through the use of light, water vapour, sound) and giving substance to time (photographically, stroboscopically). Through such works:

*The interdependency of space and time are explored through projection, movement, images (still and moving) that reveal both the complex subjectivity of perception and the intersubjectivity of experience that is shared – in the spaces of architecture as it is in the context of the exhibition itself. Throughout the exhibition the worlds of information and experience collide, intersect and multiply their contradictions*  
(Blau, 2010: 39).

The role of exhibition in establishing this basis in 'interdependency' becomes particularly evident when encountering works that experimentally demonstrate the structure of transparency and density (Junya, Ishigami & Associates; Matthias Schuler and Transsolar) or mediated environments that test the thresholds of perception. Particularly poignant in this respect were presentations of multi-sensory environments created by artists Olafur Eliasson and Janet Cardiff. Using cinematic effect to carve out slices of visibility, Eliasson's *Your split second house* oscillates between the fluidity of perception and momentary flashes that register these impressions. Exhibiting a minimalist attitude that contrasts with the grandiose effect that Eliasson coaxes from the void, Cardiff and Miller Studio's reprisal of *The Forty Part Motet*—which I will refer to again in relation to my investigation on UVA's *Chorus*—instead places heightened emphasis on tightly controlled spatio-acoustics to produce the intertwining of sonic proximity and intimacy.

While holding these preceding observations in mind, the primary drive of my research at this time is directed towards exploring the system-like attributes of the exhibition interface—in and of itself—in order to better understand how transversal relations reinforce the conceptual framework for curatorial design. While site-specificity has been a prevailing undercurrent throughout most of my recent research into virtuality and the art of exhibition, the focus of those enquiries has been directed for the most part to the staging of exhibitions that are situated within a museological context. Yet, particularly as the experience of pervasive, inte-

grated media environments becomes more commonplace, I will use the course of this particular investigation into the practice of United Visual Artists to speculate on how, when digital mediation and spatial practice are integrated within an exhibition “eco-system”, a transductive way of producing aesthetic experiences that extend beyond the gallery becomes operative.

United Visual Artists are a London-based collective whose portfolio ranges across live performance, temporary interactive installation and architectural interventions. UVA are renowned for their ability to work across various disciplines (including video, installation, architecture) and applications (commercial music video, staged performance, light shows, responsive artworks, public art and architectural interventions). [14] As leading exponents of light-based installation work and cross-media experiential spaces, their productions are characterised by a prevailing emphasis upon the visual and sculptural qualities of light, most recently with an emphasis on LED and LASER technologies. Exhibiting a cool and tightly controlled formal aesthetic, UVA’s light-based artworks harness the potential of light to transform and animate a sense of space, be the spaces enclosed, interior architectures or public environments. Combined with their sophisticated use of media technologies, their spatial practice precipitates strong subjective as well as collective responses from their audience. As recounted by Matt Clark (UVA Creative Director and co-founder along with Chris Bird and Ash Nehru):

*When we started UVA we were predominately designing for live performance, using light to create a focal point for a large audience. With our installation work we created spaces where people were completely immersed, experiencing light on a very intimate level. We became more and more fascinated by the notion of light as a presence, how it changes the way people relate to the space around them, and to others.*  
(Clark and Whelan, 2009)

Over the past decade, UVA have successfully produced compelling aesthetic experiences that turn the audience into active participants. The extent of the success of their creative practice in that respect is demonstrated by notable works, such as Volume and Chorus – which will be used as the illustrative basis of this particular study. [15] Volume is a large-scale public interactive environment that consists of forty-six light columns arranged in a grid-like space. Each column is equipped with its own speaker relaying a unique channel of sound. Using a camera system to track the movement of audience members through the installation, the abstract light patterns and audio samples (provided by Massive Attack) respond to combined individual and collective interaction. [16] The installation’s distinctive system framework is characterised by the nature of the exchange that occurs between interactors and the elements that make up the work’s total sensory environment. This interaction influences the transformations that effect the aesthetic quality of the lighting patterns of the columns, the resulting soundscape

and the overall, highly integrated rhythm of the entire environment. When engaging with the work there is a prevailing sense of there being an inter-dependent relationship between individual presence and the emergent quality of the system.



Figure 4. United Visual Artists, Chorus (Howard Assembly Room) Kinetic light installation. Howard Assembly Room, Leeds (6th February – 1st March 2009). Commissioned by Opera North Projects in association with the Culture Company. Used with permission of United Visual Artists; Photo credit: United Visual Artists – James Medcraft.

Chorus is comprised of an array of eight pendulums each mounted with an LED light source and single speaker. Each pendulum has been assigned a unique score composed by Mira Calix. [17] The individual “voice” associated with each pendulum can be heard when the auditor is within immediate proximity of the moving path of the swinging pendulum, but as an ensemble they form a tightly interwoven chorus of light and sound. The work’s concept arose from the search for a simple and unifying relationship between light and opera. In musical terms, a chorus is the main part of a song that gets repeated; etymologically, the word “chorus” relates to a refrain (from the Latin *refringere*, “to repeat”). Chorus or strophic form describes a particular way of structuring a piece of music, which is based on the recurrence of a single formal section in a way that is analogous to repeated stanzas in poetry. Equally, the term can be used to mean a distinctive method for the spatial arrangement of sections of a choir that can affect the resulting perception of sound.

Approached initially by Opera North with a design commission to celebrate the re-opening



of the Howard Assembly Room of the Grande Theatre of Leeds, the genesis of the work's formal solution was inspired by the combined conceptual, physical and geometrical responses to this site-specific "backdrop". [18] The shape, design and functional properties of Chorus respond in a synergetic way to architectural features of the space. The design utilises the ceiling's arcs as pivot points for the suspended arms of the pendulums, with the resulting movement of the pendulums forming a mirrored arc of the barrel vaulted ceiling itself. While taking the pre-existing spatial properties of the site and its overriding sense of proportional order into account, the work also exhibits an underlying desire to produce a form of visitor/

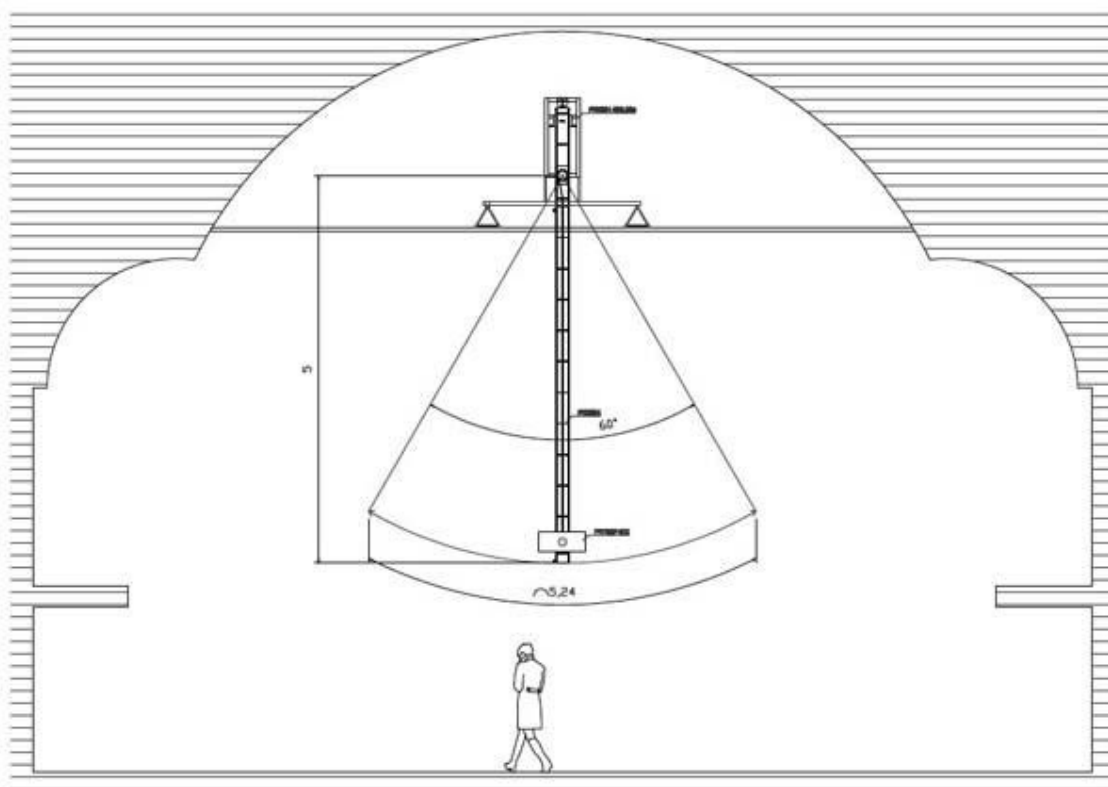


Figure 5. United Visual Artists, Chorus (Architectural plan - Howard Assembly Room, Leeds) Commissioned by Opera North Projects in association with the Culture Company. Acknowledgment: Used with permission of United Visual Artists; Design credit: United Visual Artists.

viewer engagement that reflects a scale of human presence in the space. Chorus operates simultaneously at a level of individual and collective experience. In developing the concept design of Chorus, UVA sought to balance creating an imposing, and at times menacing, physical presence while still enabling the public to move freely in order to fully explore its audiovisual properties as every position in the space offers a different perceptual relationship with the work. Visually, this is achieved by enabling relatively unobstructed panoramic

views of the overall setting that frames the work, as well as drawing the attention of its viewers when passing below the work itself upwards to the ceiling and its gothic decoration. Complemented by its acoustic register, the work's spatial performance restores a sense of the building's original splendour and mystique.

Considered as a technical ensemble, these pendulums form an instrument that allows the creative artists and participants alike to explore the relationship between performance, sculpture and composition. Subsequent restagings of Chorus have enabled UVA to continue to refine and test the limits of the work and its adaptability to other spaces and situations. [19]

In the following section, I will look more closely at the installation of Chorus at Durham Cathedral in order to address how this particularly evocative setting is animated by the work's direct performance and its perceived operativity.



Figure 6. United Visual Artists, Chorus (Durham Cathedral) Kinetic light installation. Artichoke's 'Lumiere' Festival, Durham Cathedral, Durham (12th – 15th November 2009). Acknowledgment: Used with permission of United Visual Artists; Photo credit: United Visual Artists – James Medcraft.

Durham Cathedral is considered a masterpiece of Romanesque architecture and amongst the greatest Norman buildings in Europe. Built as a shrine to St Cuthbert and begun in 1093, the cathedral became a main destination for pilgrims throughout the middle ages. The choice to reinstall *Chorus* in this particular architectural setting activates an interpretation of the work that references the role of choral music in the medieval church, where it served the purpose of not only illustrating scriptural texts but transcending them emotively. [20] Arguably, such associations with choral form and effect become even more pronounced in this reprisal than when the work was staged initially in Leeds.

Rigged in such a way as to be suspended directly over the main aisle of the cathedral, the array of swinging pendulums assumes a distinctively anthropomorphic character. [21] Formally, the stark minimalism of *Chorus* sets itself in stark contrast to the architecture's Romanesque features. However this physical relationship sets up an intriguing rhythmic oscillation between the mechanical arms and views that juxtapose the resulting streaks and trails of light with the ornate altar (which acts as a backdrop to the lighting emitted from the hub of each pendulum when viewed frontally) or the cathedral ceiling (which serves as a compositional surface for the kinetic work to play upon when taken in from directly below). By situating the work in this architectural context, audience movement is channelled along the narrow central nave. As a result, the experience of the environment is intensified within a central corridor of action and activation. The cadence of the swinging arms of the pendulums along with their accompanying visual and sonic refrains encourages a certain processional quality that promotes a strong reverential feel. The overall viewing quality results from a mixture of stationary (perceiving sight and sound in relation to architectural backdrop, whether oriented ahead, behind or overhead) and moving "takes" (walking through or beneath the swinging arcs of the kinetic arms reinforces the cinematic quality of the work as it evolves temporally and dynamically). The combined audio, visual and kinetic qualities of *Chorus* animate the entire space. When mobilised, the oval-shaped lights that are incorporated into the head of each pendulum assume the character of an orbiting spectre. While each lighting sequence is highly individuated, together these animate entities exhibit a collective intelligence, in the effect becoming a swirling congregation of poltergeists. As a product of the programming that drives the responsive system, each performance, or run cycle of the work, incorporates subtle rhythmical variations. As a result, no two performances are exactly alike.

Operationally, each pendulum is controlled by a series of complex micro-electronics allied to a mechanical drive system. The pendulum swing is powered by an electrical motor through a reduction gearbox that turns the drive shaft. The motor takes its command via digital relay from an Arduino micro controller. The Arduino has been programmed to receive data from the control computers running custom software programmed to not only control the swing of the arm but also the audio and LED componentry housed in the "bob", or head of the pendulum. Each casing contains two LED boards each with fifty surface mounted LEDs

framed by a vignette aperture creating a round, orb or light. Additionally, a single speaker is housed within the “bob” which is also connected to the micro controller and amplifier which delivers a full sixteen channels of audio. The first eight channels are each dedicated to a single pendulum with the remaining channels corresponding with the surround sound system of the local venue.

The programming that controls the operability of the system enables Chorus to exhibit behavioral characteristics that demonstrate properties of self-organization (that occur internally within each run of the sequence) and variation (which becomes apparent as the overall rhythm of the work changes). These autopoietic qualities are revealed when the eight pendulums seem to move in concord; congregating together, before dispersing into off-register patterns, or following each other in a snake-like weaving that traces a path through the overhead space.

In each section of the work’s composition, the pendulums constantly adjust their position in order to match the sequenced formations that have been programmed. As Chorus has been designed to operate as an autonomously functioning real-world physical system, even small differences in terms of weight on the “bob”/arm structure can cause major differences in terms of friction on the axis of revolution. During each performance, the system adapts to its environment by constantly retrieving data and giving feedback. Effectively the software system is continually adjusting and recalibrating in response to the momentum of the other pendulums, as this affects each one of them individually. With every run through of the work’s script or score, the system automatically resets and starts again. As a result, variation is introduced into the work as small differences arise from acceptable levels of friction (whether in relation to entropy associated with communications, triggering of electronics or mechanical lag) and introduce in-between sequences that influence the shape and behavior of the overall system.

This resulting texture intuited by the viewer/auditor is not derived from isolated perceptual responses to sight or sound, but formed out of Chorus’ audiovisual media mix. Acoustically, Mira Calix’s three-part score is composed of an array of samples (of voice, instrument and effect) that figuratively conjure the flapping of wings, creaking and scraping of surfaces and sonar-like “pings”. Calix’s voice ranges from soaring pitch and amplitude to whispered breaths and sighs. The elements of this sound track focalise the auditor’s attention to their location in space, as the motion of the speaker housed in the head of the pendulum’s arm modulates the projected sound as it swings in an arc overhead. As a consequence of this modulation, breathless delays and artifacts of reverberation are incorporated into the resulting soundscape, creating an ambience that is otherworldly and ethereal.

On a visual register, Chorus' use of light is attuned to this integrated sonic and kinetic rhythm. As UVA architect Ale Tsolakis observes [23]:

*There is a big difference between a sound that moves across many sources (speakers) and a source of sound moving. Like that, a light pixel can move along an LED screen or you can have one pixel/LED moving physically, horizontally. The optical effect, especially from close, is so different.*

As each of the pendulum arms swing, the single luminous aperture of each "bob" laterally scans across the breadth of the cathedral like a searching flashlight. The lighting scenario shifts constantly between moments of focus and diffusion. This overall cadence, the pace of movement combined with the rhythmic on/off sequencing of the emitted light, become harmonised as the pulses of each separate light begin to find overlapping phases and super-impose. As revealed by slow motion photographs documenting Chorus' performance, the introduction of artificial light into the environment has a transformative effect that quite literally creates a fleeting sensation, the sense of space coming into existence, if only momentarily. [23] Reflecting the distinctive emotive quality that unites their explorations with light, UVA observes: 'Most of our light works are experiential, set in the real world for people to touch, feel and interact with; they're here today, gone tomorrow' (Clark and Medcraft, 2009).

By folding their respective qualities into each other, Chorus' choreographed performance of light and sound is synthesised into an audiovisual experience that becomes actualised over a period of time, through moments of inflexion.

In seeking to facilitate a way of thinking relationally about the interaction between technological operability and human agency, Gilbert Simondon introduced the associated concepts of technicity and concretisation. Technicity proposes a way of thinking about how technical objects and practices (material, cognitive, social) cannot be separated from their shared milieu. Concretisation describes the process by which such technical ensembles materialise, while inflexion marks this turning point, the transformative moment when the individual actors involved in this scenario exchange their constituent properties and converge.

By intensifying the relationship between all elements of its technical ensemble (light and sound; motion and mechanics; construction and space; audience and subject; viewer or auditor), Chorus evocatively manifests the 'translation of varied visual and auditory media into one another's modalities' (McLuhan, 1997; 1955: 44). Marshall McLuhan's influential thinking about the way that media technologies impact upon human systems exerted a sig-

nificant formative influence upon how experimental art was critical positioned and articulated in the late 1960s. [24] Drawing parallels between pre-modern oral culture and the variety of emerging media cultures of electronic communication, he would distinguish the characteristics of this new mediated or “acoustic space” thus:

*Auditory space has no point of favored focus. It's a sphere without fixed boundaries, space made by the thing itself, not space containing the thing. It is not pictorial space, boxed in, but dynamic, always in flux, creating its own dimensions moment by moment (McLuhan, 1997; 1955: 41; my emphasis).*

At the moment of inflexion, the transductive nature of the Chorus gives material expression to the chorus effect. This phenomenon relates directly to how similar, but discrete sounds emitted from multiple sources blend together to produce the perception of a single, richer sound. Occurring naturally in the case of a choir, string ensemble or a musical instrument such as the piano, this effect can also be simulated using an electronic means, such as a signal-processing device. Regardless of technology or method, the effect is achieved by taking a signal and mixing it with one or more modulated copies of itself. With Chorus, UVA have created a work that operates as a technical ensemble for producing kinesthetic impressions of tendency, duration and intensity through its phasing and programming of visual and acoustic events. The evocative, rich and shimmering quality of Chorus results from such an amalgam of sound and vision; and, in doing so, the work most elegantly actualises transduction through its ‘ongoing interaction, stabilization and destabilization between different realities’ (Mackenzie, 2002: 210).

Broadly speaking, UVA’s creative process reflects McLuhan’s appeal that our mediated environments should be approached self-consciously as ‘perceptual probes and treated as ‘anxious objects’ instead of being allowed to remain unperceived or untested (McLuhan 1997; 1967). While this investigation has presented the opportunity to reinforce certain ideas around the crucial expository role that exhibition plays, it has also reconfirmed for me the need to continue exploring how mixed realities are formed through exhibition. It would seem that finding a unifying means of articulating exhibition praxis calls for the creation of hybrid architectures that are:

*... conceived in the active terms of communication, information flow, and interaction—that finds the global in the local and seeks the collective in the personal. While focusing on the particular conditions of site, program, materials and structure, it engages with the larger cultural and economic conditions of its making—the smoothness and connectivity of the world of information—inventing new hierarchies that*



*produce hybrid, flexible environments; exploring action-based logics for organizing space that give their users the agency to inhabit them as they wish (Blau, 2010: 43).*

Underlying the curatorial philosophy of Kazuyo Sejima's 'People meet in architecture' was the observation that the new media ecosystem is radically altering the conception of architecture and influencing how lived experience in constructed environments is being shaped. As Blau (2010: 44) points out, this transformation is compounded by the fact that the media system itself is currently in a state of radically altering from 'a system in which the traffic in ideas and consumer products moves in one direction (from broadcaster to consumer) to a system that is multidirectional and in which users are active producers'. As social media alters the relationship between the personal and collective, and ubiquitous computing effectively dissolves the dichotomy between virtual and real spatial relations, new cognitive models are required to navigate the transverse relationships that exist between new technologies and architecture, and reciprocally, new architectural programmes and media.

Atmosphere may prove to be one such useful approach. Employed by Sejima as curatorial trope, the term atmosphere is indicative of non-fixed forms or states that are conditional and interdependent. While compelled to draw allusions to the principle of cloud computing in relation to web technology, in the context of architecture, atmosphere connotes 'an emergence that arises out of a multiplicity of interactions between the built object and its physical and social environments' (Blau, 2010: 40). In the Biennale exhibition, the notion of atmosphere was most closely associated with Matthias Schuler and Transsolar's Cloudscape. In this expansive installation at the Arsenale, a cloud of dense vapour effectively defines the exhibition space. The vagueness of the seemingly unbounded space is articulated by the continuously changing qualities of filtered light that pierce the volumetric fog, illuminating vistas revealing the procession of pillars that run the length of the gallery and a single curved ramp situated at its centre. These architectural forms—one a permanent, precondition of the space, the other, designed as a temporary feature—are the work's only structural interjections. The density of the cloud is continually modulating in response to the shifting micro-climactic conditions and the varying levels of human action in the immediate environment. Visitors experience the cloud from a variety of positions: within, below and above. Human presence operates at both the level of individual and crowd. Tetsuo Kondo's ramp acts as a regulatory mechanism, determining the procession of individual audience members who traverse the bridge that loops across the space. But it is not just the movement of the crowd that is being controlled in this fashion. The ramp also functions as a "vision machine" that structures the perceptual experience of individual viewer and collective audience alike in a feedback loop. In accordance with the nature of the viewing experience of the work:

*Schuler's project actualizes the very notion of atmosphere as a negotiated condition by translating the terms of engagement of the exhibition itself from binary subject-object relations to the multiply diffuse terms of environment, ecology and hybrid networks (Blau, 2010: 41).*

In closing, this text forms part of series of explorations derived from a closer interrogation of the transdisciplinary practice of United Visual Artists. Focusing on their kinetic light installation, *Chorus*, in this instance has lead to identifying how its resulting form and dimensionality as a mediated exhibition experience are the product of setting transductive forces into motion. This observation is of topical relevance to contemporary curating, especially in relation to the nature of aesthetic experience in space and how this might be seen as actualising the nature of subjectivity, access and involvement in today's new media ecosystem. This finding has implications for the consideration of achieving greater appreciation of artistic practices that explore the combined qualities of synthetic image and space. It also supports the need for engagement with contemporary architecture, particularly given the increasingly cultural significance that new media and global networks bring to the creation of social, mediated, relational and experiential environments. It is my contention, then, that further testing of the interrelationship that exists between artwork, audience and space—and that informs the basis of related texts based on UVA addressing the subjects of aesthetic interaction and programme architecture directly—will prove useful in demonstrating the transversal basis of the various processes (material/transmaterial), integrations (real/virtual) and interactions (human/technological) that are coming to characterise expanded exhibition-based praxis today.

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## Notes

[Epitaph] McLuhan, Marshall. 'The Relation of Environment to Anti-Environment', in Michel A. Moos (ed.) *Media Research: technology, art, communication* (Amsterdam: G+B Arts International, 1997; 1967): 116.

[1] These ideas have been developed most comprehensively in my forthcoming book, *Virtuality and the Art of Exhibition* (Intellect, UK). This research investigates how the intersection of new technologies with exhibition space offers new possibilities for aesthetic experience. The larger project is focused by expositions on spatial practice and digital mediation that establish the context for the emergence of the multimedial museum. The critical enquiry informed the creative production and realisation of a series of artworks, along with curated and 'demonstration' exhibitions that promote the conceptual and strategic application of curatorial design. Through operating as a transversal artwork, *The Ammonite Order, Or Objectiles for an (n) Natural History*—which featured in the ISEA2009 exhibition (Belfast: Ormeau Baths Gallery, 2009)—demonstrates how a non-deterministic relation between digital media-tion and spatial practice can dislodge the hierarchical, primacy of real objects presented in gallery space. Together, the encompassing series of theoretical and practice-based investigations constitute a transdisciplinary response to the evolving role of new media in art, culture and society at the turn of the twenty-first century.

[2] The 12th International Architecture exhibition, titled 'People meet in architecture', was directed by Kazuyo Sejima of the celebrated architectural firm, SANAA. The curated selection of works placed emphasis upon collaborative realization and the construction of environments that are reflections of collective consciousness. As introduced by Sejima (2010: 14):

*The twenty-first century has begun and many things have changed; people, cultures and economies have never been as connected as they are today. Due to advances in*

*technology, we have started to connect with other people in a completely different way, forming relationships indirectly as through the Internet. In this new intangible world I believe that architecture occupies a unique and important place.*

[3] Mitchell Whitelaw has recently developed the idea of transmateriality as a way of viewing computers as material machines that through operating as computational devices produce an 'incredibly dynamic, pliable set of techniques for manipulating the material environment' (See: Whitelaw, Mitchell. 'Transduction, Transmateriality and Expanded Computing', Blog posting, 3 May (2009), <http://teemingvoid.blogspot.com/2009/01/transduction-transmateriality-and.html>).

[4] Beryl Graham and Sarah Cook (2010: 83) make reference to Lucy Lippard's historical account of the rise of conceptual art and the dematerialization of the art object from the mid-1960s onwards when teasing out the following trajectory:

*One of the links among conceptual art practices of the 1960s, networked and systems-based art practices of the 1970s, telecommunication works of the early 1980s, and Internet-based art of the 1990s is the approach to the dissolution of the autonomy of the art object.*

[5] Editorial definition of Transversality: a transformative mobility though different systems (that can be at once technical, but also social, political, natural). It tends to be lateral, rather than hierarchical. A transversal connection does not just connect fields or sets of pre-existing relations. It transforms the things/events that are brought into connected networks. Any 'individual'/individuation/social or natural ecology is to some extent a network, and any network involves ecologies of transversals. Crucially, the micro-reconstitution of relations is as important as, if not more so than, the macro- reconstitution of fields.

[6] Gilbert Simondon was a French philosopher best known for his theoretical account of how individual and collective individuation occurs through the active transformation of forces into novel assemblages of relations. Simondon's theory has been interpreted as presenting a view of technical objects as existing 'somewhere between a transient, unstable event and a durable, heavily reproduced structure' (Mackenzie 2002: 14). According to Adrian Mackenzie, who draws heavily upon this foundational concept to interrogate the ways that technical mediation is embodied in his book *Transductions: Bodies and machines at speed*, transduction engages with the problematic corporeality and temporality of contemporary technology and provides a particularly useful way of 'thinking about diverse interactions and resonances between the elementary technicities present in a technical ensemble' (15).

[7] Most notably, art historian Rosalind Krauss has identified the dawning of a post-medium condition in late-Modernist art, drawing directly on the example of Marcel Broodthaers' influential practice and its attendant deconstruction of the filmic medium. See: Krauss, Rosalind. *A Voyage on the North Sea: Art in the Age of the Post-Medium Condition* (London: Thames & Hudson, 2000).

[8] Dick Higgins viewed the separation between media as an expression of the mechanistic type of social thought inherited from the era of industrialisation. Higgins' held that art needed to adapt in the face of changing social factors (identifying the war in Vietnam and labor crises as contemporaneous social problems) and aesthetic conditions (noting the changing sensitivities and literacies of art's audience as a result of their increased exposure to mass media such as radio and television), while, for his part, Burnham identifies biological sustainability, social inclusion, conservation and 'understanding the growing symbiosis in man-machine relationships' as pressing needs of the times.

[9] Burnham draws a very clear distinction between "kinetic art" and "kinetic sculpture", in which he saw the additional property of motion being trivialised as little more than a modification of the formalist aesthetic conventionally applied to static forms of sculpture:

*Rather than visual appearance there is an entirely different concern which makes kinetic art unique. This is the peripheral perception of sound and movement in space filled with activity' (2005; 1968: 168; my emphasis).*

[10] Reproduced article from Time Magazine, 9 February 1968, reviewing the exhibition of Hans Haacke's Photo-Electric Viewer Programmed Coordinate System:

*'Kinetics: Big Brother'*

*Luminal artists commonly require the viewer to push a button or step on a lever in order to activate their art, but Manhattan's Hans Haacke, 31, has dreamed up an ingenious way of getting the viewer to turn on the art without really trying. On display last week in Manhattan's Howard Wise Gallery was a small white room, lined on four walls with 28 electric bulbs at shoulder level. When the viewer walked into the room, the four lights centering on him lit up in unison. When he moved, other bulbs lit up, chasing him around the room in a Big Brotherly game of tag.*

*The mechanism was triggered by a series of hidden photoelectric cells paired with infra-red light projectors, which together created an invisible light grid. The cells were located directly beneath the light bulbs; when the viewer's body intercepted an infra-red light beam, the cell triggered a relay switch to the bulbs above. Haacke's Photoelectric Viewer Programmed Coordinate System furnished little to look at, but lots to ponder at the coffee shops. Does a tree make a noise when it falls in the forest if nobody is there to hear it? Does a work of art cease to exist, because no one is there to turn it on?*

(See: <http://www.time.com/time/magazine/article/0,9171,844380,00.html>)

[11] In tracing the historical development of film and video media in the visual arts, Gabriele Knapstein (2006: 25) writes:

*The turn towards film by visual artists during the sixties must be seen in the context of the praxis of "expanded cinema", and of the development of an expanded conception of art, one manifested beginning in the late fifties not only in the visual arts, but also in music, dance, theatre, poetry, Action Art as well as in film productions. The praxis of "expanded cinema", as it developed during the sixties, must be seen in connection with the activities of filmmakers, visual artists, musicians, dancers, poets, theatre and action artists, activities that transgressed genre boundaries, as summed up by the concept of "Expanded Arts", for example in 1966 in the journal Film Culture, edited by Jonas Mekas. The most diverse forms of multimedia and intermedia works have been subsumed by this term, which refers both to the expansion of individual genres, and to spatial and temporal coordinates.*

Fluxus artist George Maciunas' 'Expanded Arts Diagram' (1966) offers an intriguing visual register to supplement this description.

[12] Conceived as a centrepiece for a meditation on and about the conditions of summer, Nouvel's temporary structure commissioned for the Kensington Gardens in London in 2010 drew upon performativity and participative usage combined with heightened sensory manipulation to create a 'contemplatory experience' composed from 'indelible moments'. In more than a symbolic way, the "density" of the colour red celebrates the joie de vivre and lazy revelry; the 'pursuit of sensations' (Virilio, 2010) that characterize the season alongside its doomed ephemerality: 'Red doesn't last. Heat vanishes with summer. Energy fades into inertia and death' (Nouvel, 2010). Spatially and temporally, Red Pavilion is formed from the paradoxical "complementarity" of endurance and fleetingness.



[13] Writing in the exhibition's accompanying catalogue, Yuko Hasegawa speaks of "bodymind" as a key concept for understanding the processes whereby individual perception and experience are transformed into perceptual forms expressing collective knowledge or intellect. "Bodymind" embodies a new rationality premised on complex networks, information sharing and the dissolution of media boundaries. According to Hasegawa (2010: 28): 'the environment surrounding us is changing. This change is influenced to an unprecedented degree by media and information, necessitating alterations to the architectural program'.

[14] Besides their responsive light installations—such as Chorus, which is being focused upon directly in this text—United Visual Artists' reputation is most strongly identified with the notable concert stage and light-shows that they have produced and realised for Massive Attack (between 2003 – 2010), Unkle (World Tour, 2004) and U2 (Vertigo Tour, 2005-06). Other live performance and event-based productions have ranged from the MTV European Music Awards (Rome, 2004) to Echo, an 8-minute live performance piece with the Mimbire Acrobat Group presented at Tate Modern (London, 2006) to Speed of Light, which was commissioned by Virgin Media to mark ten years of broadband in the UK (London, 2010). In addition to live audiovisual collaborations (Becks Fusions, UVA vs Chemical Brothers, 2007; UVA vs Massive Attack, 2008), UVA have directed numerous music videos including Colder's To The Music (2006), Battles Tonto (2007) and Massive Attack's United Snakes (2008).

[15] Chorus was recently awarded a distinction at Ars Electronica in the interactive category.

[16] Volume was developed as the result of a commission from PlayStation to mark the launch of the PS3. The work was installed in the John Madejski Garden enclosure of the V&A Museum in London from November 2006 until January 2007. Following its popular reception, Volume has toured to international venues including Taipei and Melbourne. Additionally, the work has received critical recognition through its short-listing in the Interactive category of the 2008 Brit Insurance Designs of the Year awards and exhibition held at the Design Museum, London.

[17] Mira Calix (Chantal Passamonte) is an experimental recording artist who specialises in mixing vocals with experimental electronic textures, orchestration and classical instruments. In addition to her performances and recorded work, she has collaborated on works for theatre and installation pieces, including UVA's Chorus and My Secret Heart (which was inspired by Allegri's 17th century choral work Miserere Mei). The outcome of a collaboration with Streetwise Opera and British video artists Flat-E Productions, this work premiered at the Royal Festival Hall in London in 2008.

[18] The Assembly Rooms at the Leeds Grand Theatre were designed by architects George Corson and James Watson in 1879. Ostensibly, the venue was created to provide “respectable” entertainment, ranging from magic and minstrel shows to concerts and musicals before being turned into a cinema in 1911. Their public inauguration was marked by a performance from the popular stage magician Dr H.S. Lynn, whose repertoire was known to feature conjuring tricks and illusions. One notable illusion (called Palengenesia) involved the disassembly of a human body limb by limb, before putting it back together. According to legend, this particular illusion had a formative influence upon the young Houdini.

[19] According to UVA architect Ale Tsolakis:

*It was from the start (and still is) our ambition to orchestrate Chorus with live performance, to use it both as a stand alone ‘instrument’ and as an active choreographic element. Its full potentials are still to be reached and the functions of the space could trigger a lot of them (Email correspondence with Ale Tsolakis, 16 June 2010).*

To date, Chorus has been reprised in situ at the world heritage site of Durham Cathedral as part of Artichoke’s Lumiere festival (12-15 November 2009) and performed most recently inside the massive industrial setting of a repurposed hydraulic power station for The Wapping Project in Battersea (23 June 2010).

[20] Developing within a tradition dating back to the 4th Century, a new type of choral music involving multiple melodic parts emerged during the Middle Ages. Forms such as the Gregorian Chant and the motet, which evolved during the Renaissance, were distinctive developments of this polyphonic technique. The motet, for instance, describes a composition with different texts sung simultaneously in different voices. English composer Thomas Tallis’ exemplary choral piece, *Spem in alium* (c. 1570), was written for eight choirs of five voices each.

Of comparative interest to this study, Tallis’ composition acts as the basis for Janet Cardiff’s celebrated installation, *Forty Part Motet*. Cardiff’s installation outlines the circumference of the space with a series of forty speaker stands. By setting the speakers at an average head height, this spatial arrangement effectively substitutes an audio speaker for each singer in the chorus, enabling the “viewers” to differentiate between each voice. As they circumnavigate the gallery, the voices combine and the auditory experience seamlessly shifts to an appreciation of their harmony. In this deceptively simple way, *Forty-Part*

Motet enables an intimate engagement with Tallis' original composition through an open and public aesthetic experience. As Cardiff reveals in the artist's statement accompanying *Elusive Paradise: The Millennium Prize* at the National Gallery of Canada of 2001:

*Even in a live concert the audience is separated from the individual voices. Only the performers are able to hear the person standing next to them singing in a different harmony. I wanted to be able to 'climb inside' the music connecting with the separate voices. I am also interested in how the audience may choose a path through this physical yet virtual space.*

[21] As tradition has it, over the years each of the bells of Durham Cathedral have had their unique weights and pitch characterised by being assigned names to reflect their individual personalities, such as "Galilee", "Long Bell", "St. Bede" and "St. Oswald".

[22] Email correspondence with Ale Tsolakis, 16 June 2010.

[23] Produced in between these iterations of *Chorus*, UVA held their first gallery exhibition in June 2009 at Smithfield Gallery, London. Titled *Deus*, this body of work explored the potential of light to redefine an environment, physically and emotionally. The series of large format images were executed in an effort to distil the experience of their installation work into still photography. On one level, the series of photographs act as a record of a number of light interventions in secluded areas of Britain. By deploying artificial light in the surrounding natural landscape, a new ephemeral space is created. The photographic series relates closely to *Monolith*, UVA's 2006 light installation produced for Onedotzero's *Transvision* night at the V&A Museum's John Madejski Garden, as well as connecting with the music video created for Battles' single, *Tonto*, in which artificial light is set in contrast with a stark natural setting (see: <http://www.youtube.com/watch?v=1LLAN29W-4w>).

[24] McLuhan's canonical texts include *The Mechanical Bride* (1951), *The Gutenberg Galaxy* (1961) and *Understanding Media* (1964). Illustrating his influence, Higgins refers to McLuhan in his 'Statement on Intermedia', which was published initially through Something Else Press in July 1967, while Burnham does likewise in his 'Systems Esthetics' essay for *Artforum* in September 1968.

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## FCJ-123 The Transversal Generic: Media-Archaeology and Network Culture

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transmediale – festival for art and digital culture  
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*The generic no doubt cuts across the contemporary operators of thought, like the transversality of Deleuze-Guattari, or Foucault's diagonality.—Francois Laruelle (2011: 252)*

'Take, for instance, an overhead projector' as Bruno Latour wrote in a 1994 article (36). And why not? Introduced as a non-human actant by John Law in 1992 (3), Latour further employs this standardised piece of presentation equipment as an example of a generic black-box technology whose operation is hidden from the user. Most likely drawing on his own immediate experience as a lecturer, Latour described a situation where the technological complexity of the overhead projector only reveals itself in breaking down, when technicians come to the rescue and open up the machine, revealing components in a seemingly never-ending network. Today, one may assume that Law and Latour have long since abandoned the overhead projector. However, as I will explore in detail in the second part of this article, the act of opening up an overhead projector (discursively as well as materially) has curiously returned, and at the same time migrated outside the exclusive domain of select AV experts. This migration can be tied to the increasingly generic archaeological impulse that Simon Reynolds (2011) has recently described in his theorisation of the different regimes of cultural production in the analogue vis a vis the digital era. 'It's as though the space-time of culture has been flipped on its axis: the place once occupied by the future is now taken by the pasts' as Reynolds (2011b: 34) writes on the transformation of music culture in which artists are no longer 'astronauts but archaeologists, excavating through layers of debris (the detritus of the analogue, pre-internet era)' (Ibid.). In the haze of syn-



thetic futures past evoked by the hypnagogic pop of artists like Oneohtrix Point Never, the fetishistic focus on analogue technologies in Hollywood movies like *Zodiac* (2007) and *Super 8* (2011) or in the work of contemporary artists who utilise and re-purpose analogue technologies such as Haroun Mirza or Gina Carducci, it is as if media-archaeology has moved from a research agenda on the margins of media studies to being a wide spread cultural practice. In this context media-archaeology has also increasingly become, as recently stated by Jussi Parikka, 'a method for doing media design and art' (Hertz and Parikka, 2010).

Indeed, not long after the turn of the millennium it suddenly seemed as if media-archaeological practices were popping up everywhere: academic conferences like the *Re: series* from 2005 onwards investigated the intertwined histories of art, science and technology; exhibitions like ZKM's 2003 *Future Cinema*, despite its sci-fi sounding title, looked as much back to older conceptions of the future of film such as the Expanded Cinema practices of the 1960's; in music, genre epithets like hauntology and hypnagogic pop have emerged to describe music that not merely samples snippets of earlier music but in a dreamlike way refashions entire cultures of popular sounds, such as 1980's chart-pop or early synthesizer music, complete with their associated obsolete hardware and software. This is all not to speak of the immense number of academic titles taking a historical view on media: *New Media, 1740-1915*; *Always Already New: Media, History, and the Data of Culture*; *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means*; *Rethinking Media Change: The Aesthetics of Transition*; *New Media, Old Media: A History and Theory Reader...* the list could easily go on. If we understand archaeology as the scientific study of past societies including their ways of living and thinking, then what is the relation between such a "backwards" looking discipline and the seemingly ever-forward looking vantage point of cultural production in capitalist society, with its foundational principles of creative destruction, built-in obsolescence and obsession with the new?

A suitable starting point for considering the role of media-archaeology in contemporary culture is to consider the increasingly expanded role of the archive. Archaeology is not only a discipline for the objective study of the past, it is also an active intervention from the present into the past, mediated by different forms of archives and archival practices, whether physical or digital. In Michel Foucault's work, archaeology's raw materials were significantly expanded to include the modern bureaucratic archive as its main site of excavation, an archive used to transversally intervene across different historical discursive configurations. Complementing Foucault, Michel de Certeau (1975) pointed out that the work of history and the archive as a specific spatial and material site was itself transformed by the advent of the computerised archive, transforming the way we do history. Researchers loosely identified with "German media theory" such as Friedrich Kittler and Wolfgang Ernst later developed this thread further in line with McLuhan's media theory, arguing that the archive should not be understood only metaphorically, but that its specific technical materiality needs to be

the first thing addressed. The archive in this sense is foremost a technically ordering device, which in the computerised age is being governed not by humans but by programmed protocols. Media-archaeology, it could be argued, has developed as a bastard discipline in between Foucault's transversal interventions across a more metaphorical sense of "the archive" as a discursive site and the Kittler tradition of emphasizing the technically determined and operational, or even actively intervening material aspects of archives themselves. In this article, I use both these understandings of the archive and archival practices, the material and the discursive, as equally important. This is in order, on the one hand to grasp how media-archaeology has become a sort of cultural "generic" in contemporary network culture and on the other to discern how it still may be attractive as a critical practice. This idea of the cultural "genericity" of media-archaeology will in turn be deployed as a positive force of transformation: 'Here the generic is the problematic that allows us to reformulate, on the one hand, the event as non-historical occasion or historical-without-history, and on the other hand the True-without-truth as transformation of the history-world' (Laruelle, 2011: 254).

The first part of the essay will deal with theoretical approaches to media-archaeology while the second part focuses on artistic practices. Siegfried Zielinski's "an-archaeological" excavations are discussed as valuable for understanding the non-linear approach to the archive and an expanded, "deep time" sense of media history. This is contrasted with the work of Wolfgang Ernst who almost clinically rejects anything that has to do with human agency such as memory and culture in relation to the archive. Following Ernst, I connect media-archaeology to a certain mode of instrumentalisation of the past which is akin to the "teleological mechanisms" or "Circular Causal and Feedback Mechanisms" of cybernetic discourse, as found in the early work of Norbert Wiener and Heinz von Foerster. It is argued that in this cybernetic view teleology as linear, idealist progression was transformed into an evolutionary emergent entity, as actualised, material past turned into a resource for the probabilistic production of the still virtual future.

The cybernetic principles for managing the future through an operationalization and disclosure of the past as simply "the past" are then read through Wendy Chun's notion of 'the enduring ephemeral'. In Chun's work memory, in the computerised age, is seen to have been conceptually conflated with storage, and this loses track of the double bind of the simultaneously constructive and degenerative aspects of the past and history as memory. In this context I then return to the revisionist imperative of Zielinski's media-an-archaeology through the operations of artistic works that engage a transversal circumventing of the teleological underpinnings of network culture. A level of critical potentiality in media-archaeology is re-introduced through my exploration of artistic uses of the transversal discursive and material forces driving this generic, involving the construction of pasts and presents both through historical/narrative and material interventions. The media art practices considered in the second part of this article depart foremost from a series of projects that have taken place within the scope of the festival

and ongoing artistic research project *The Art of the Overhead*. This revisiting of an old school presentation device is here conceptualised as a transversal approach to a medium as an archive in itself that cuts across material, discursive and institutional configurations. Drawing on the theory of transversality as found in the works of Felix Guattari, Calvin Schrag and Gerald Raunig, I will argue that such a transversal notion of media-archaeology is possible but that its critical powers do not lie outside of its generic status but should rather be derived from it. The notion of transversality is here referred to in the sense as a potential form of institutional critique (cf. Raunig, 2007) and particularly, as recently described by Luciana Parisi, as devoted to 'the existence of unrealistic conditions of thought' in research and artistic practices that are 'able to insert cuts, gaps, break downs in the smooth operational flow of info-knowledge of cybernetic capitalism' (Parisi, 2008). Returning to the notion of the generic, I invest in this a certain positive ontology, beyond absolute critique and more in line with the non-philosophy of Francois Laruelle (2010). Laruelle's conceptualisation of the generic (2011) makes possible a weak form of intervention, which is not founded in any idea of a by default "radical" nature of transversal practice. The generic is rather to be considered as a unilateral base from which it is possible to also generate critical transversal modalities.

We shall suggest that genericity, without destroying the market and capitalist structure of exchange and equivalence which is necessary to it as the element in which it intervenes and which is of another order, no longer simply reproduces it even with difference, but contributes to transforming it through its operation which is of the order of idempotence, as we shall make clear later on. This is a transformation that takes place according to a subject of-the-last-instance and as its defence as Stranger against capitalist-and-epistemological sufficiency. (Laruelle, 2011: 242)

As an example of how this may apply to the field of media-archaeology, my own case-study of the transversal artistic re-deployments of the institutional medium of the overhead projector provides an excavation of how an unlikely contender for media stardom may take up a critical modality within the rising atemporality and real-time obsessions of network culture.

## Problematic Archés: Archaeologies and An-Archaeologies

Instead of embracing media-archaeological practices as in any way critical by default, one needs to ask what arché, that is what idea of "origin" these kind of media excavations presuppose? Might media-archaeological art not simply be conforming to the stabilizing

feedback mechanisms of digital capitalism as in the 'product-making-nostalgia' (Suominen, 2008) of phenomena like retrogaming? Or do they rather work to dislocate the teleological mechanisms of the old and the new, in the manner in which Michael Dieter (2007) has discussed the dysfunctional spaces created in the hardware-archaeology of artist game-modding?

In research, media-archaeology often entails a kind of revisionist ethics best exemplified by the work of Siegfried Zielinski, as the searching for the 'new in the old' (2006: 3). In this sense, media-archaeology resonates with the multiplicity of Henri Bergson's actual-virtual dynamic and, though far from a unified discipline, has emerged as an archaeology of the 'fortuitous find' (Zielinski, 2006: 28) where lost artefacts, discourses and personage of media-historical significance are (re-)discovered and re-used in new ways. Perhaps this requires a practice-oriented and slightly romantic view of archaeology as discovery: the practical endeavour of digging out new knowledge from the past (cf. Snickars, 2006: 132). While following Foucault's archaeological and genealogical methodologies, Zielinski recovers histories of repressed media situations from a "deep time" perspective (with a perhaps unacknowledged hint of Adorno's cultural critique), looking for the new in the old:

*(...) we shall encounter past situations where things and situations were still in a state of flux, where the options for development in various directions were still wide open, where the future was conceivable as holding multifarious possibilities of technical and cultural solutions for constructing media worlds.*  
(Zielinski, 2006: 10)

Zielinski indeed offer us truly exhilarating cases of forgotten apparatuses and their inventors, but his post-Foucauldian an-archaeological narratives (or "cuts" as he more aptly calls them) do not seem to be able to break out of a postmodern celebration of rupture and heterogeneity. This risks leaving us with a favouring of the politics of particulars vis a vis the universal. The question is whether this approach fulfils the radical position to which Zielinski would like to ascribe to his efforts, that is to 'enter into a relationship of tension with various present-day moments, relativize them, and render them more decisive'? As Zielinski argues in the introduction to *Deep Time of the Media* (2006: 9-10), standardisation and processes of unification (read convergence) have indeed become key to contemporary media culture. However, far from being hostile to heterogeneity, studies such as Tiziana Terranova's *Network Culture* (2004) have shown that network architectures and their associated business models thrive on a new type of compartmentalised difference, found in phenomena such as data-mining and user-generated content. These new avenues for dynamic particularisation within cybernetic systems presents a challenge to the idea of media-archaeology as a discipline of cultural critique and construction of alternative media worlds.

Perhaps we need to understand the current status of media-archaeology differently than as a form of avant-gardist research practice? More than just an academic or artistic trend or part of a historical turn in media studies, media-archaeology can be understood as a widespread cultural practice of going to the archives of techno-culture in order to create something (a-) new. 'Nostalgia isn't what it used to be' (Connolly, 2006), notes a blogger musing on the abundant availability of games he played as a child now spread across a number of platforms geared for easily accessible retro-gaming such as the PSP and the Nintendo Wii. Similarly, Jaakko Suominen, in the article 'The Past as the Future? Nostalgia and Retrogaming in Digital Culture' (2008), has pointed to how 'product-making-nostalgia' has formed a central part of the logic of production in consumer societies since at least the 1960's. Particularly in discussing the genre of retro-gaming as assembling an archive of the past for future consumption, Suominen's article points to the consumption intensive character of convergence culture. One may easily add the recycling of any other media content such as music and old movies on ever new platforms and in a myriad of formats as part of this capitalist consumer logic of perpetual obsolescence and renewal. Similarly, albeit in a broader sense, Nigel Thrift (2005) has discussed the constantly ongoing activity of consumer interaction demanded by what he calls the "cultural circuit" of contemporary capitalism. In network culture this circuit is replicated on the level of production as well, as it entails the perpetual re-use, remix and adaptation of previous forms of content as well as of cultural styles. Media-archaeology in this sense seems not only to be the radical appearance of non-linear media history and artistic practice, but also increasingly a generic type of feedback mechanism intimately tied to how the objects of the past in the political economy of network culture are material resources, constantly "re-readymade" for new consumption. Understood as a generic force within such a cultural circuit of contemporary network capitalism, the media-archaeological impulse becomes qualitatively different to that of the post-modern. We are not entirely situated in a culture of pastiche and nostalgia that mocks teleology but rather in a situation of cultural production. In this situation the old and the new have become conflated and the past increasingly takes on the form not of a collective cultural memory but a computationally archived resource for future production.

In the light of this view of contemporary network culture's focus on instant archiving and managing of archives (think of blogs, social media or search bots) one may say that media-archaeology has become a generic force: we are all now media-archaeologists, a process strongly supported by the specific materiality of the past in the digital, as archival and computational. This perspective resonates with another thinker on the German media-archaeological spectrum, Wolfgang Ernst, who maintains that the archive's primary function has moved from storage to a state of constant transference of information (Ernst: 2002). Emphasizing a post-Foucauldian as well as a post-Kittler approach, Ernst treats archives as entirely material entities not functioning according to discursive or narrative operations. For Ernst this is especially pertinent to the digital and networked archive, which has moved out of being a static collection in need of human administrative or discursive activation into a state of constant transmission governed by information protocols. In contrast to Zielinski's approach, Ernst's

media-archaeological analysis does not depart from stories about old and forgotten media and their relation to the new but from what he calls the “time-critical” materiality of media technologies: media operate according to a micro-temporality which is processual and event-based rather than historical and discursive. In this view, media-archaeology is a descendant of cybernetics; it turns to the archive as a constant circular feedback of stored data operating in the present.

‘To predict the future of a curve is to carry out a certain operation on its past’, Norbert Wiener (1965: 6) famously wrote in his foundational work on cybernetics. This hints at the idea that the roots of media-archaeology as a generic form of cultural production in contemporary network culture lie in how early cybernetics laid the ground for an operationalisation of the past that disclosed the paths of future actions. ‘Teleological mechanisms’ was the term originally used in 1940’s cybernetic research to describe the function at work in the operationalising dynamic of ‘feedback’ (Frank, 1948: 191). As a concept geared towards the control of an uncertain post-war future, systems of practically any kind would be seen as containing a potential for self-correction and evolution according to the constant comparison of present output with past input. If we follow the cybernetic media-archaeology outlined through Ernst above, such processes may be regarded as further intensified in the materiality (technical as well as cultural) of digital networked media. Here the convergence of the old and the new clearly forms a part of a new kind of ‘archive fever’ (Derrida, 1996) in which, whether user- or industry -driven, old media content is constantly repurposed for new consumption. In this sense, digital and networked archives allow for a networked, modular and, most importantly, temporally non-linear version of the principle of creative destruction once posited by economist Joseph Schumpeter as integral to the evolution of the capitalist economy (Schumpeter, 1942: 83). This networked political economy gives us a background to approach media-archaeology differently than as a by default radical force in network culture. That is, we should approach media-archaeology not only as a critique of technological development and linear assumptions about the progression from old to new media. Media-archaeology could in this way be explored according to the idea of a highly developed cultural “generic” which is increasingly integral to much contemporary cultural production.

To sum up this section, having its origins in the “teleological mechanisms” of early cybernetics, I posit a certain operationalisation of the past as inherent to the constant play between old and new in the cultural circuit of contemporary network capitalism. The political economy of new and networked media builds on an instrumentalised making available of the old for constant re-appropriation. However, as I will argue in the conclusion, part of media-archaeology’s attraction lies in how it simultaneously operates in line with as well as potentially reconfigures such a cybernetic operationalisation of the past from within its own genericity. This idea requires that we reformulate the force of “the generic”, understood no longer only as a term for that which generally applies in different contexts but also as



a unilaterally active force which generates possibilities of transversally transforming given contexts; for example in reforming the conditions of cultural production. Underpinning this understanding of the media-archaeological generic is the conceptualisation of the generic found in Laruelle's work (cf. above) as well as the Deleuzian notion of a virtual excess in the actual, an always contingent potentiality of becoming. In order to contextualise this conceptualisation of media-archaeology it is necessary to explore the problematic conceptual gaps and possible fault-lines within cybernetic theory itself, as designating those instants where non-evolutionary (in the non-sense of non-creative destruction) changes may be predicated. The next section discusses some of the basic premises for how cybernetics entails an instrumentalised concept of the past and then moves on to consider the problematic conflation of the "actual" past with a more expanded sense of the past as the space of memory and degeneration of memory. Here, Chun's discussion of the "enduring ephemeral" in computational culture will serve as a guiding concept and this discussion ultimately leads us back to re-consider the transversal criticality of some media-archaeological practices, in a rejuvenated spirit of Zielinski's "fortuitous finds".

## Cybernetics and the doing and un-doing of History

The uses of history—do we learn from the past in order to raise our historical awareness of present conditions or are we mostly interested in it for the sake of predicting the future? Maybe it is obvious that the first question usually leads to the second, as historians justify the instrumentality behind their works in terms of avoiding the repetition of history's past mistakes or in the case of reactionary histories of cultural heritage, consolidating a future in which everything should and will remain the same. As Keith Jenkins argued in his postmodern classic *Re-Thinking History* (1991) the uses of history are in fact endless, at the same time reminding us of the party slogan in Orwell's 1984: 'Who controls the past controls the future; who controls the present controls the past' (Orwell, 1977: 248).

The dystopia of Orwell's 1984 was conceived concurrently with the utopia of the cybernetic model which turned to the data of the past as a resource for controlling the present and managing the uncertainties of the future. Orwell completed his book in 1948, the same year as Norbert Wiener published *Cybernetics: Or Control and Communication in the Animal and the Machine*, laying the foundation for cybernetics as a science based on the probabilistic prediction of the future. This work establishes cybernetics in a way that uncannily recalls the 1984 vision of a state eradicating possible subversive elements, arising out of the past conceived as a space from which to construct multiple interpretations of the present. For the sake of context, we need to remember that both Orwell and Wiener were working in the direct aftermath of WWII, with its strong impetus to correct the wrongs of history's past mistakes.

As mentioned earlier, Wiener published his first forays into cybernetics under the framework of 'Teleological mechanisms' (1943; 1948). This framework united a number of interdisciplinary researchers in the search for a holistic rethinking of cause and effect, according to principles of self-regulating systems, in nature, technology and society. Moving away from linear models of cause and effect and geared instead towards circular feedback movements, the teleological perspective advocated by Wiener in essays like *Behavior, Purpose and Teleology* (with Rosenbleuth and Bigelow, 1943) and *Time, Communication and The Nervous System* (1948) was not one of final causes but rather a kind of behavioural "soft teleology" aimed at delimiting the set of probable actions available to humans as well as to machines within a given situation through constant comparison of results (output) with past input. In the latter essay, as well as in the opening chapter of *Cybernetics*, Wiener discussed Newtonian and Bergsonian concepts of time, favouring Bergson's formulation of duration as the constant irreversible "directedness" of time over the measured time of astronomy which (for Wiener) falsely extends, in the same manner, into the past and the future, like a palindrome (1965: 31). For Wiener, the past is the past precisely because of its fixed, specific nature and thereby the past becomes, in Bergsonian terms, the actual which through quantification may be operationalised so that we can apprehend the virtual that is the openness of the future. Wiener writes:

*In short, we are directed in time, and our relation to the future is different from our relation to the past. All our questions are conditioned by this asymmetry, and all our answers to these questions are equally conditioned by it. (1965: 33)*

The study of the "directedness" of teleological mechanisms, for the purpose of *Control and Communication in the Animal and the Machine*, as the subtitle of Wiener's foundational work suggests, does not draw any "natural" demarcation line between the world of biology and the mechanical. On the contrary, mechanical and computerised devices are in cybernetics seen to be highly instructive about the self-regulating dynamics of humans and animals, albeit not completely analogous. So even though early cybernetics evoked Bergson's concept of time as duration in constant movement, as opposed to the spatial quantitative time of science, this is where Wiener also departed from what he saw as Bergson's 'vitalism' (1948: 48), in that human and machine were to be seen as congruent entities, available to the same processes of control through probabilistic statistics.

While much has been made out of the connection between the cybernetic orientation towards the future and its relation to the society of control and surveillance issues (cf. Holmes, 2007), less has been made of the possible relation between this problematic actualisation of the past as a material informational entity and the temporality of network culture. Despite the goal of cybernetics being the management of the future, the greatest operation

of control it seems is actually carried out on the interpretation of the past. On the surface, Bergson's virtuality as 'bound up intimately with the activity of a living centre' (Ansell-Pearson, 2005: 8) and denoting a subject's actions of subtracting and dividing the whole into parts through perception and representation, does not seem that different from cybernetic sampling of continuous reality into discrete units. In cybernetics, the construction of such sensing subjects takes place across the realm of machines as well as of organic life. Yet what is aimed at is an ontology for determining the future through a disclosure of the past as that which is known. This instrumentality of the past as materialised through information is different from the Bergsonian and later Deleuzian reading of the virtual and the actual as both tied to a positive indeterminacy of 'pure virtuality' (Bergson, 1991; Deleuze, 1997). In the words of Keith Ansell-Pearson:

*In insisting that memory is not a simple duplication of an unrolling actual existence (...) Bergson is granting the virtual an autonomous power. The disruptive and creative power of memory works contra the law of consciousness, suggesting that for Bergson there is something "illegal" or unlawful about its virtuality. (2005: 10-11)*

In the networked processes of instant archiving and repurposing of media content the disruptive power of the pure and "illegal" virtuality contained in the past is repressed, at least on the surface of functionality which only accounts for a reduced sense of the actual. As Chun has suggested with her notion of 'the enduring ephemeral' (2008), digital media culture is characterized by an ideological conflation of memory and storage where the degenerative aspects central to memory are repressed 'in order to support dreams of superhuman digital programmability and of the future unfolding predictably from memory' (Chun 2008: 2). For Chun, 'memory does not equal storage' (ibid: 164)—memory is connected to the past as an active process of looking backwards while storage 'always looks to the future' (ibid.), but everyday computer jargon and practice have come to see the basic computational processes of storing and erasing data as the constant writing and re-writing of memory. This conforms memory to a kind of storing and erasing of the past as already actualised data, a clinical information-keeping which we might see as deriving directly from cybernetics as the science of the most effective circulation of information. In her article, Chun discusses how the conflation of memory to storage and the repression of memory as an active process involving degeneration, derives from Vannevar Bush's seminal design of the (never constructed) 'Memex' machine for the associative storing and retrieving of "personalized" data. Perhaps not too surprisingly, as a contemporary to Bush, Wiener describes the functioning of computerised memory in a similar way, although he does actually take some steps to consider how to counter the degenerative processes inherent to computing and how they relate to similar aspects of the human brain.

Whether our computing machine be artificial or natural, if it is to operate with no intervention but what enters through sense organs, it must be able to store data and recall them when they are needed later. (...) Usually, a message gets blurred in transmission; it does not take many consecutive blurs until it is unintelligible. To avoid this, the message should be copied, so that instead of transmitting a blurred image of itself it recreates a sharp image. (1948: 211)

Wiener argues that if degeneration (the 'blurring' of the message) appears, simply copy the original message to ensure that it stays the same. Cybernetics would go on to describe just how such processes of copying as transmission can be designed for the minimum of information loss and consequently forming a vital part in store-and forward protocols of communication such as packet-switching on the net. In the original cybernetic vision, technology is glitch-free, while the human brain is not:

*When the machine has done its task and settles down to rest, these data are removed and replaced by other elements or by others of the same kind, and the machine is set up for another problem. But the human machine is never completely cleared. It always retains memories, from the past, of every situation which has ever confronted it. The depth and permanence of these memories is indicated by the success of a hypnotist or psychoanalyst in summoning them up from the depths. In other words, we can regard human life only as one grand problem and its separation into particular smaller problems as relative and incomplete. This coupling of all problems to all previously undertaken problems greatly complicates the behavior of the brain and may significantly contribute to its pathology.*  
(Wiener, 1948: 214)

In the passage above, the haunting aspects of memories in the human psyche are even linked to mortality, implying that the brain might become an immortal machine if such aspects were eradicated. Perhaps what we need today instead of this, given the media-archaeological generic, is a reconsideration of the degenerative and indeterminate aspects of machinic archives, including those of the past. This is not to suggest a pathology of machines modelled on human biology but a transversal realm of information exchange which can never be complete and which gives rise to inconsistencies across the realm of machines, humans and their cultures. Recalling the above discussion of Chun's identification of the cybernetic conflation of memory to storage, a media-archaeologist in this context needs to be attentive to the productive critical potentiality of unavoidable gaps of non-pasts (forgotten, repressed, misrepresented) in the cybernetic transmission processes. Such excavations, be they theoretical or practical may allow for the intermission of transversal agencies beyond the control of clinical information ideals and neo-rationalist managerial agendas. With

Deleuze (1994: 128) as focalizer we see how “in the infinite movement of degraded likeness from copy to copy, we reach a point at which everything changes nature, at which copies themselves flip over into simulacra”. Applying this insight to the alteration produced by the combination of incessant archiving and re-deployment of the past, we see how the past re-acquires a new kind force of becoming in the present. So even though we have in cybernetic systems a kind of copying of the past that is directed towards the future, this process can still in spite of itself give rise to the “not-quite” and “bad copy” (cf. Tuer, 2006: 44).

Difference may here be seen not as particularised cultural practices, but as immanent alterations of the cybernetic temporality of network capitalism. As an example we may return to Suominen (2008) who points out that typically consumerist media-archaeological practices such as retro-gaming might also involve the ‘agony of home coming’ associated with the original meaning of nostalgia. This may lead to self-ironic reflections on the nature of the practice itself, in the process reformulating it. In the context of retro-gaming, such critical media-archaeological practice is analysed by Dieter (2007) who points to the dysfunctional aesthetics of DIY game-mods, citing Cory Arcangel’s *Super Mario Clouds* (2002) as the quintessential example. In this work, Arcangel famously hacked the original 8-bit cartridge of the NES *Super Mario Brothers* game, producing a version stripped bare of anything but the blue sky and pixellated clouds. In the modified game one simply follows the clouds as they scroll across the screen, and as Dieter suggests, contemplates the technological obsolescences of a lost gaming childhood along the way.

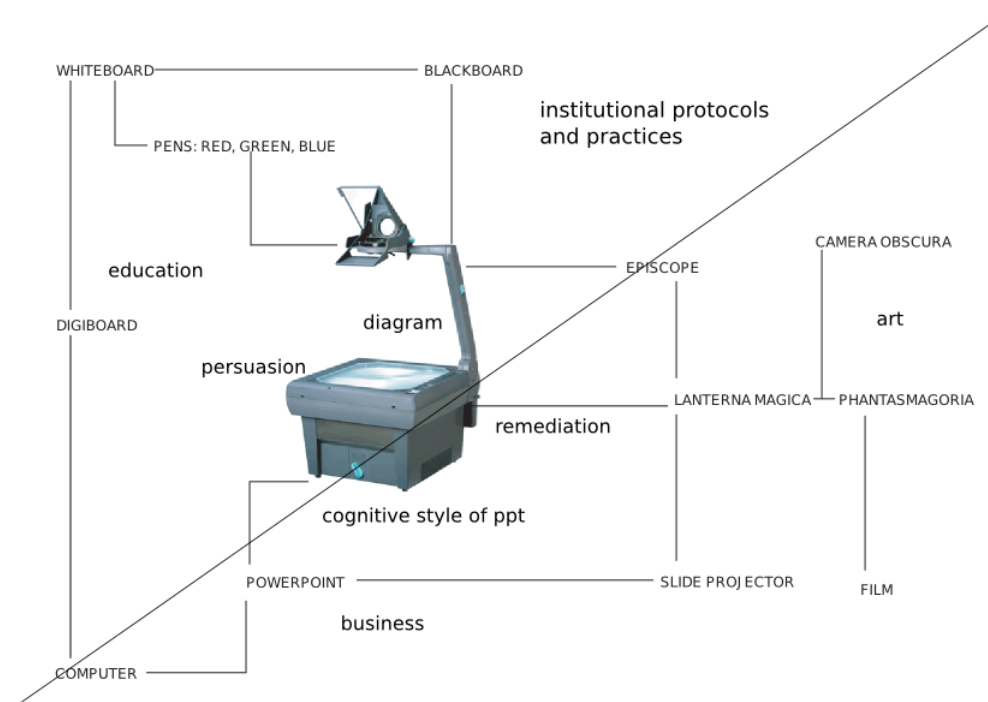
## The Art of the Overhead: An-Archaeology

*Like communities, all media are partly real and partly imagined.*  
(Kluitenberg, 2006: 8)

In the concluding part of the essay, I will consider how artistic practices working in the spirit of media-archaeology, appropriating near-obsolete or residual media technologies, may be seen as “reverse-remediations”, acting out the politics of contemporary networked media through spatio-temporal hybridism. In this mode, new digital and networked media, rather than re-fashioning themselves, are re-fashioned by the artists who engage in revisionist interventions using near-obsolete, often analogue forms of media. Such activities are potentially transversal to the cybernetic media-archés analysed above in the way that they work across different subjectivities and materialities of media as well as their associated institutional frameworks. They set up imaginary and “unrealistic” constellations of theory and practice. Thus media-archaeology as transversal media practice can follow from different

arches. It can simply conform to the circulation of capital or it may become the ontogenetic or perhaps rather 'Variantological' (Zielinski and Wagnermaier, 2005) base from which to imagine and establish new media-archés, going beyond the 1:1 relationship with cybernetic consumer society.

In order to elaborate this view on media-archaeological art, I will draw on my own artistic and curatorial involvement in The Art of The Overhead, a media art festival devoted to that almost forgotten, yet still residual, medium of the overhead projector. First, I will briefly outline a conceptual archaeology of the overhead projector in an everyday and artistic context and, secondly, I will look at a few specific artistic appropriations of this technology to produce an imaginary or "bastard" device which performs a reverse-remediation of the new into the old.



'The Many Contexts of The Overhead Projector' from Kristoffer Gansing and Linda Hilfling's lecture 'OH-istory!'

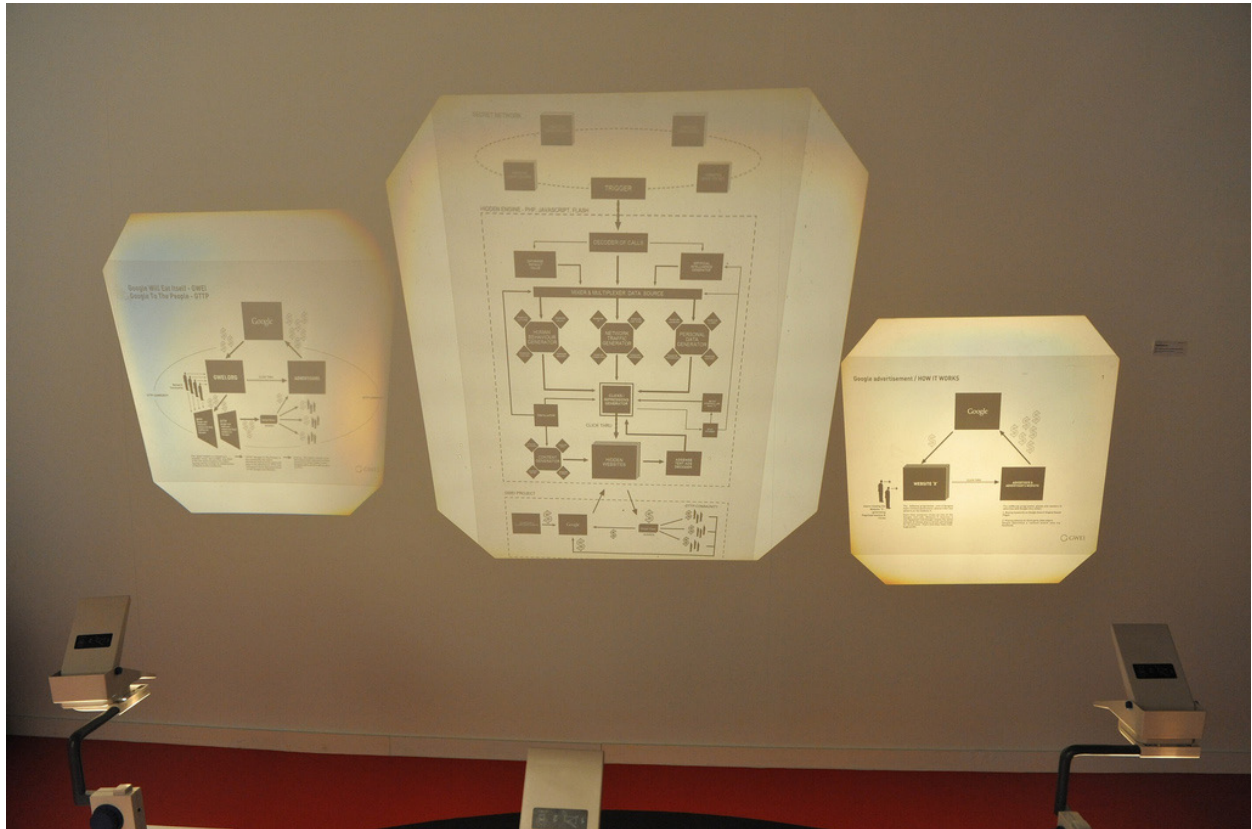
*There is no definitive history of the overhead projector (OHP), a device which on the one hand is an institutional medium within education and business and which on the other extends across a hybrid context of uses from bowling to intermedial art (cf. Hilfling & Gansing, 2007, Coy & Pias, 2009). I will consequently approach the origins of the OHP with the an-archaeological insight of Zielinski, demonstrated in his*



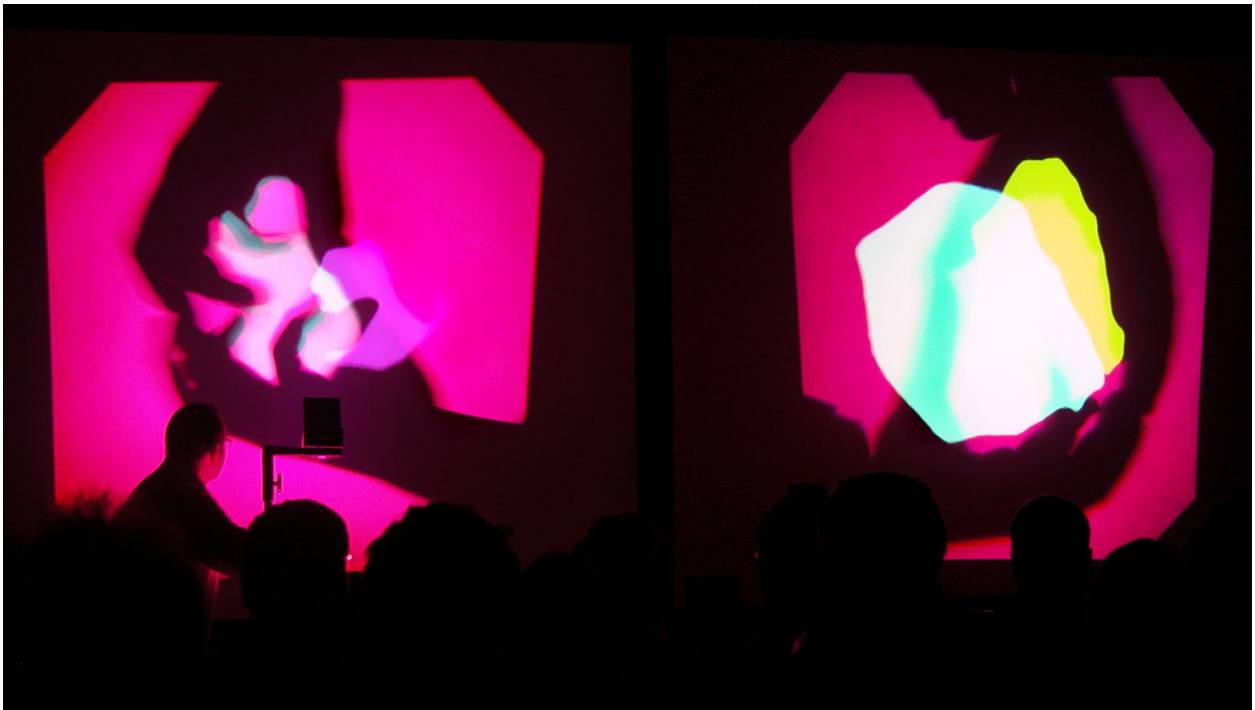
*approach to the history of projection: 'When the knowledge that flows into an invention has been developed over centuries, the question of who actually invented it first becomes rather pointless' (Zielinski, 2005: 91).*

Instead of a hierarchical genealogy, one has to trace the history of the overhead projector as a network of relations between technologies and practices, traversing the diverse areas in which it has been put to use across Education, Science, Business, Entertainment and Art. Except for its association to institutional settings within education and business, the OHP has always lacked a clear identity of its own, appearing in the beginning of the 20th century as an anonymous mass-manufactured "standard object". In this sense, the OHP can be seen as a combination of different projection technologies such as the magic lantern with its transparent glass slides and the opaque projector (episcope) with its table-top set up, through which it is possible to reflect the light off horizontally positioned objects like books and printed images. In both its anonymous character and its near obsolete status, the OHP displays an affinity to the concept of 'residual media' (Acland, 2007), as a device often still sitting unused somewhere in the back of the class- or conference-room. Its physical presence in this context perhaps serves as a silent reminder of the genealogy of Power Point templates: the first version of what was soon to become this ubiquitous presentation software was originally called Presenter, released as Power Point 1.0 in 1987, a b/w Mac OS application designed for the easy formatting of slides meant to be printed on overhead transparencies (this original OHP related context of use is retained in the German word for "slides": "Folien", see Müller-Prove, 2009: 48). In other words, there is a direct connection between the common conference epidemic known as 'Death by Power Point' (Garber, 2001) and 'The Tyranny of the Overhead' (Dolby, 2000). The bore of standardized conference presentations, coupled with memories of childhood angst of speaking in public, connected to performing with these technologies make them hard to target within the consumer culture of product-making-nostalgia. Indeed, one is still hard-pressed to find any comprehensible information about the overhead projector on the net beyond the endless lists of the "do's and don'ts" of presentation guidelines. These are of course themselves worthy of a closer inspection as they tell the story of the wider institutional discourse-network of presentation of which the overhead has formed a vital part: 'cover only one main idea per slide', 'don't turn your back to the audience', 'always bring a spare bulb', 'don't correct with spit'.

Being a hybrid projection technology mostly associated with institutional contexts in business and education, the OHP might even contend for the title of the most boring medium in the history of technology. So what then is the imperative to let its light shine once again? A song commissioned for The Art of the Overhead (2005), the first international media art festival devoted to the overhead projector, Monochrom/Oliver Hangl's Farewell to the Overhead states: 'Now you are dead media, looked up on Wikipedia. Not even Danish E-Bay nerds do care (...) Is there a chance to get you back again tonight to shed your light?' (Grenzfuhrtnr & Hangl, 2005). The overhead festival aside, by the mid-00's, the overhead projector



Google Will Eat itself Photo by Julian Stallabrass, Creative Commons, Attribution 2.0 Generic (CC BY 2.0)



The Manual Input Sessions, by Tmema (Golan Levin and Zachary Lieberman, 2004).

did seem to make an unlikely comeback in contemporary art, as for example observed by art critic Ben Lewis, commenting on the 'swamping' presence of OHP's in art installations at the 2005 Venice Biennale (Lewis, 2005). Even in the media art scene, with its obsessive focus on the latest technologies, the OHP was sneaking in: in the installation version of Übermorgen's interventional net-art project Google Will Eat Itself (GWEI, 2005), five overhead projectors are used to project the detailed diagrams explaining the system of subversive Google share buying at the core of the project. For their audiovisual performance The Manual Input Sessions (TMEMA, 2004-06), Zachary Lieberman and Golan Levin used overhead-projectors in combination with digital projection, to create an interface where 'analogue' hand gestures triggered and interacted with digital live animation. Around that time, Levin also published a short text called 'An Informal Catalogue of New-Media Performances Using Overhead Projectors (OHPs)' (Levin, 2005).

Overhead projectors and new media? Levin's list reminds us that it is not the first time that OHPs have been in vogue in audiovisual performance, stressing the heritage of 1960's 'light show' which through key figures such as Elias Romero, Helen LeBrun and Tony Martin extended across psychedelic rock, Ken Kesey's Acid Tests and the experimental intermedia art of The Tape Music Center in San Francisco (Bernstein, 2008; James, 2010). But even then, the overhead projector was not considered a state of the art piece of technology but was already regarded as an everyday institutional medium, chosen for its cheapness and accessible flat working surface, ideal for manual operation of the liquids, prisms and various filters so central to these kind of performance practices (Gansing, Martin, Scroggins and White, 2010).

The two projects mentioned above, GWEI and TMEMA, could even be regarded as emblematic in that they represent the two main strands of contemporary appropriations of the overhead projector. In the first instance, we have Übermorgen's ironic recalling of the OHP as a class- and conference- room institution of truth designed for the flat, objective presentation of facts. In the second example, Levin and Lieberman are working in the shadow(-play) of this institution. By letting it take part in their live analogue/digital assemblage, they accentuate the informal aspects of this seemingly dusty piece of projection technology. Taken together these two different projects, through the rich irony of the restrained formal use and the "magic" of the animations brought about in the informality of the live improvised performance, work through the logic by which the OHP, as a standardized technology can be simultaneously open and closed—and how that which is open can seemingly paradoxically reveal itself by way of that which is closed (cf. Hilfling & Gansing, 2009).

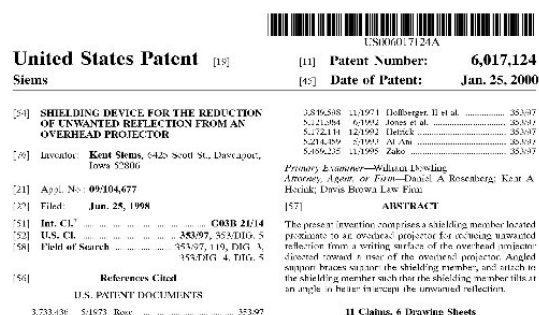
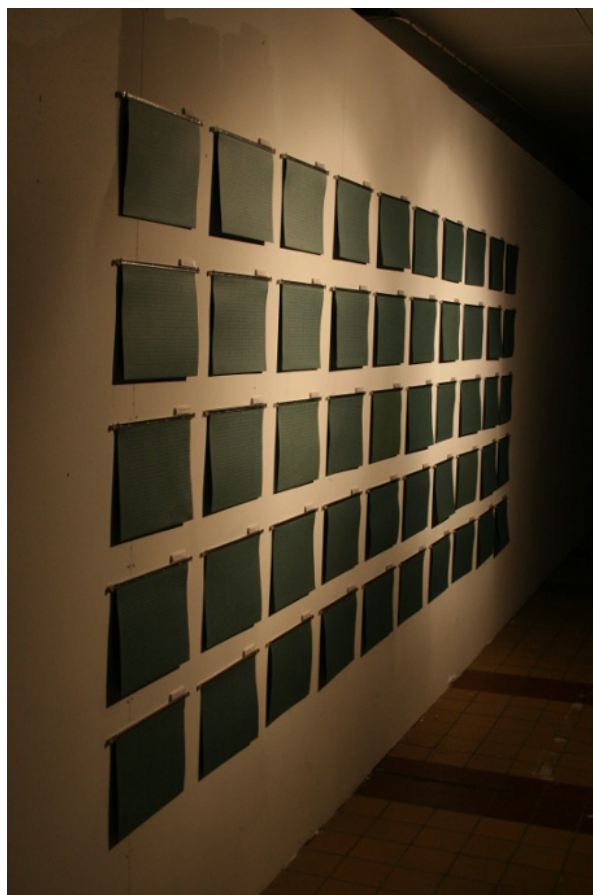
Perhaps this is the main lure of the OHP for contemporary artists, that its otherwise unlikely cultish sheen can be derived from an ambivalent double status. This dynamic has been

similarly identified by Pias (2009), in perhaps the first serious attempt of dealing analytically with the OHP as a medium. His analysis situates the OHP in between being a device for persuasion in linear bullet-list presentations, business style, and the quite different dynamic of the OHP as a (proto-)augmented-reality technology belonging to a kind of spontaneous work-meeting culture where the speaker reveals, rearranges and further modifies his visuals as he goes along. A major in the minor so to speak, the interplay of the formal/informal uses of the OHP however goes much further than the presentation cultures mostly associated with it. The light of the overhead can be traced from its major institutional pedagogic settings to a network of appropriated minor practices extending from its use as an artist drawing aid, across bowling alleys (the 1940's Tel-E-Score for keeping track of bowling player scores) to Haight-Ashbury concert venues (the psychedelic liquid-light show) and even into DIY home cinema cultures (the 00's "Volksbeamer" movement of cheap video-projectors). In spite of this multiplicity of uses, the OHP was never sold on the consumerist basis of being a tool for individual creativity (Hilfling & Gansing, 2007). Consequently, the OHP has seldom been explored on its own terms according to modernistic aesthetics of Greenbergian "medium specificity". Being a mediator of other worlds (and the worlds of others), the (non-)specificity of the OHP lies closer to the transversal aesthetics of intermediality, and this is perhaps what makes it pertinent to critically remediating the relations of production in contemporary network culture.

The Art of the Overhead festival and its different projects cuts across the different technologies, institutions and the practices connected to the OHP. Within the festival there are transversal partial territories opened up by reverse-remediations, such as Katrin Caspar's installation *Random Hit* (2009) that transposes Wikipedia entries onto cut-up transparencies, or Barbara Sterk's interactive work for the *The Art of the Overhead Archive*, private hypermediacy (2005), which emulates a Windows-desktop filled with customisable error messages on the OHP.

One work which attempts an overarching and transversal approach to the OHP as an archive in itself is *Variations on a Standard* (2005-) developed by Linda Hilfling and myself as a research project presented at the festival from 2005 and onwards, in the form of an archive of patents. On the surface, an overhead projector appears as a fairly simple standardized object for projection: involving a lens, a lamp, a mirroring device, electricity and a screen. But there are many variations existing on this simple formula as shown in the archive of overhead related patents dating from 1918 to 2005. They are arranged in a wall-mounted installation, where each patent is printed on a set of transparencies that go into an old-school office-archive folder. The audience can approach the wall, take down a folder and project the contents on a nearby OHP. The archive includes some of the key patents in the multifarious history of optical devices connected to the OHP. This includes different modifications and endless variations of the typical OHP, such as the portable projector, but also encom-





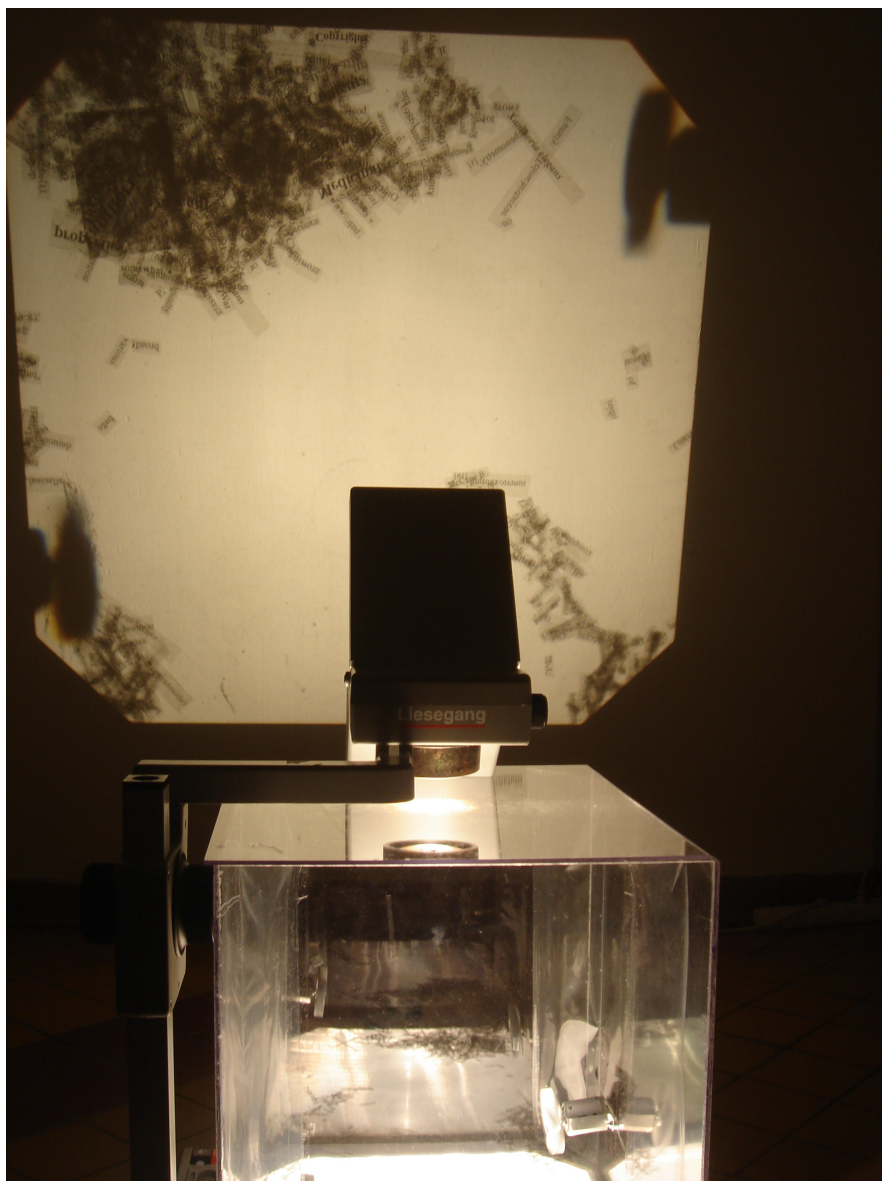
Variations of a Standard & An overhead patent Gansing & Hilfling, 2009.

passes a vast array of increasingly weird augmentation devices where “Shielding device for the unwanted reflection from an Overhead Projector” (2003) would just be one of many examples.

The patents archive was developed further and presented in an extended edition for the 2009 festival. The theme of this festival was “OHPen Surface”, relating to the notions of open and closed as a recurring dialectic within network culture, for example concerning standardisation of both hardware and software entities. A patent can be seen as the traditional inventor’s way of closing off a certain technology, marking off a particular assemblage of technological parts with the cultural notion of an “original” invention. It is a standard procedure ensuring that it can be commercialised and not copied by others. Arranged patents side by side however, as endless variations on a standard, for the audience to browse and project, may also reveal how the closed world of a patent and its denoted standard object are part of many diverse networks in which the open, the variation, appear by way of that which is closed, the patent. The multifarious story of the OHP is here activated by the archive itself as a transversal movement across OHP history in a way that resonates with the way in

which Glen Fuller has described archival transversality as something that ‘problematise the historical event’:

*(...) transversality is a concrete manifestation in the institution (psychoanalytic clinic) or the archive. In both cases it may not exist at all but has to be evoked or deployed. Transversality is a bomb; it is a weapon, and sometimes a tool. In the institution it problematises subjectivity (as an event); in the archive it problematises the historical event. (Fuller, 2007)*



Random Hit by Katrin Caspar. from the author's archive.



Sweden-based German artist Katrin Caspar's *Random Hit* (2009) is an OHP-based installation which performs a reverse-remediation of the old into the new. It further develops the open/closed dialectics and double-status of the OHP discussed above. In this work, Caspar has placed a transparent square plastic-box container on top of the projection surface of the OHP. In it we see small words printed on and cut out from transparency foils. The words are blown about the OHP projection surface with the help of two computer fans situated at the edges of the box. When projected, these words form generative and temporary clusters reminiscent of tag clouds, cut-up poetry or perhaps its more mundane version, the once so popular fridge-poetry. As the title indicates, the words have been selected from a simple script performing a randomising operation on Wikipedia entries which are then cut up into the words to be printed on the foils. The method of selection coupled with the materiality of the collage adds a transversal dynamic to the project, beyond the temporary territories of meaning and poetic statements generated when the air moves the words. As Caspar herself describes this simple experiment, she is connecting the flat space of the overhead, as a stage for the teacher's typically linear pedagogic narratives, with the encyclopaedic, data-base knowledge space of Wikipedia. The concept is reinforced literally by the physical materiality of the assemblage-like installation. The boxed in three-dimensional space on the top of the overhead creates a further shadow play so that words are projected over their own more or less blurry copies. This is a process evocative of the politics of information networks and their incessant copying-as-transmission discussed earlier.

*Random Hit* can be thought of as a reverse-remediation (cf. Korsten, 2010) vis à vis the pre-organised illusionary representation of projection. This is not simply in terms of the digital into the analogue, that is of the rendering of the discrete continuous again. It is also a reverse-remediation of the politics of networked knowledge formation, of the latter's seemingly transparent logic, found in the dynamic generation of "tag clouds". In their by now classic 1999 study, *Remediation - Understanding New Media*, Jay David Bolter and Richard Grusin argued that, by default, not only do new media continuously refashion old media but "older media" is also consistently transformed to respond to the development of new media. Recently, Korsten (2010) suggested the term reverse-remediation for dealing with instances of "uncanny" incongruities between different media being brought to the fore. Here reverse-remediation fosters critical reflection on the nature of different media, beyond the immediacy principle. This mechanism is present in Kaspar's work. The traversal of the old and new blurs the supposed openness of network model of knowledge formation, together with the supposed closed nature of the older analogue model, forming partial territories of meaning situated between these regimes of knowing. This blurring of the old and the new is not carried out in order to re-enter a cultural circuit of intelligible relations. Instead it demonstrates that media-archaeological art practice may transform this generic into—in the words of Laruelle—what is only a 'semi-circulation' of 'knowledges and products which do not have "guarantors", unilateral merchandise, "perspectives", or "intentions"' (2011: 251).

Through the spatio-temporal traversal of different media-archés, Random Hit becomes a synthesis of the approaches identified in the previous two projects of GWEI and TMEMA. On the one hand, we have the institutional context of the OHP as a conveyor of knowledge. On the other hand there is also its connection to improvisational and intermedial aesthetics. This brings the analogue into the digital and reverse-remediates the context of use of particular knowledge technologies. As such, Random Hit goes against the connective and techno-fetishism typical of generative network-based art. The cybernetic dream of smooth self-emergence within systems is here countered by an aesthetics of dislocated messages and in-between projected worlds. In the context of media-archaeology, a work like Random Hit is transversal in relation to the cybernetic disclosure of the noises of the past. It thus evokes Gerald Raunig's (2007) characterisation of transversality precisely not as conforming to teleological feedback mechanisms, but as practices of rupture and fault lines. These practices do not necessarily connect. Yet they bring new bastard subjectivities or "concatenations" of art and politics into play.

Transparent (sic) DIY approaches to media culture have a strong presence in many OHP based performances,. There's little room for high-tech smoothness. Instead the attraction of an OHP performance frequently comes from the artist and audience realising that such and such an effect can be achieved with simple, perfectly understandable means. This may for example involve acts of humorous reverse-remediation, for example in the work of a group of three artists, Milk Milk Lemonade. In work such as *The Game*, they "re-create" and "play" the levels of a fictional 8-bit computer game on the OHP, as an animated movie performed live.

Milk Milk Lemonade describe themselves as "the kids whose parents couldn't afford a Spectrum or an Atari, so they made their own computer game with the aid of analogue, OHP technology". Milk Milk Lemonade's working methods are completely revealed to the public, even taking the form of an installation staged before the work is being performed. Employing retro-graphics and a soundtrack featuring a dreamy voice singing 'it's time to go home now', 'i want to see that face' and 'i want to hear that voice', *The Game* is reminiscent of the whole nostalgia market connected to 8-bit culture and retro-gaming as well as of the music genre of hypnagogic pop. However, their remediation can also be regarded as a critical reverse-remediation. The digital to analogue re-conversion involved also modifies game hacking and modding in themselves, both here cast as a tangible, embodied and performative practices. It's a queering of the tech-nerdy showing-off of such practices, and recalls the way in which Cory Arcangel exposed the makings of his game-mod *Super Mario Clouds* (cf. above). Although the difference here is that the artists have gone for a productive tension between reduction by analogue means, contra maximisation by playful intermedial aesthetics, manually "plucking" the characters off the (equally manual) scrolling game track/stage in the end.

The arché of the archive is, following Derrida (1996) and Ernst (2002), a movement where order is created from disorder. Yet the materiality of networked media culture seems to lead to a generative multiplicity of parallel disorders as well as orders. There are no absolute origins to be found in this culture of constant computation and transmission of data. There is rather a constant generation of new links leading to what some have characterised as either a pervasive real-time culture (Volmar, 2009) or a state of atemporality (Sterling, 2010), where all cultural forms and media content seem to be simultaneously accessible, extending across past-present and future. Perhaps then, when media-archaeological practice becomes a cultural generic, the final breakdown of the cybernetic ideal of managing the future through the operationalisation of the past is already in motion. In such a context, the most radical cultural practices may not necessarily be those that literally transduce techno-material energies from one machine to another. They might rather be those which do not connect on technological terms but which work transversally across systems, rather than within them. This can be observed in the principle of maximisation found in intermediality. In relation to medium-specificity this is the indeterminate and “dislocative” side of modern aesthetics.

Through this brief exploration of some specific artistic uses of the transversal discursive and material forces driving a media-archaeological generic, a level of critical potentiality in media-archaeology has been re-introduced. This involves the construction of pasts and presents through both historical/narrative and material interventions. The media art practices considered in the second part of this article embody a transversal approach that cuts across material, discursive and institutional configurations of media-archaeological culture, activating them beyond the cybernetic disclosure of the past. According to the concept of transversal reason of Calvin O. Schrag (1992), these would be ‘chronotopal communicative practices’ (163) which operate according to a transversal rationality cutting across ‘multiple configurations of discourse, perceptions, human emotions and actions, and institutional complexes,’ (154) without at the same time being entirely coincidental to them. Here the ‘shift of grammar is that from the universal to the transversal’ (168). Thus the transversal character of media-archaeology constitutes a critical potential within its generic cultural status, rather than being opposed to it.

Such a reading of the generic has been inspired by the non-philosophy of Laruelle, through which we can approach the generic and “genericity” as forces simultaneously of the “general” and the “generative”. In this double understanding of the generic, Laruelle gives us a new understanding of transversality. Transversality no longer stands for an absolute heterogeneity, but for lines always contingent with what they traverse, differing not by default but always in the last instance. Media-archaeology as a generic cultural force embodies such transversality in its constant re-articulation of the old and the new across material, discursive, institutional, subjective and archival spectra. By way of artistic media-archaeological interventions, the old and the new of such fields are becoming, in Laruellian fashion, ‘trans-

versal yet unilateral', 'universal yet incomplete', 'dual yet not dialectical' and, we may add, simultaneously old and new: 'The generic will be the Two that has lost its totality or system' (Laruelle, 2011: 246).

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Kristoffer Gansing is the artistic director of the transmediale festival in Berlin. In his PhD project, *Transversal Media Practices*, at the K3, School of Arts & Communication in Malmö, he investigates the articulation of old and new media forms in contemporary cultural production and network culture.

<http://www.transmediale.de>

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## FCJ-124 Interactive Technologies as Fields of Transduction

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### Introduction

Digital and interactive technologies have evolved dramatically as the traditional desktop computer has given way to ubiquitous computation. Computation is now an integrated part of many people's everyday lives, a question of experience more than simple use, as John McCarthy and Peter Wright have argued in their seminal book on the subject *Technology as Experience*. Yet while all this might be a simple given, accounting for and working with the reality of newer interactive technologies is less straightforward. Ubiquitous computation provides a digital layer that can be added to almost anything, offering radically new contexts of use and technological possibilities (McCullough, 2004). This changes the way one can—and must—imagine the design of digital and interactive technologies. Design is often now for what Terry Winograd has termed 'interspaces', in a move away from more traditional screen-based interfaces (Winograd, 1997: 161). In addition, design for living with ubiquitous digital technologies needs to consider the experiential qualities that come into play in interactive environments. This will be the central concern of this article. The exploration of experience in this context has so far been based on a wide range of humanist and artistic theoretical foundations and projects that supplement the existing vocabulary used in interaction design (see Dourish, 2001; McCarthy and Wright, 2004 and 2010; Petersen et. al, 2004). Here we will draw on the work of French philosopher Gilbert Simondon to add a different perspective to the exploration of experience of interaction design within interactive environments.

Many approaches that address the significant changes shaping the relations between humans and technology tend to leave these two domains apart. For these approaches, technologies might become ubiquitous, and ever more subtle in their presence and effects, but they remain separate to human experience. In this article, however, we explore a way of thinking the design of interactive environments that blurs the clear difference between human experience and its technological milieu. We reframe design thinking via Simondon's thought. Simondon's concepts allow us to outline a mode of thinking and practicing interaction design that begins to break away from the binary logics of man and machine.

At the same time, we need to emphasise that contemporary design might balance this new approach with established approaches. Essentially, we are content with an antimony—a necessary contradiction between partial perspectives (see Gil, 1998:5)—within the contemporary moment of interaction design. In this article we underline the creative shift that Simondon allows us to propose within design. Yet we also understand the need to continue to work with some of what remains of the divide between human and technology, even as we overcome this divide. For us, this has two very practical reasons. First, we need to take into account the actual design and design assumptions that are currently part of designed experience. Second, the binary assumptions in current debates on the design of interactive technologies can be very productive, even for our breaking away from them. In sum, we conceive of the human-technology binary as a stimulating problem from which to propose potential transformations of design practices.

In fact, interaction design is an intrinsically open discipline. There is, within interaction design, a growing interest in developing a philosophical understanding of, and a vocabulary to describe, interactive environments' shaping of our lives in experiential terms. Here we mobilise Simondon's concepts of individuation, in-formation, the preindividual, and the associated milieu in the context of interaction design. Simondon helps us to think of designing interaction in terms of process and becoming rather than product and being. We conceive of this as designing for the dynamics between fields of transduction and fields of experience. Fields of transduction and experience are overlapping parts of each event. They offer particular conditions of emergence that are relationally dependent but not predeterminable. We turn to Simondon because we believe his ideas enable lines of thought that work on the level of emergence and immanence within these fields. Such ideas allow us to consider interactive technologies as metastable—as in continuous negotiation with their environments. Simondon's theory of individuation also offers a way to think about the relation between humans and technology without pre-determining either of their capacities for the creation of interactive experiences (see among others Adrian Mackenzie, 2002; Isabelle Stengers 2002 and 2004; Brian Massumi, 2002, 2008 and 2009; and Erin Manning, 2009).

As Adrian Mackenzie has underlined, however, the thought of transductive processes must itself be transductive (Mackenzie, 2002: 18). This calls for a theoretical approach that incorporates the processual dynamics of the object of study; an approach that in itself creates new fields of potentials, new experiences and relations. It is this modality of transduction that we deem most important in the context of interaction design. At the same time as, in our thinking about design, and our design practice, we generate transductive materials and events, these materials and events weave themselves back into our thinking and design practice. The result is something like an eventful or processual “thinking-design”. How do we account for the transductive nature of each interactive environment and simultaneously consider the transformation of our own thinking by such environments?

In this article, we propose two interrelating trajectories by which to negotiate the ways in which Simondon can be used to enable new processes of thought in and with interaction design.

The first trajectory involves a theoretical mobilisation of a range of Simondonian concepts, framed by an overarching interest in uncovering processual richness and complexity. Based on the tension between expression and experience, we use the foundations of Simondonian thinking to propose an analytic understanding of interactive environments in terms of the fields of transduction and fields of experience they produce. This moves the emphasis of the analysis from preformed and predetermined entities to processual conditions, and to the emergence of relations. These processual and relational conditions of emergence are best defined by Simondon’s concept of the associated milieu. This concept allows for a re-thinking of the relation between man and machine/technology, where neither should become a blueprint for the crafting of the other. Following Erin Manning, we argue for an experimental approach to interaction design, now understood as a form of technogenetic emergence. In the final section we show how this kind of technogenetic experimentation must always be effectuated within the preindividual and affective aspects of experience.

The second trajectory presents two examples that shed light on how fields of transduction and experience arise. We consider first Rafael Lozano-Hemmer’s piece *Voz Alta* from 2008 ([http://www.lozano-hemmer.com/voz\\_alta.php](http://www.lozano-hemmer.com/voz_alta.php)). Here we will investigate the different layers of interaction and expression in a large scale urban installation, one affectively charged with the event of the 1968 student massacre in Tlatelolco, Mexico City. The second project considered is the interactive installation the Impossible Room, developed by the authors as a proof of concept as part of the SenseStage workshop at Concordia University, Montreal in 2009. The Impossible Room experiments with bodily and affective capacitations for interaction as these co-emerge with an interactive system. The installation interlaces fields of transduction and fields of experience. It does so via the relations between an algorithmic and dynamic sensor

system for interaction on the one hand, and embodied spatio-temporal experience on the other, all within a space that appears impossible to navigate.

Finally, we outline directions for future experimentation with a Simondonian approach to interaction design.

## Mobilising Simondon: Fields of Transduction, Fields of Experience

To mobilise Simondon's concepts within interaction design is a challenging endeavor. Each concept in Simondon's theory of individuation is accompanied by an entire swarm of conjunctive concepts. In the following section we will outline the main Simondonian concepts that nurture our own conception of interactive environments as fields of transduction.

Two aspects of interaction are crucial to the conceptual adventures that will follow: expression and experience. Expression is that intensive force, or affective shock, which strikes the body first, before any ordering of that force can emerge as content (Masumi, 2002a: xvii). Expression therefore defines the event of affective tendencies at the verge of actualisation. It stretches affect into an actual occasion. Yet affect and expression are to a certain extent autonomous with regard to the actual occasion. In their autonomy they function as attractors via which an event may engage with an embodied experience. As autonomous, affect and expression are forces of generative relation in the constitution of an event. Their autonomy provides the necessary freedom for an event to evolve as novel and not predetermined. The generative relation involved comes before any differentiation into subjects and objects.

To address the relational layer of an event, before it is unfolded into subjects and objects or humans and technology, we use the notion of a field. Here we discuss both fields of experience and fields of transduction. Fields of experience describe embodied experience: sensations and perceptions. What we call experience might be better understood through William James' concept of pure experience. Pure experience indicates a plain unqualified actuality, 'as yet undifferentiated into thing and thought' (James, 1904/2003: 39). When we navigate through the conceptual landscape of Simondon's theory of individuation then we always do so to address modes of expression and experience in their very coming-into-presence, and as zones of openness for experimentation.[1] Fields of transduction are the relational

meshes through which events that arise between humans and interactive technologies come into presence. Transduction names the very process of interlacing physical, vital, mental and collective strata as part of each individuation within which experience in turn emerges. Interaction is seen here as part of the processes of transductive individuation. These occur interstitially. Thus, although as always we have to consider processes of interaction with respect to what an interactive environment can do, we need to do so in a way that emphasizes the interstitial fields within which expression and experience emerge. Deleuze points out in his lecture on Spinoza: "[When w]e define things by what they can do, it opens up forms of experimentation' (Deleuze, 1980). In this article, we are interested in further opening up those forms of experimentation.

## Individuation and Ontogenesis

The concept of a field enables us to discuss both potential tendencies in their incipience and processes of actualisation in their effects. Both are part and parcel of each individuation which is the central focus of Simondon's work. Individuation is the very process of becoming of an individual. Although the term individual might be misleading. Simondon attributes the status of "individuality" to every process of expression, seen as a becoming, yet there is no essential individual as it is sometimes conceived. On the one hand, the process of individuation precedes any individual. On the other hand, each "individual" is an open-ended construct of transductive (as well as affective and expressive) forces. In short, individuals are processes of ongoing individuation. According to Simondon, individuation is the very motor of existence, an "existence" which becomes constant perpetuation and transformation. Each individuation is marked out by the various tendencies it holds in play, in relation to the environment or "milieu" in which it individuates. Each individuation is not only in flux but relies on a collective unfolding with its material and immaterial environment. In the case of interactive environments, individuation happens across all layers, from digital materials and processes and the sensing human subject to processes of thought.

In developing a theory of individuation, Simondon introduces a shift in the way things (subjects and objects) are understood to come into presence and endure. Individuation foregrounds process over products or fixed entities. It fosters becoming over being. Simondon underlines this point by conceiving of his overall mode of investigation as ontogenetic (Simondon, 2005: 23). Different from an ontology primarily concerned with 'being,' ontogenesis accounts for becoming. It conceives of individuation as a perpetual process of forces negotiating their future composition. Considered from this point of view, the notion of interaction undergoes a crucial transformation. Interaction is not a mere connection between pre-determined states of affairs. It is the process of relations producing individuations, as they



individuate. The produced individuations (and the terms with which we come to understand them) only endure as long as the relations hold them. Considering interaction as a relational concept in this way allows us to ask: how can one compose relations that open up experimentation within fields of experience?

According to Simondon technical objects (among others) are continually individuating through processes of transduction. Transduction is the “mechanism” driving individuation. One way it can be understood is as any transfer of information across an interstitial field, in which it becomes a kind of propagation. The concept denotes a process ‘... – be it physical, mental or social – in which an activity gradually sets itself in motion, propagating within a given area, through a structuring of the different zones of the area over which it operates’ (Simondon, 1992: 313). Transductive processes are individuations in progress. Transduction—with its ongoing transformation and gathering together of forces—therefore operates at the level of becoming. These processes unfold as relational events that create new conditions of becoming and generate ‘novelty’. Simondon’s transductive conception of becoming describes the motor that allows different registers of being or becoming, namely the physical, vital, mental and collective, to generate relational events conjunctively.[2] It enables forces to become relational, to constitute an event of experience. The interplay between transduction and experience is what makes each interactive environment at the same time physically, vitally and mentally intertwined. This is what, in this article, we describe as the intersection of fields of transduction and experience. There is perhaps further complication in addressing these fields. To address processes of transduction in the design of interactive technologies often means addressing the very forces that lead to experience before they individuate.

## In-formation and the Preindividual.

The concept of information is key for Simondon’s understanding of processes of individuation as transductive and ontogenetic. Yet information in this context is understood very differently to the “content of transmissions between sender and receiver”, as it is well known in traditional communication models. The notion of information here can be better understood as in-formation; the coming-into-form or a certain structuring of a prior state of disparity. According to Simondon, the process of individuation is a process of dephasing (*déphaser*) from a phaseless state of potential, that is, the preindividual (Simondon, 2005: 25). If individuation is a process of becoming, this is becoming as dephasing, which involves the contraction of disparate tendencies and potentials into an individuation. To allow disparate potentialities to actualise relationally, in-formation is required. In-formation is precisely that which provides a process of dephasing to happen conjointly between different tendencies. Rather than the content of a transmission between pre-defined terms, such as sender and receiver, in-forma-

tion emerges at the moment when an individuation appears out of disparate fields of potentials. The emergence of in-formation is therefore a crucial aspect of individuation.

In-formation is not predefined but it nevertheless constitutes a field for resolution from disparate tendencies, taken up here as a constructive problem. This problem-resolution dynamic is of course perpetual. Or, one could say that a logic of perpetual resolution requires a primordial disparity. Problems are necessary. It is this primordial disparity that Simondon calls the preindividual—his term for the state of disparity from which a dephasing as individuation unfolds. If there are overall processes within this primordial disparity, for the resolution of problems, that is, the beginnings of processes of individuation, these are perhaps what we call fields of transduction. The transductive nature of individuation can allow the processes of individuation to traverse entire fields, ranging from matter, to vital beings, to abstract thought, in order to yield multiple resolutions. In these transductive fields, in-formation functions as the shock of expression when disparate tendencies contract into actuality. At the same time, in-formation provides an excess of the actual event that feeds back into the realm of the preindividual, thus allowing for novelty within both the preindividual and more general fields of transduction. Throughout all this, in-formation, due to its immediate character, cannot be predefined. However, it might be able to be carefully orchestrated in larger processes of individuation.

Let us sum up the recent points. The preindividual as a concept has a particular function in relation to individuation. The preindividual is that field from which an initial problem takes off. By problem we have to understand a creative force that generates an individuating process. An individuation is the seeking for and attempt at resolution of that problem. [3] Another way to think of this is to imagine the preindividual as a charged and tensed field that is able to produce new individuations from past and present events. It does this by drawing a potential future into the present. The preindividual facilitates the potential of a future becoming (it gives events a durational quality) and this allows individuations to become, transductively. The preindividual level of experience is the potential and not yet actualised part of each particular individuation. At the same time, the preindividual itself maintains its autonomy. This allows it in a sense to push and pull an individuation to seek a resolution, and to yield a new problematic attached to that resolution that is “given back” to the preindividual. In all this, the crucial aspect of the preindividual is its capacity to generate collective individuations. As Simondon points out, the preindividual being, as a complete being, is always more than one (more than unity) (Simondon, 1992: 312). An individuation that transduces more than one individual is collective. So all individuation is collective. For this collective individuation to emerge the preindividual tension has to express a certain force.

## Affect and the Associated Milieu

The force that makes individuations evolve collectively and endure can be named affect. As Simondon points out, 'it is affectivity that expresses a preindividual charge in a becoming and supports the collective individuation' (Simondon, 2005: 252). At this point we can direct attention to the perceiving and experiencing body as that through which certain individuations become collectively through affective forces. However, if a collective facilitated by a preindividual becomes affectively, this changes our concept of the body. The body can never be a simple containment. It is instead an open system allowing collective individuations the potential to happen. The same applies to technology, as itself a kind of series of perceiving and experiencing "bodies" which are never entirely exterior to other bodies. If each engagement with technology (and bodies) is affective, this means that each engagement creates individuating collectives of various kinds. Interaction design, as the engagement between technology and bodies, therefore has to question which levels of a collective individuation might be of importance when it comes to yielding an enhanced notion of experience. Yet this has to be qualified perhaps, as this is not a question merely of an experience that can be predetermined but of a pure experience, where affect and the transductive field of a collective individuation become sensible. In interaction design terms, for each actualisation there is a particular collective set of affordances that allow for the event to exist, although via Simondon we have rethought the nature of affordances, events and existence.

As the dephasing of a preindividual field, an actualisation always produces more than an individual (even this individual in its potential is expressed through excess—its preindividual charge). Or, seen from another perspective, an actualisation always also produces an associated milieu, in relation to the individuation. The associated milieu is that dense zone of potential, which shifts with each becoming of the individual. The relation between associated milieu and individuation always emerges from the middle of events. In their relational bond, individual and associated milieu define the intensive zone of interplay between transduction and experience. The preindividual is a third factor, immanent to each individuation and its associated milieu. With the notion of the associated milieu we now can approach more clearly the particularity of the complex nexus between preindividual, transduction/information and individuation.

Following Simondon, we have to consider experimental environments for interaction with digital technologies as always transductively co-emerging with the process of interaction itself. This can greatly contribute to the design of interactive technologies. If we conceive of interactive technologies as fields of transduction that relate to fields of experience through shared associated milieus, the emphasis shifts away from designing controlled environments and interactions. Instead, there is an opening towards radically experimenting with the way

we might live and co-evolve with technological assemblages. This changes the very conception of experience within interaction design. A Simondonian theory of interaction design would be concerned with unfolding the idea of these technological assemblages and associated milieus. Both would be understood as transductively emergent phenomena, at the same time conditioning and constructed through the interaction. Interaction in its turn must be considered in terms of processes of individuation unfolding as an experiential field in relation to particular fields of transduction. These fields emerge through the interaction and cannot be pre-determined by either system or user.

## Technical Objects, Invention and Affective Engagement

Mobilising Simondon in relation to the design of open interactive environments is particularly interesting due to the rich, isomorphic vocabulary proposed to describe the relations between humans and technology. These concepts go beyond describing technology as finalised machines. Instead, they focus on the relations that emerge from the transductive encounters between technical elements and their socio-cultural milieu.[4] This allows for an understanding and description of interactive environments in open-ended and processual terms. Further, it goes beyond a focus on whether a given design should be built in the image of either man or machine, cutting directly through discussions of usability and user-friendliness in present day interaction design. According to Simondon's thought, interaction design should be neither human- nor machine-centered but transductive, challenging how an interactive experience might become.

One of the central claims made by Simondon is that it is not possible to constitute a symmetrical relation between man and the technical being. This would be devastating to both the values of the individual and those of the technical being (Simondon, 2005: p. 519). In Simondonian terms technology is more than prosthesis, more than a tool, and man is more than a cog wheel in the technologically crafted system. The relation between man and machine functions as a double assimilation and has a real value of being (*valeur d'être*) (Simondon, 2005: 521). Man is completed by the machine, and the machine finds unity in its relation to man: man and machine are mutually in-forming each other. Yet this double participation or relation is a chiasm between two universes that stay separated. In other words, man and machine are not separable in the relations they maintain but at the same time they have distinct modes of entering and leaving a relation. An individuation, for instance an interactive media art installation, only happens in the moment where the interaction-as-individuation takes place. Such interaction has little to do with cyborg phantasies since, according to Simondon, not only is the human body permeated by the machine but the machine is permeated by the human body. Further, Simondon argues that if man has ultimately created

machines, this is to develop and produce new relations (Simondon, 2005: 522). It is in this sense that we have to account for Simondon's insistence on regarding human-machine relations as their own mode of individuation.

Neither the human nor the machine preexist their particular expressions on the plane of experience. They both individuate conjunctively (in an individuation). The environmental conditions in the form of associated milieus are part of the individuation of technical objects, which is the condition for technical progress. In other words, the individuation is '... made possible by recurrent causality in an environment that the technical being creates around itself' (Simondon, 2007: 207). Of course, the invention of technical beings is not only a question of the man-made. Neither should it be seen as the invention of a fully determined and closed system. Brian Massumi has argued that the invention of technical beings is to a large extent self-conditioning emergence (see Massumi, 2009: 40). In this self-conditioning emergence, the associated milieu does not only provide the environment for a technical being to become in conjunction with a subject; the subject itself also co-constitutes the associated milieu through its actions. Or rather the technical being and the subject both co-emerge together in the process of invention. Invention here then is defined as the self-conditioning emergence of novelty, cutting transductively across the individual and its associated milieu. An invention is an act of a widening of potential in the realm of experience. As such, interactive environments might enable a transductive field for inventive creation involving both technologies and experience.

With a renewed concept of interaction as a relational force we can reconsider the question: through which kinds of individual-milieu couples might novel experiences emerge? By 'novel' experiences we mean embodied states that challenge the habitual modes of perception and sensation of our environment—in other words, a widening of the scope of what a body can do. Interaction design is here reconceived. It is not only a practice interrelating technologies ready to be encountered by human perception but also a potential technique to make fields of transduction felt on the plane of experience. Such interactive experiences always happen at the threshold of, or in the interstice between, affect (potential) and emotion (effect).

In Simondonian philosophy, technical individuation is conjunctive with psychological individuation. According to Simondon, affectivity and emotivity are the utmost transductive forms of the psychic individual. Affectivity is what relates the preindividual to the individual (the actualised) through transductive charges, that is, in-formation (Simondon 2005: 252). Here Simondon has a rather particular conception of affect: affect is the preindividual capacitation of an emotion to be captured in experience. On the other hand, theorists like Brian Massumi stress the importance of affect as the potential (read: virtual) capacitation and intensive charge in an event of experience itself. For both Massumi and Simondon however,

if in their different ways, affect is necessary for any event to be experienced and endured. We can perhaps sum this up by suggesting that it is only by means of affect that we are able to relate to other individuals through felt intensities—often at the cusp of becoming emotion (where emotion is already individualised affective force, see Massumi 2002: 61).

It is through affective capacitations that a relational event of experience can conjointly emerge with a field of transduction. As shown above, an individual always individuates co-extensively with its associated milieu. This double-mode of becoming enables in-formation to give an event a certain outline without exhausting or determining the event's potential for future becomings. If emotion is, as Massumi argues, 'a recognised affect,' then it provides an actualisation with a charge that can be captured experientially (Massumi, 2002: 61). Importantly, such an individualised event of experience still maintains its transductive nature. It re-potentialises the event, opening it up onto its relation to the preindividual plane of potentiality. Interaction considered as the relation between technologies and human beings as pre-defined entities would not allow for a re-potentialisation of the interactive event. However, interaction understood through the notion of affect not only allows us to consider the transductive nature of any individual-milieu couple as open-ended and emergent. This also allows us to consider the drawing into experience of a sense for future (not yet actualised) becomings. Interaction design is constantly concerned with the question of how to create environments for future unactualised becomings. Yet interaction needs to function affectively to enter the zone of the interstice between transduction and experience which has been discussed in this article.

In sum, affectivity and emotivity are both necessary for an experience to actualise and open onto preindividual potentialities. We could add that affect, as well as the preindividual, do not come before emotion and experience (i.e. action) but are immanent to them.

## Designing Interaction as Technogenesis

We have outlined the importance of affect and emotion in the event of experience for our general argument concerning interactive environments as fields of transduction. Affectivity and emotivity are the 'transductive forms par excellence' of the psychic individual precisely because they both maintain the necessary tension between expression through experience and re-potentialisation through in-formation (Simondon, 2005: 247). We have also argued that a Simondonian take on interaction design would be concerned with thinking the design of interactive environments as transductive. This means we have to conceptualise the prein-



dividual as enabling affective and experiential interactions via the relations emerging in technological assemblages and associated milieus. In sum, a Simondonian approach necessitates thinking affectively about interaction design. In this article we have suggested that this means emphasising the interdependence between transduction and experience.

One way of thinking about interaction design in this way is to give accounts of interactive environments that allow for the complexity of technologies' capacity to engage people affectively and create particular experiential fields. To work with affective engagements is to foreground a mode of interaction in which experience becomes the zone where transductive forces are felt in embodied states of perception. Again, neither the human nor the enabling technology can be understood separately in these affective and transductive assemblages. Conceived as an individual-milieu couple, interaction always requires a relational thinking in order for the primordial emergence of any experience to be rendered palpable. If one considers the process of design as partly self-conditioning emergence, one has to orchestrate events of interaction to the extent that interaction becomes an event yielding novel experiences—through an attentiveness to the affective engagement of an experience.

The question of how to account for and design such affective engagements on the basis of transduction has rarely been addressed in contemporary literature. One exception can be found in Erin Manning's recent book *Relationscapes*. Here she builds on Simondon to unfold the concept of what she terms technogenetic experiences. According to Manning, technogenetic experiences recompose the body through a multiplicity of techniques understood as '.... technolog(ies) of emergence (an ontogenetic technology or a technogenesis) through which new complex systems are composed' (Manning, 2009: 71). These techniques are associated milieus of potential, '.... compositional matrices for the machinic body, in-forming the body through transductions that open the body-becoming to the metastability that provokes it to become in excess of its organism' (Manning, 2009: 71). What Manning calls technogenesis is the interstitial process of becoming, through the associated milieu, from which a particular mode of being emerges. Manning takes up Simondon's particular account of the human-machine relation to regard machines as techniques of relation (Manning, 2009: 87). She points out: 'The machine operates ontogenetically through "(...) concretising invention creat(ing) a techno-geographic milieu ... that is a condition of possibility for the functioning of the technical object"' (Simondon, 1958, translated in Manning, 2009: 87-88). Technogenetic individuations account for the becoming of a technology by means of the techniques of relation they can develop in a relational event with other individuals (be they physical, human, vegetal, or mental).

The transductive aspect of a technogenetic individuation merges with the field of experience in the expressive event that is interaction. In other words, during the process of invention the

self-conditioning attribute of the machine feeds into the field of experience by means of a shared associated milieu of the machine and the human. This relational nexus between associated milieus and their different individuations is particularly interesting if we deal with the question of how technologies designed to be interactive influence the way an experience actualises. This question can be explored by working with the relational bonds between transductive fields and fields of experience. Working with these, we continuously move along the threshold between the actual and the virtual of such events of experience.

Manning argues that if digital technologies want to truly contribute to this technogenetic transduction they must work at the level of perceptual emergence, making transduction felt affectively (Manning, 2009: 72). This perceptual emergence can be sought out by tapping into the body's rhizomatic networks of actuality and virtuality. Such a tapping-into functions through sensation/experiencing amodally. Amodal experience is a key way to activate the body's relation to the world. Amodal experience opens the body to its technogenetic potential by addressing its affective experiential field.

In sum, so far we have suggested that the value of Simondon's thought for the design of interactive environments lies in the inseparable relation between technologies and humans as part of a shared technogenesis. The propositions at stake foreground both the force of relationality that underlines transduction and the expansion of potential through affectively engaged embodied experience. In the following section we will outline two examples that operate transductively between body-becoming (what a body-becoming can do) and the techno-geographic milieu. As we will see, in both cases a transductive mode of thinking enables an interlacing of manifold layers of experience that are usually treated separately.

## Loud Voices and Impossible Rooms

This preliminary conceptual tour has brought to the fore a range of concepts and directions of thought that we believe can enrich the critical discourse on the design of interactive technologies and environments. So far the theoretical development has been grounded in an exploration of concepts. In this section, we seek to show how the concepts work in the analysis of two different but related technological assemblages, namely *Voz Alta* by Rafael Lozano-Hemmer and the *Impossible Room* which was developed in part by the authors on a proof-of-concept level during the SenseStage workshop at Concordia University, Montreal (<http://sensestage.hexagram.ca/workshop/>).

Although the two projects are not typical examples of interaction design, they are both artistic experiments with the crafting of technological assemblages that foster new interactive experiences. As Bolter and Gromala have argued, it is possible to regard digital art as a series of radical experiments in digital design (Bolter and Gromala, 2003:7). We will argue that the analyses of Voz Alta and the Impossible Room enable a re-thinking of the nature and extent of experiential concerns and relational events we might be able to explore through the use and design of digital and interactive technologies.

The analysis will show how the two installations can be conceptualised as fields of transduction and experimental, experiential fields of technogenetic emergence. We will demonstrate how the installations, in differing but still complementary ways, function as associated milieus for transversal exchanges. The installations can be considered as individuations occurring between humans and technology. By creating conditions of emergence for affectively engaging interactions these individuations ontogenetically tap into the preindividual through fields of transduction. The analysis is not intended to validate the conceptual development. Neither is it supposed to validate the quality of the presented projects. Instead, the point of the following section is to make the concepts and projects resonate in a mutually beneficial way, keeping thoughts in motion as a conceptual feed-forward into further experimentation and invention in interaction design.

## Voz Alta

Voz Alta (translated as 'Loud Voice', the project also has the subtitle Relational Architecture 15) is a commemorative, technological in(ter)vention in urban space by interactive artist Rafael Lozano-Hemmer. The installation was built in 2008 to mark the 40th anniversary of the student massacre in Tlatelolco, Mexico City. [5] In the massacre, which took place on October 2nd 1968, hundreds were killed. However, the event is not very well described or documented and the subject is still a taboo in present day Mexico. Lozano-Hemmer's web site described the piece in the following terms:

*In the piece, participants speak freely into a megaphone placed on the "Plaza de las Tres Culturas", right where the massacre took place. As the megaphone amplifies the voice, a 10kW searchlight automatically "beams" the voice as a sequence of flashes: if the voice is silent the light is off and as it gets louder so does the light's brightness. As the searchlight beam hits the top of the building of the Ministry of Foreign Affairs, now Centro Cultural Tlatelolco, it is relayed by three additional searchlights, one pointed to the north, one to the southeast towards Zócalo Square and one to the*

*southwest towards the Monument to the Revolution. Depending on the weather, the searchlights could be seen from a 15Km radius, quietly transmitting the voice of the participants over Mexico City. Anyone around the city could tune into 96.1FM Radio UNAM to listen in live to what the lights were saying.*

*When no one was participating the light on the Plaza was off but the three lights on the building played back archival recordings of survivors, interviews with intellectuals and politicians, music from 1968 and radio art pieces commissioned by Radio UNAM. In this way the memory of the event was mixed with live participation.*

*Thousands of people participated in this project, without censorship or moderation. Participation included statements from survivors, street poetry, shout-outs, ad hoc art performances, marriage proposals, calls for protest and more.  
([http://www.lozano-hemmer.com/voz\\_alta.php](http://www.lozano-hemmer.com/voz_alta.php))*

As can be seen in a video of the installation on YouTube, it is clear that people had numerous reasons for participating: voicing their opinion on the current state of freedom and democracy in Mexico, bearing witness to the event, demanding that people responsible for the killings should go on trial – and the people participating did so in a variety of ways, either spontaneously, in groups, reading up statements or just sending shout-outs to their friends. [6] Participants who talk about their experience with the installation emphasise the strange and powerful feeling of seeing their ‘voice in photons’ or their ‘voices becoming light (and) enlightened thoughts become words’. The installation is simultaneously described as artistic and political, emphasising the accessibility and non-elitist approach to art that it demonstrates. One participant in the video underlines the fact that the installation lets ‘people believe they have a voice that can actually make a difference.’

## Megaphone–Light–Radio

In her book *Materializing New Media: Embodiment in New Media Aesthetics*, Anna Munster describes Lozano-Hemmer’s approach to what he himself has termed ‘relational architecture’. This means working with interfaces as active fields of relations requiring negotiations between body, building and imaging technologies (Munster, 2006: 147). Munster argues that Lozano-Hemmer’s work is located at the very core of contemporary affect and experience. His work shifts the experience away from the interface as a thing in itself, making it ‘...a kind of quality that emerges in the experience of (these) relations in information spaces.’ (Munster, 2006: 148). Munster’s proposition to move towards the interface as a shared and

distributed set of tendencies and intensities aligns with our proposition for interactive environments as fields of transduction. According to Lozano-Hemmer himself, he is actually not creating interfaces, but situations. Drawing on Brian Massumi, Munster points out that Lozano-Hemmer's work addresses the way in which technologies can be twisted away from pre-existing forms and functions and toward operating directly as technologies of emergent experience (Munster, 2006: 148 from Massumi, 2002: 192). In their operation as technologies of emergent experience the modes of interaction involved play into the field of experience in their own particular ways.

The different technologies used in Voz Alta create a technological assemblage that allows people to tap into the field of transduction provided by the installation through different experiential gateways. The megaphone can be conceptualised as the most situated part of the technological setup. It demands and creates attention, offering people a means to amplify their voice to an extent which makes an actual difference to them. This activity very manifestly modulates the general feel of the place by actualising a range of virtually present and really lived stories relating to the site. The experience of seeing your voice as pulses of light creates an affective surplus effect that exceeds the audiovisual. It spills its excess literally and manifestly all over the city. There is no way you can not engage affectively with Voz Alta; for a start the installation forces you into the role of a performer via the technological setup. Further, the immediately situated experiential field provided by the installation has an impact on the general feel of the city. In a very obvious way, the technology is being used here to alter a range of basic relations; to the act of voicing your opinion in public space, to the reach of this act, and between the past, the present and the future of Mexico City. Enabling a field of transduction, the technical object also enables a relational field of experience.

It is clear that the light emission is more than illumination, or at least that the light illuminates more than buildings. The emission of light is directed towards places that are historically and symbolically connected to the massacre, literally tying the stories being told to the physical manifestations of the people and civic institutions connected to the tragedy. As stated before, the light functions to grab attention, but it also becomes more-than-visual as people develop a connection to the setup. It is clear that the light must have an impact on the affective experience of the city; it draws people into the sphere of the installation by reminding them about what is going on. The light, then, highlights the experience of the city, offering ways to engage with the installation and the historical setting. Via the light beams, spoken content becomes pure expression generating new potential in-formations of a new transductive register. Light transduces in-formation across different registers (the technological, urban, personal, historical, political) to generate altered states of experience. In this respect, the technical object and its associated milieu broaden the experiential relations between humans and the city. The installation as a field of transduction enables a widening of the field of potential for acts of expression. Voz Alta demonstrates, then, in a very elegant way, not only how a technogenetic becoming can concern different registers of being or

matter but also the way time, in such a technogenetic becoming, can become multiple, with many intersections across past-present-future.

The radio station works differently since it is not tied to a particular location or action and can be experienced anywhere in the city regardless of whether anybody is actually talking into the megaphone. The radio functions as the contextual framing of a range of situations and relational events, mainly tied to the performances carried out on the Plaza de las Tres Culturas. It is plausible that knowing their voice will be broadcast on the radio as well affects the people voicing their opinions in the public space. Finally, it is crucial to note that the megaphone is not only emitting visible light but also invisible electronic pulses, creating its own hertzian space to be explored (Dunne, 1999). As such, it perturbs already existing associated milieus of communication and interaction.

The transductive nature of Voz Alta becomes extremely apparent in the different modes of entering a formerly contained or rather shunned event. In the use of the megaphone different modulations take place. These generate different modes of expression that enable other relational events between experiencing bodies and expressive technologies. Interaction is distributed across the transductive field of the entire system, from radio waves, to voices heard to photons flashing throughout the city. Crucially, through each engagement with the system, both the engaging subject (or individual individuating) and the associated milieu of potential expressions shifts and re-organises itself.

The different interfaces presented in Voz Alta thus alter the relations between, among other things, social arrangements, environmental conditions, historic repression and public awareness. Voz Alta is an example of how to design strong, situated, relational events where embodied experience and technical objects mutually shape the emergence of fields of transduction. In Simondonian words, Voz Alta works ontogenetically to create a situated, technogeographic milieu to be simultaneously explored and further developed.

## Infrastructural Emergence

A range of relational events emerge from the associated milieu created through the interactions surrounding Voz Alta. There is a strong link between the situated performances and the stories that are told, where the setup stages and alters the conditions for acting out the story in public. There is a strong relational retro-activation of the physical site, and of the narrative



of the massacre, through the interaction with the installation. More than just functioning as a medium to speak up or aloud, or to communicate messages and memories, Voz Alta opens up a register of politics that is intrinsically technogenetic and affective. Through the technical system and its modulating processes (voice into light or radio waves) the experiencing subject is challenged not only in terms of what it can do but in terms of how to make different levels of experience conjunct in creative and novel ways. In this way, the politics of the event are an immanent part of the way the system is open for affective engagement. Each individuation that emerges from this affective engagement is touched by what becomes a political field. In sum, the transductive distribution of politics enters the field of experience through the different modes and modulations of expression.

From an interaction design perspective Voz Alta can be conceptualised as pure infrastructure, form without content— in-formation, individuation. All the content is provided by the people who interact with the installation (except for the excerpts on the radio station). Instead of describing the events that took place, the installation becomes a “living memorial” where people can re-live the historical event. What is existing virtually, as part of the ambiance and pastness of the city, the people, and the place, is actualised by the participants. The idea of using the technological setup to “give people a voice” creates the potential for strong affective ties by capacitating (or empowering) people. Thus the installation ‘bridges’ the affective with emotivity, emotions, narratives and communication. All these thresholds of the experiential continuum are somehow activated and distributed in the physical, social and affective spaces the installation creates. Instead of just making historical material public, Voz Alta provides a field of transduction that allows multiple and ongoing individuation. Each engagement with the megaphone transforms the relation between the technical object, the individual speaking, the city, time and memory. More generally, this interplay between individual and associated milieu allows us to conceive of the technical object as a relay for the individual to participate in acts of invention. Such inventions happen via a becoming-attentive to the preindividual realm of potential that might be taken up and actualised in a future event.

Not only does Voz Alta empower people to speak up, it shifts the way the political is rendered active.

## Impossible Room

The interactive installation the Impossible Room brings into play a contextual setting that is different to Voz Alta. The installation was developed by the authors in a laboratory setting as part of a range of experiments carried out during the SenseStage workshop at Concordia

University, Montreal. SenseStage is an interactive performance system developed by Marije Baalman, Harry Smoak and Chris Salter. Technologically, SenseStage is a wireless sensor network, built for immediate use in interactive performance environments. Building on this network, we experimented with the design of a particular experiential field, exploring affective capacitations and bodily engagement in a controlled setting.

The Impossible Room itself is a darkened room filled with smoke. It invites the visitor to enter and experiment with the responsiveness of its augmented environment. The room appears to have a life of its own and offers different zones for interaction. The ambiance is enhanced by a pervasive soundscape and by visual events that provide cues for movement. In the room, sensors are distributed on the floor (floor sensors activated when stepped upon), on the walls (distance and IR sensors activated when approached) and in an object lying on the floor (an accelerometer activated when moved around). All sensors are visualised with a blue light to attract attention and this subtly choreographs the visitors' movement around the room. The underlying algorithmic structure is based on the notion of impossibility; whenever a visitor responds to a cue, there is a cue countering the prior one—the sound moves from one end to the other of the room, the lights change. The room attracts attention only to re-direct attention to the opposite end of the room. The process is built on (modulated) binaries like left/right, or up/down, facilitated by the sensor setup.

The soundscape consists of an ambient, deep drone complemented by a bird's singing in a dissonant, highly pitched and distorted way. The sound is activated when a visitor enters the room and would be overwhelmingly loud and disturbing. However, the more the visitor agitates the room, the more the visitor tries to figure out how to respond to the cues in the room, the more activated the room becomes—and the more appeased the soundscape gets. In the end, after "performing" the room, the sound changes to a bird's natural singing. The light changes to a red, sun-set color, creating a relaxed ambiance. The impossibility of the room consists in demanding actions with no particular goal. These actions are demanded because the experiential field is saturated in the immersive setup of distorted audio-visuals. The agitation of the visitor is inversely proportional to the mood of the room. Another way to put this is that the room inversely performs the visitor and vice versa. The whole setup is always on the verge of impossibility.

In sum, the setup fosters an over-cued and disturbing ambient environment. This seems insurmountable and hostile at first but changes character through interaction. In an extension of the setup, the room might continue to provide contradictory cues for action unless you actually knew how to appease it, making it possible to "play" the room like an instrument. For this to happen, an evolutionary and adaptive algorithmic backend is required, radically experimenting with the different sensors' abilities to choreograph the room spatially in ac-

cordance with the audiovisual setup.

The installation was only available to the people attending the SenseStage workshop for a short period of time. At least 20 people tried the room. The feedback was generally positive. Many of the people who visited the room gave accounts of strong affective experiences created by the ambiance and interaction. Some followed the cues provided in a straightforward and linear way, whilst others simply drifted along in the room, thus activating it in a less intentional way. Most people did achieve the intended appeasement of the room. Those who did not still spoke of an intense experience. Based on the feedback we received we believe that the interactive setup created an experiential field worth exploring, fostering different kinds of relational events of technogenetic emergence—as regards the technology, the physical setup, the audiovisual ambiance, and the people themselves.

## Operating Impossibility

The Impossible Room works directly—and explicitly—on a preindividual, affective level. The interactive setup constantly modulates the affective experience of being in the room through all people's interaction with the distributed technological infrastructure. At the same time, in the Impossible Room, the field of transduction resonates with different thresholds of experience as it is modulated by the underlying algorithmic structure. The design of the installation attempts to effectively condition the way visitors perceive and act in the room without forcing upon them an exact outcome. This is effectuated by oversaturating the room with different cues that catalyse perceptual changes in the experiential field. The aim is to tap into the very conditions for experience and orchestrate these, but technogenetically.

The Impossible Room is very different from Voz Alta as it experiments with a highly constrained and determined field for interaction. The interesting aspect of such a constrained field is the experiential precision one can evoke. As Andrew Murphie has explained in regard to the potential of Virtual Reality environments (e.g. immersive mediascapes and the like), VR (both as practice and as a concept) '... allows us ... to shift the gears on the threshold of perception, operation, and expression more powerfully than ever before' (Murphie 2002: 188). According to Murphie, virtual reality implies not a virtualisation of reality but an increase of 'our ability to operate the virtual' (2002, 192). The emphasis on operation is crucial in this context. Instead of constituting modes of representation, confined interactive environments such as the Impossible Room foreground the operational quality of an experience. The very notion of operation is broadened. It accounts for how things come into presence in terms of 'what they do.' However, the experimental nature of the Impossible Room adds a further

concern to operation: it investigates what things ‘can’ do, their potential capacities, not only ‘what they do.’

Operation, as described above, also plays a central role for Simondon. It is a key part of transduction. For Muriel Combes, writing on Simondon, operation—similarly to information, affect and expression—is autonomous of the terms it relates in its unfolding (Combes, 1999: 22). So to investigate the operational level of interactive environments means to develop techniques of experimenting with this autonomy, in other words with preindividual potentials. The Impossible Room provides a zone of experiential experimentation that aims to make its relational nature palpable in an embodied experience. The environment of the Impossible Room taps into the field of transduction and enables its emergence without fully prescribing the interaction. Instead, interaction is turned into a field of potential, continuous variation.

When the Impossible Room experiments with the distribution of technology it affectively engages and spatially choreographs the physical boundaries of the room. For many people these boundaries are dissolved and they find themselves interacting with the invisible layering of digital processes and algorithms. There is an overload of cues and multiple ways of relating to the interactional setup, including the option to simply ignore them, which does not, however, mean they do not have an effect on what you are doing or experiencing. The work creates a distributed ecology of sensing, of sense and sensation across human and digital strata. In other words, the Impossible Room deals with the question of how to design an interactive environment that dynamically experiments with the relation between experience, embodiment and interaction.

The design of the Impossible Room also begins with the idea that technologies can be sensible and flexible in their operational nature, to the extent that they change the way we perceive different spaces in a remarkable way. The work seeks to explore and expand the specific capabilities of a range of sensor technologies—floor sensors for extensive, horizontal space, accelerometers for intensive movements, IR-tracking for vertical displacements. Inviting people to take part in forming a mixed and relational interactive ecology with the expanded capabilities of technologies, the Impossible Room also experiments with our perceptions of ourselves. The technologies that are becoming a part of our everyday lives now make the felt experience of the technologies tangible in a disturbing and creative way.

Such a mode of experimenting with preindividual potentials requires an ethical awareness. To shift the point of action from effects to affects and from expression to transduction also means to orchestrate becoming for the better or worse. Alongside this the political undergoes a shift, from an explicit order to a virtual immanence within each event. In sum, inter-

action design has to address the experiential, experimental and political dimension of its practice. Here we consider the moving relation between individuation and associated milieu by means of transduction as a crucial aspect of such practice. Of course, many questions remain. For example, how do we enable a field of experience through fields of transduction without rendering the range of potential too narrow or too wide? This is one paradoxical challenge each design process has to balance. Or, as Voz Alta and the Impossible Room experiments ask, in their different ways, how do we bring together digital and analog strata in a way that allows for novel qualities of experience to emerge while traversing the edge of the (im)possible.

## Conclusion

The analysis of two different interactive environments brings to the fore the complexity of current technological assemblages. To regard technologically enhanced media environments such as Voz Alta or the Impossible Room as fields of transduction allows us to understand a layer of interactivity that is often overlooked in more traditional conceptions of interaction. Voz Alta is a designed environment that offers conditions of emergence for activating preindividual fields of becoming ontogenetically. Voz Alta makes the transitions and transductions from the virtual to the actual felt through the associated milieu conditioning and created through the interaction. Voz Alta alters the affective experience of the cityscape, of the historical facts behind the setup, of the interactive situation itself and of the possible relational events that might emerge from the interaction. Time travels through the people engaging with the interaction. The collective pastness enters the present, and the users themselves become a kind of 'memorial' of the event. It lives on. It is retro-activated through their engagement and interaction with the installation. The conditions of emergence offered by the installation activate people possibly creating new capacitations and relations, qualitatively altering or qualifying the experience—of Tlatolelco, of the history of the student massacre, of the user herself, of the technology used in the setup, of technology in general.

Compared to Voz Alta, the Impossible Room unfolds in a much more controlled environment. Unlike Voz Alta, the Impossible Room does not aim to modulate the affective experience of a given location or retro-activate a historical context. Instead, the installation simply effects a transformation of the room it occupies. In doing so, the Impossible Room tries to make the relations between the human and the technology felt more intensely. The algorithmic infrastructure and the interactive setup that unfold through people's interaction is always processual, always different from the last time, although the conditions of emergence remain largely the same. The interaction can be more or less intentional or volitional, and the transductions offered by the experiential and technological field can be felt more or less

affectively—but the complexity of engagement is virtually present at all times. As such, the Impossible Room allows for collective individuations to potentially unfold in what are simultaneously technogenetic and experiential space-times.

Voz Alta and the Impossible Room provide different takes on the question of how to activate fields of transduction and experiential fields of becoming using interactive technologies. They offer different conditions of emergence giving rise to a multitude of relational events that take on a life of their own through interaction. In Manning's words they both involve the constitution of a form of technogenetic emergence that changes experiential space-time, recomposing and in-forming the body through transductions. Such a transformation is more immediate in the Impossible Room, which arguably affects the users' bodies more directly in the interaction than Voz Alta. On the other hand, it is obvious that Voz Alta more clearly activates a range of different experiential levels, adding emotivity, emotion and narrative or communicational expressions to the interactive setup in an extremely engaging and touching way.

We are aware that the Impossible Room operates at a totally different scale of impact and execution to Voz Alta. However, we argue that both installations are genuine inventions in a Simondonian sense. It would be interesting to look into the way digital and analog technologies are at play in the two installations since Voz Alta can be said to experiment more with an analog setup whilst the Impossible Room is certainly diving into a world of the digital. It should be made clear, though, that the associated milieus are neither solely analog nor solely digital but a zone of in-mixing.

The mobilisation of a Simondonian vocabulary makes it possible to unfold this zone of in-mixing, in part because Simondon's concepts allow us to see interaction very differently. We can then work actively with this in-mixing in the analysis of interactive installations. Just as importantly, we can work with this in-mixing in the development of new interactive experiments in design practice. Introducing Simondon in interaction design paves the way for thinking the invention of technological assemblages and beings as an integrated part of our contemporary culture. Instead of maintaining clear lines between humans, technology and the world we have to conceive of technological individuation as cutting transductively across all strata of life.

In Relationscapes, Manning suggests that the potential within the technogenetic lies in further explorations of preindividual potential and affective experiences. This in turn allows for explorations of alternative and experimental configurations of people and technologies. As we have briefly begun to suggest, such explorations always carry ethical implications



with them. One of these is the question of how experience might unfold, if it does so within a collective ontogenetic process. This is a central question within the contemporary ethics of interaction. Yet, if fields of experience are transductive and collective, and if all instances of an individuation emerge relationally, then we have to account for interactive technologies, systems and experiences differently. Here we have suggested that the concept of a field of transduction enables us to reconsider what we mean by affectively engaged interaction, environment and the relation between thought and experience.

Throughout the article we have proposed a mode of thinking and practice of interaction design which carefully considers the relations between fields of transduction and fields of experience. We believe that interaction design can function as an experimental laboratory for this. Designing technologies that focus on working with an associated milieu as self-conditioning emergence radically shifts the role of the designer. The designer becomes a "helpmate to emergence" in processes of technogenetic individuation (Massumi, 2009: 40). Bodies, technologies and concepts have to maintain an open-ended character to further participate in the process of technogenetic invention. We understand fields of transduction as an open-ended interplay of these disparate tendencies folding into fields of experience. Working at the junction of these fields means working with the body as open to experience in its pure state, where affects take precedence over emotions and feelings over consciousness. A design process that mobilizes such work always has to experiment with operations that lure bodies into experimentation. Both of our examples demonstrate how an ethics of interaction might facilitate an affectively engaged mode of interaction that does not pre-determine experience but invites experimentation. Interaction taken as an interstitial event makes the field of transduction palpable and at the same time allows one to maintain an open relation between bodies and technologies. The fields of transduction can feed into designed processes themselves, as well as more generally demanding an open practice of experimental interaction design research.

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## Notes

[1] The concepts of expression and pure experience take on an important role in relation to different discursive receptions of Simondon's work. Expression and pure experience emphasise the role of a perceiving and experiencing human body that engages with interactive technologies in our essay. Hence, this body is not predefined but co-constitutive with its technical environment. Expression and pure experience allow us to account for the perceiving body on an affective plane without predetermining the human body as phenomenological, as hermeneutic readings of Simondon tend to do.

[2] If one wants to align the concept of transduction with another concept in Deleuze and Guattari, then the notion of machinic might be the most appropriate. Even though both Deleuze and Guattari use the two notions independently. (See *A Thousand Plateaus* 1987, 404-415; Guattari 1995, 33-57).

[3] Simondon's use of the notion of problem correlates with Deleuze's remarks on stating a problem as inventing, as proposed by Bergson. (see Deleuze, 1988: 15)

[4] In this section, while maintaining these distinctions, we will primarily hint at how the vocabulary can be used in order to re-think the practice of interaction design, working with digital technology.

[5] [http://www.lozano-hemmer.com/voz\\_alta.php](http://www.lozano-hemmer.com/voz_alta.php)

[6] <http://www.youtube.com/watch?v=87SCyQ2O8wY>

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## FCJ-125 From Representation to Sensation: The Transduction of Images in John F. Simon Jr.'s 'Every Icon'

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*Perhaps the peculiarity of art is to pass through the finite in order to rediscover, to restore the infinite.—Gilles Deleuze and Félix Guattari, What is Philosophy? (Deleuze and Guattari, 1994: 197)*

### Science and Art

When encountering John F. Simon Jr.'s software artwork *Every Icon* (1997) on his website, it can be difficult for viewers to know whether they are seeing the visual execution of a mathematical theorem or experiencing a work of artistic expression. [1] This is because they are presented with a stark white and black thirty-two by thirty-two square grid on the right side of the website and three statements that read like a mathematical theorem on the left side. They state:

*Given: An icon described by a 32 X 32 grid.*

*Allowed: Any element of the grid to be coloured black or white.*

*Shown: Every icon (Simon, 1997b). [2]*



But before viewers even take notice of these three statements, their attention is immediately drawn towards the upper left corner of the grid where a rapid flicker is occurring.

Once the grid's flickering corner has captured the viewers' gaze, they notice that a series of black squares emerge from this flicker, moving across the top row of the grid towards its right side. These black squares continue shifting to the right, column by column, away from the flicker until the leading black square stops moving. Then all the squares in between this now static black square and the flicker gradually change from white to black. Once all of the squares from the static black square to the flicker are black, the static black square then moves to the right, occupying the square in the next column and all the squares to its left suddenly change to white. At this point, another series of black squares emerges from the flickering left corner, which move towards the static black square.

If viewers continue watching Every Icon for a few more minutes, they will notice that the flicker occupies only the first five squares on the left side of the top row. Although these five squares seem quite chaotic, the orderly change of the squares from white to black is generated from this intense flickering. Viewers also experience a movement that seems to only be taking place in the top row of the grid. Change appears not to be occurring elsewhere in Every Icon. The squares in the lower thirty rows, which are all white, look to be completely static. The second row from the top has a few black squares on the left side, while the other squares in the row are white.[3] Like the lower thirty rows, the second row from the top also appear to be motionless.

Despite the fact that the top row of the grid tends to draw much of the viewers' attention because of the flickering that is generated by squares oscillating between white and black in the left corner, it is not the only thing presented on the website for Every Icon. There are also the three statements on the left side. When viewers read these statements, the actions occurring on grid begin to make some sense. The first two statements set out the parameters for what is taking place on the right side of the website. The first statement mathematically describes the size of the grid as measuring thirty-two by thirty-two. [4] The second statement establishes which colours will be found within each square on this grid: white and black. The final statement is a proposition that states this grid will present every possible icon using the parameters set out in the first two statements.

These three statements complicate how the grid is to be understood and perceived because these statements can be interpreted both mathematically and aesthetically. It becomes difficult to know whether viewers are looking at the visual execution of a mathematical

theorem or the emergence of a work of art. Are viewers watching a sophisticated abacus as it slowly and successively counts out every permutation available to it? Or are viewers watching a rapidly changing abstract animation? Does Every Icon propose to visually represent a demonstration of a numeric theorem? Or does it propose an aesthetic experience? Simply put, when viewers encounter Every Icon, are they perceiving images that emerge from the work of science or, as Simon presents it, the work of art?

Gilles Deleuze and Félix Guattari state that when one discipline begins to interfere within the realm of another, the methods and techniques of that interfering discipline need to be followed. For them, 'the rule is that the interfering discipline must proceed with its own methods' (Deleuze and Guattari, 1994: 217). The methods and techniques that are used in one realm cannot be transposed onto the other. Accordingly, when art begins edging into the realm of science, it must proceed aesthetically. Deleuze and Guattari give an example stating that when discussing the beauty of a geometrical figure, like a square or a triangle, 'so long as this beauty is defined by criteria taken from science, like proportion, symmetry, dissymmetry, projection, or transformation, then there is nothing aesthetic about it' (1994: 217). Any scientific operation or technique used in or for the production of an artwork must be approached from the purview of art. 'There are indeed technical problems in art, and science may contribute toward their solution, but they are posed only as a function of aesthetic problems of composition that concern compounds of sensations' (Deleuze and Guattari, 1994: 196). If a particular work of art tries to proceed by scientific analysis, then the artwork risks being disregarded as art and instead could be deemed the work of science. Conversely, if an artwork is the object of scientific study or experiment, then it cannot be analysed aesthetically. Science must operate under its own standards and with its own methods and techniques, otherwise it could potentially be condemned as art.

There is a potential risk that the images viewers experience in the encounter with artworks that use or incorporate cutting edge technologies and work with scientific theories will be dismissed as the visual results of a scientific experiment, rather than producing something of artistic merit. Yet, without science, many innovative works of art may not have been able to generate the images that viewers experience today. Consider painter and architect Leon Battista Alberti's development of linear perspective in painting during the early Renaissance, which used geometry as its foundation; or the pointillist painting technique developed by George Seurat during the 1880s, which was influenced by the optical and colour theories of chemist Michel Eugène Chevreul and physicist Ogden Rood; or finally, Woody Vasulka's metamorphic video works from the 1970s and 1980s, which used some of the earliest digital imaging technologies (some of which Vasulka invented himself). [5] When viewers encounter these past works or more contemporary artworks categorised as digital, internet, or software art, or under the ubiquitous rubric 'new media art,' such as Simon's Every Icon, it is often the case that the images that are perceived cannot be clearly differentiated when it comes to art and science. Are they emerging from a scientific experiment or an artistic practice?

## A Question of Technique

In order to make any possible differentiations between science and art in artworks like *Every Icon*, the techniques of these two realms need to be further addressed. This is because what constitutes a scientific experiment or an artistic practice is a question of technique. According to Erin Manning, techniques 'are processes that work with the relational potential of that which is already underway' (2009a: 99). Techniques enable latent relations to arise for the experiencing as that experience is taking place. They do not create relations out of or from nothing. Rather, techniques are compositional processes that utilise the potential immediately available to it for the gathering and emergence of relations. For Bruno Latour, what is interesting about composition is 'that it underlies that things have to be put together (Latin *componere*) while retaining their heterogeneity' (2010: 473-474). Techniques enable that which is available for experiencing to generate relations and compositionally emerge into a novel encounter in the midst of that experiencing moment.

For science, there is a need for techniques to become tools for the production of reliable and repeatable result. A scientific experiment is circumscribed to a definitive outcome that judges its consistency by the repeatability of the very outcome it generates. The particular techniques it uses manifest themselves through their reliability to produce the same relational compositions every time they are called upon. The techniques science uses become specific scientific tools when there is a sense of predictability attributed to them as they repetitively generate dependable outcomes. Science would not use a particular technique if the outcomes did not have some form of anticipated accuracy to an intended outcome.

For instance, the technique of addition is scientific because when two or more quantities are combined, their relational composition generates the sum of these quantities, producing a result that can be repeatedly obtained. The repeatability of the technique then creates an expectation that the outcome will always be the same. If two plus two did not consistently generate a sum that equals four, but some other value like five, ten, or a billion, then the technique of addition would be deemed too unreliable for scientific use. Similarly, in optical colour theory, when two complimentary colours, such as green and magenta, are either combined or come within close proximity, they produce the colour white. [6] This technique of combining complimentary colours would not hold scientifically if it did not repeatedly produce the same outcome.

Science's need to focus on repeatable outcomes requires that some form of closure occurs in order to limit the activity of the techniques it uses. If these limitations were not put in place, then the process these techniques activate could potentially never end, making it difficult for

science to assess a particular technique's ability to generate a repeated outcome. For Brian Massumi: 'Science generates results by imposing controls designed to close its contents as much as possible' (2002: 235). The technique of addition, for example, could continue adding more quantities together, infinitely creating ever-larger sums. Likewise, the technique of combining optical colours could proceed to engage in an endless practice of colour fusion, infinitely generating every possible hue available to vision. At some point science requires that the process of activation must either be momentarily paused or completely stopped so that an evaluation of the results a particular technique has yielded can be conducted. Science needs to set restrictions to a technique's process of activation because stopping or limiting the process a specific technique activates enables science to assess a technique's consistency and repeatability. Without this closure, there would be no possible way for science to repeat a particular technique's process of activation in order to verify its consistency.

The techniques that activate art differ from those used in science. The aim of art is not to follow science in producing repeatable, consistent results drawn from the relations these techniques enable; instead, art focuses on generating an experience that leaves the outcomes it manifests open to ongoing relational encounters. The specific techniques that art uses draw relations to the forefront of attention by composing a novel experience for perception, while leaving this novel experience open to allow further relational encounters to emerge. This is why it is not unusual to experience a new flicker of colour when gazing at a painting or digital image, or another layer of sound when listening to a musical composition. Encounters with art tend to generate new experiences for perception because the techniques it utilises allow for changes to emerge in the midst of that encounter. A technique's compositional process of gathering relations in art continues after the work emerges, enabling the potential for new relations to emerge and affecting how the emergent artwork is experienced and ultimately perceived.

In art different techniques can potentially yield similar experiences. For example, in order for viewers to perceive a particular colour when they encounter an artwork, such as blue or red, artists do not need to use the same technique to generate these colours. There are several different techniques available that can activate a particular colour perception. Heinrich Wölfflin points to two techniques for activating colour that have been used throughout painting's history, which he calls the linear and painterly styles. The linear technique renders depictions through the use of lines, which distinguish and separate each depicted object and their details. The perceived colour is then filled between these lines. In contrast, a painting composed in the painterly style is only constituted by colour itself. There are no lines bounding colour to a specific detail or object that is depicted. Instead, the relations that occur among the colours within a painting activate it as such.

When using the linear style of painting, each of the depicted objects is coloured using a mixture of pigments based on the local colour of that specific object. Wölfflin gives an example stating that a 'painted blue cloak obtains its effect by means of the same material colour as the cloak had or might have in reality' (1950: 51). If there are areas of the blue cloak that appear lighter or darker, possibly from casts of either sunlight or shadows, then the painter will mix the blue pigment chosen to represent the cloak with either a brighter colour like white or a darker colour like black. It is from these distinctly rendered and locally coloured objects that the linear technique activates the painting. The fine, clearly rendered details of this technique further enable the potential for new relations to emerge with each encounter, generating something new to see.

Painters who use the painterly technique emphasise the relations among the colours, blurring the distinctions between any fine details. This is because the painterly technique 'aims at that movement which passes over the sum of things' (Wölfflin, 1950: 19). By using relations of colour, the painterly technique attempts to capture an overall impression of the depicted scene, instead of activating a painting from clearly rendered details found in the linear style. Wölfflin gives an example, stating that when a red cloak is painted using the painterly style, 'the essential thing is not the red of the natural colour, but the way in which the colour, as it were, changes under the eye of the spectator' (1950: 52). Brighter and darker areas of the red cloak in the painterly style may contain a variety of other colours that are not actually found locally, such as blue or yellow. This is because, when using the painterly technique, pigments do not need to be blended to imitate the local colour of the objects being depicted. Rather, pigments are mixed together in order to give the appearance of a particular colour. As long as the painting activates a seeing in which the colours emerging from it parallel those of the actual things being depicted, it does not necessarily matter what coloured pigments are used to achieve this. As well, because emergent colours activated by the painterly technique can use a variety of coloured pigments to achieve the visible outcome, there is the potential for other unintended colours to emerge from the same use of this technique. There is no definitive result that this technique activates.

Both the linear and painterly techniques used in painting are capable of activating experiences of colour that appear to be similar. Although these two techniques go about generating this experiential activity differently, they both can achieve similar outcomes that are open to further relational encounters. Examples of more contemporary techniques used in art, which are more closely aligned to Simon's *Every Icon*, are the vector imaging technique and the raster or bitmapping technique, which activate digital artworks. Like the linear and painterly techniques in painting, both the raster and vector techniques in digital art are capable of generating an encounter that yields similar outcomes, while simultaneously remaining open for new relations to gather as an encounter is occurring.

The vector imaging technique activates a digital artwork through the relations that gather from data that 'is recorded mathematically in terms of geometric shapes, points and lines called primitives' (Reed, 2006). The relations occurring among these mathematically generated points and lines activated by this vector technique enable images to emerge by differentiating and dividing a particular space. Similar to the linear technique in painting, objects and their details are rendered with a series of lines that produce shapes, which are then coloured to the intended hue. Because the vector technique is based within a mathematical structure of lines and points, the encountered images that emerge from this technique have the ability to be activated at a variety of sizes without any visible degradation. A digital image activated by the vector technique can easily be made ten times as large without any perceptible loss of detail by making a proportional calculation among the points and lines. If a red rectangle is rendered measuring four centimeters wide and three millimeters high, then when this rectangle is made ten times larger, it will still be proportionally the same. The width to length ratio will still be four to three. The red rectangle will simply be forty centimeters long and thirty centimeters high. This means that there is no particular outcome that is generated when a digital artwork is activated by the vector technique, leaving the work open to potential new relations.

The other technique used in digital artworks, raster imaging, activates relations with a grid comprised of squares, or pixels, and 'assigns data to all of the squares in the grid based on their color and location' (Reed, 2006).[7] Encountered images emerge from this technique through the relations that occur among the pixels, unlike the vector technique that activates artworks through a series of lines and points. The data that is assigned to each pixel activates a specific colour within it. This data is based on a sampling of the primary additive colours red, green and blue. The colour of each pixel is always comprised of a proportion of these three colours. Once the colours of the pixels is established, they then begin to gather into relations, affecting each other like the colours of the pigments used in paintings activated by the painterly technique. As these coloured pixels interact, there is the potential for new colours to emerge from their activity. These new emergent colours are what viewers come to see as the images generated in the encounter with the digital artwork. The relations among the coloured pixels continue affecting each other as the image continues to be encountered, enabling minute fluctuations to emerge in the seeing. The seen image persists in remaining open to the emergence of subtle nuances of colour activated by the raster technique.

## A Composite Practice

The raster and vector techniques are particularly interesting because the data that these two techniques use to activate digital artworks comes from the realm of science. These two techniques use scientific methods for artistic outcomes. On the one hand, the vector technique



enables relations to gather among the measurements of points and lines that the scientific techniques of mathematics and geometry activate. On the other hand, the raster technique gives the means for relations to come together among colours in each pixel of its grid. Precise proportions of red, green and blue that the scientific technique of primary additive colours determines generate these colours encountered within the pixels. These precisely measured colours are then positioned within a set of mathematical coordinates that is the grid. These two techniques used in digital artworks produce an overlap that slides between the realms of art and science because the artworks emerge from the relations occurring among data, which in turn is produced by scientific techniques.

The overlap of art and science that emerges when encountering many digital artworks such as photographs, videos and websites also occurs with *Every Icon*. This is because Simon's work is activated by the raster technique. Viewers can easily discern the grid and black and white square pixels that the raster technique uses in order to activate this artwork, generating the images they come to see. As well, Simon proclaims his use of the raster technique in the first two statements presented on the left side of *Every Icon*'s website, stating the actual size of the grid and the colours to be found within that grid. The use of the raster technique in digital art is not particularly unique. It is the most widely used imaging technique in digital image. This is because, according to Stacy Reed, this technique is 'easier to manipulate, and can record data of photos [as well as videos and websites] with more accuracy than vector can, capturing subtle shifts in hues and values' (Reed, 2006). But what specifically differentiates *Every Icon* from the many artworks that use the raster technique is that it directly engages in the overlap of science and art. The scientific techniques informing *Every Icon*'s raster technique appear to be the content of the work itself. This overlap of science and art in *Every Icon* is so subtle, Deleuze and Guattari would state 'that we find ourselves on complex planes that are difficult to qualify' (1994: 217).

When looking more closely at how science is involved in the activation of *Every Icon*, it is clear that this work's use of the raster technique as well as new technologies (for its time), such as java applet software to generate the seen imagery and the internet as a distribution and exhibition platform, are not what solely generate it as such.[8] Rather, *Every Icon* is activated by a composite of scientific and artistic techniques, which is in keeping with how most of the world is actually encountered. Deleuze explains that, 'things are mixed together in reality; in fact, experience itself offers us nothing but composites' (1988: 22; emphasis added). Simon's very method for activating *Every Icon* is to take scientific and artistic techniques as composites that enable the images that viewers encounter to emerge. As Guattari notes:

*I don't think that scientific and technological progress must necessarily bring about a 'schiz' in relation to desire and creativity. On the contrary, I think that machines must be used – and all kinds of machines, whether concrete or abstract, technical scientific or artistic. Machines do more than revolutionise the world: they completely recreate it (2009: 74).*

Simon's artistic practice involves the creation of a machine that interfolds the techniques and technologies of science with art for the activation of an artwork. This machine is Every Icon itself. As soon as science and its activating techniques become the composites for Every Icon, science is no longer strictly scientific; instead, it becomes a contributing composite for activating Simon's artwork. Yet as a composite for the activation of Every Icon, scientific techniques do not transform into artistic ones. Rather, science co-activates Simon's artwork with other artistic techniques.

What Simon is doing with scientific techniques and data is not what science does with them. It is not Simon's goal to become a scientist or to produce a strictly scientific work. Rather with Every Icon, he is making science do the work of art by tuning science towards generating an artistic outcome. He has an interest in scientific techniques but it is strictly for a singular artistic purpose. If Every Icon strictly did the work of science, it would generate a specific and repeatable result that would stop relations from continually gathering. Remember that science will stop or halt new relations from emerging in order to test the accuracy and consistency of its techniques to generate repeatable outcomes. However, the data that the scientific techniques produce for Every Icon—the size of the grid and the black and white colours within that grid—is not being used to generate a result that is closed to new relational encounters. Though Every Icon's use of scientific techniques, the work demonstrates how impossible it is for science to actually stop relations from emerging. According to Massumi, 'the results of [science's] own methods, the very effects its closures enables it to produce, flow back around to create a qualitative global situation that makes reopening ingress into, and interferes with, its every contextual exercise' (2002: 235). No matter how consistent a scientific technique is in producing repeatable results, there will always be the potential for new relations to gather. These relations then begin affecting the very consistency that a scientific technique is supposed to produce because they enable the intended repeatable outcome to transform into a singular event. This inability of science to completely prevent new relations from emerging is what generates the composite overlap between science and art that activates Every Icon.

## The Transduction of Images

When viewers encounter the overlapping composite of science and art in *Every Icon*, they do not actually see a series of techniques from these two realms activating the work. What viewers experience is the work as a whole, not the techniques as such. Viewers come to see what the confluence of science and art is working towards, which for *Every Icon* is the emergence of flickering black and white images.

The images that emerge from the overlapping of science and art in *Every Icon* might be understood as a set of representations because the third statement on the left side of Simon's website explicitly proposes that every icon will be shown within the black and white grid. Yet despite this unequivocal proposition to show all the icons within the confines of a thirty-two by thirty-two grid, *Every Icon* actually generates something much more dynamic. Simon explains that his work 'posits a representational system where computational promise is intricately linked to extraordinary duration and momentary sensation' (Simon, 1996). Viewers do not actually see a series of visual results in the form of fixed representations activated by scientific techniques; rather, they perceive images emerging from the dynamism that is generated by the overlapping of science and art. The black and white squares on the grid exceed their mathematical coordinates and optical colour combinations, producing a movement that can only be felt in the seeing.

The overlap of science and art in *Every Icon* generates a dynamic movement that for Latour is compositional. Recall that Latour's understanding of composition involves elements that enter into relations in order to produce something new, while simultaneously retaining their singularity in the midst of the act of composing. The techniques that activate the black and white squares within *Every Icon*'s grid come together and begin composing an experience. The black and white squares and the grid itself are not only singular pieces of data generated by scientific techniques but should also be considered as compositional elements. They become compositional as they proceed to enter into relations.

Because the grid and the black and white squares are compositional elements that gather into relations, the experience viewers have in their encounter with *Every Icon* cannot be predetermined by data the scientific techniques produce. The scientific data is transformed into compositional elements through a process of transduction that generates a dynamism viewers feel as they encounter *Every Icon*. According to Manning, transduction 'is a shifting between planes that requires a simultaneous shift in process' (2008a: 330). In *Every Icon*, transduction is not a process of translating scientific techniques into artistic ones, but

instead is a transformation that produces movement felt as the compositional elements proceed to overlap between science and art. The process of transduction alters how the scientific data that activates Every Icon is encountered. It remains compositionally open to new relational encounters, breaking with the scientific procedure of closure. This openness gives each of black and white squares within the grid the means to begin entering into relations, making them elements that compositionally participate in the encounter with viewers.

Despite the dynamic movement that is felt, the process of transduction is not actually visible. Viewers do not perceive the compositional elements entering into new relations. Instead, they see the effects that emerge from the dynamism this process generates as it moves through the interval between the realms of science and art. These effects are perceived by viewers as images. Manning explains:

*The image we see is the activation of an incipient movement transducing an interval into form—a transduction of movement into mattering-form. Movement becomes matter in the taking hold of the now that is the event of perception. This is a taking hold not of the image as such, but of its relational coming into appearance (2008a: 337).*

The transduction of movement across science and art in Every Icon enables the incipency of images that is experienced. In this transductive moment of movement, the emergent effects become the images viewers come to see on the right side of Simon's website in the form of the grid with its flickering left corner. These images are not a series of representations. Rather, these images are a dynamic effect that emerges from the process of transduction and have no existence or obvious reference (beyond the simple science suggested in the third statement) outside of the encountering moment shared between viewer and Simon's work.

Simon's third statement, that proposes to show every icon, expresses an inextricable relationship between science and art. From the perspective of science, Every Icon's proposition puts forward only a mathematical system of coordinates that visually represents the calculations of all the possible permutations found on the grid. Yet according to Manning: 'Propositions never attend solely to the datum' (2009b: 226). Every Icon's proposition activates more than just a variable display of black and white squares on a grid. It generates 'enabling constraints for the opening of a relational process' (Manning, 2009b: 227). [9] The enabling constraints in Every Icon are the grid and the two colours – black and white – within the grid. As will be explained towards the end of this article, these enabling constraints lure the viewers' attention by gathering potential sensations into sets of relations.

In order to follow Every Icon's transductive movement from a scientific representational system to the incipency of flickering images, the work's scientific foundation needs to be examined. For the remainder of the article, a journey shall be taken that starts on the scientific plane of reference and ends at the artistic plane of composition. [10] The primary guides for this adventure in transduction will be Deleuze and Guattari. The journey will begin on the plane of reference, which resides within the realm of science and is populated by 'functives' and 'functions'. These functives and functions assist in demarcating limits and boundaries and set up a system that coordinates scientific data on the plane of reference. The journey will end at the plane of composition, which is within the realm of art and is populated by sensations.

Like the realms of science and art, these two planes overlap in Every Icon. They do not generate strict dichotomies because there is no clear boundary between these two planes. Rather, these two planes generate a complex continuum that enables transduction to occur. The move from the realm of science to the realm of art occurs inconspicuously, through a zone of indiscernibility. When in this zone, it is impossible to know whether the plane of reference has been completely left behind or whether the plane of composition has even been entered. It is a space 'between two forms, one of which is no longer, and the other, not yet' (Deleuze, 2003: 126-7). This indiscernible zone is where the shaping of materials and the creation of techniques occurs. This place is one of 'technical composition'.

Technical composition should not to be confused with the plane of composition as such. Deleuze and Guattari differentiate between 'technical composition', which leads perhaps from within science towards art, and the plane of composition, which is the exclusive concern of art.

*[C]omposition is the sole definition of art. Composition is aesthetic, and what is not composed is not a work of art. However, technical composition, the work of the material that often calls on science (mathematics, physics, chemistry, anatomy), is not to be confused with aesthetic composition, which is the work of sensation. Only the latter fully deserves the name composition  
(Deleuze and Guattari, 1994: 191-2; original emphasis).*

If there is a 'plane of technical composition' this involves science but it is not, strictly speaking, scientific. Yet it is also not art because it is not yet doing the work of sensation. It is concerned with the materials that allow for these sensations to occur.

In what follows, the transductive path Simon lays out in *Every Icon* will be traced.

## The Plane of Reference

In *Every Icon*'s first statement, Simon asserts that an icon will be a grid measuring thirty-two by thirty-two. This is both a description and a demarcation of a space. It not only delimits a territory on which all subsequent statements and operations will play out. It also works to slow down the actions of chaos in order to make these actions perceptible. The grid seeks to order experience. It is the form the order takes. However, chaos here should not be understood as pure disorder, but rather as a force of infinite speed within a field of infinite size. Deleuze and Guattari state that chaos;

*... is a void that is not a nothingness but a virtual, containing all possible particles and drawing out all possible forms, which spring up only to disappear immediately, without consistency or reference, without consequence (1994: 118; original emphasis).*

Chaos is a virtual field that cannot be perceived but it can potentially be experienced through the effects it generates. The virtual, according to Brian Massumi, 'appears only in the potentials it drives and the possibilities that unfold from their driving' (2002: 136). Viewers can encounter the virtual's incipency in the effects that emerge from its actualisation.

Take gravity for example. When an apple famously hit Newton on the head, he did not perceive gravity directly. 'Newton did not see gravity. He felt its effect: a pain in the head' (Massumi, 2002: 160). Newton's perceived pain is the effect that gravity had on the apple's potential to fall, as gravity emerged from the virtual field of chaos. If someone witnessed the apple hitting Newton's head, then the perception they would have had in seeing the apple fall towards Newton would have been the visible effect of a particular instance of gravity's actualisation. Such actualised effects are what are visible or painful, not the virtual itself.

Because chaos is a virtual field of potential and contains all possible particles and forms moving at an infinite speed, as Deleuze and Guattari noted above, what is actually perceived through the grid's ordering principles is always a subtraction from and a deceleration of this field. Even within this, there is always more to see, smell, taste, touch, or hear because perception can never completely grasp everything that is made available to it. And once



something is actually grasped by perception, it slips back into the virtual field of potential, just as quickly as it emerged. This makes the moment of actualisation quite ephemeral. What is actually perceived is a less-than that is always rapidly exceeded by the more-than of the virtual. To reiterate, then, in order to limit the potential for perception to exceed itself, and thus quickly return to the virtual field, science proceeds to establish a plane of reference. According to Deleuze and Guattari, the plane of reference is 'constituted by all the limits or borders through which it confronts chaos' (1994: 119). It is where thresholds are determined and matter obtains position within a scientific system. It is where potential from the virtual field is actualised into specifically referential configurations.

The delimiting and territorialising actions of the grid in *Every Icon* assist in establishing the plane of reference. *Every Icon*'s grid generates a controlled space that assists in the slowing of the infinitely fast movements of the virtual occurring within the field of potential. It is a space that encourages perception to emerge from the virtual field of potential, while simultaneously trying to prevent its return to that same field. The grid acts like a net that is cast into the virtual field in order to capture and position the potential that resides within it into actualised configurations and forms. Once caught, these newly actualised forms gain a reference within the grid's system of coordinates. Yet I shall demonstrate later in this article that the grid touches on compositional processes even while it is committed to constructing the plane of reference.

The referential configurations and forms that shape the plane of reference are what Deleuze and Guattari call *functives* (1994: 118). They explain that there are two types of *functives*. The first type, which are called 'endoreferential' *functives*, comprise of limits or variables that pervade science, which establish a threshold that cannot be surpassed. Examples of some of these unsurpassable limits are the speed of light (299,796 kilometers per second), which is the fastest speed matter can move; absolute zero (273.15 degrees Centigrade), which is the temperature at which matter stops moving; or the Big Bang, which is the beginning of time for the present universe. As well, thresholds considered to be endoreferential *functives* can be established by creating a set of variables, such as all rational numbers between one and nine. The endoreferential *functive* in *Every Icon* is based on a set of variables, the two colours black and white that are mentioned in the second statement.

Both limits and variables carry out a form of counting. Deleuze and Guattari state that it is these 'limits that constitute slowing down in the chaos of the threshold of suspension of the infinite, which serve as endoreference and carry out a counting' (1994: 119). Limits are the point where counting begins or ends. Variables are countable things found within a set. When a limit or a set of variables is determined, the process of counting begins. Having to count either each step as a limit is approached or every variable within a set slows an ac-

tualised configuration's return to the virtual field of chaos. What cannot be counted thus remains as potential within the virtual field of chaos and outside the purview of the plane of reference. This means that in Every Icon any colour that falls outside the set of black and white colours will not be actualised, persisting within the virtual field of chaos as potential.

The second type of functive, which is called 'exoreferential', demarcates the space where the variables or limits are placed. It is an external framing device, such as a mathematical system of coordinates. Anything that is slowed by the limits and variables is also caught within the web of a coordinate system. Deleuze and Guattari give an example:

*A particle will have a position, an energy, a mass, and a spin value but on the condition that it receives a physical existence or actuality, or that it 'touches down' in trajectories that can be grasped by systems of coordinates (Deleuze and Guattari, 1994: 119).*

Simply put, the grid as described in the first statement of Every Icon is an exoreferential functive. The grid can track or place with some exactitude where a limit is demarcated or where variables are positioned. It situates and differentiates, on the plane of reference, what has been actualised from the virtual field of chaos.

When an endoreferential functive and an exoreferential functive are established and situated on a plane of reference, they enter into a relationship from which a third variable is determined. This new variable is called a function and it cannot exist without two or more functives connecting in some manner. According to Deleuze and Guattari, a function 'is a complex variable that depends on a relation between at least two independent variables' (1994: 122). For a function to be established one or more limits or sets of variables must be situated within a delimited space or system of coordinates. Once established, a function becomes an object of science that accounts for the state of affairs on the plane of reference. This state of affairs is presented as a scientific proposition (Deleuze and Guattari, 1994: 122).

From the three statements that appear on Every Icon's website, it can be established that there are two functives, a function, and a scientific proposition presented. The two functives are presented in the first and second statements. As stated above, the first statement presents an exoreferential functive that indicates the size of the grid, which measures thirty-two by thirty-two. The second statement presents an endoreferential functive that indicates a set containing two coloured variables will be allowed within the grid, which are black and white. With these two functives, Every Icon generates a plane of reference that clearly de-

marcates a territory and declares what will be found within that territory. By establishing this plane of reference, Every Icon is able to capture the colours white and black in the netting of the grid, wrestling them away from the virtual field of chaos.

These two functives not only establish a plane of reference for Every Icon but they also enter into a relationship and produce a function. This function is the result of a mathematical state of affairs in which all the combinations of the two variables are allowed to occur in every element found within the designated space. These elements, according to Massumi, 'can be used as the basis for comparative judgment in any context, independent of situation' (2002: 165). They are general abstract entities that can be 'seen anytime in principle, but nowhere in particular' (Massumi, 2002: 165). This is because elements that are found on the plane of reference are relative to the standards or limits established by functives. Since the grid in Every Icon measures thirty-two by thirty-two, the number of elements can be determined simply by multiplying these two numbers. This results in one thousand twenty-four distinct elements established on the plane of reference. From here, each of these elements can be one of two possible colours, either white or black. Specifically, Every Icon's functives establish one thousand twenty-four black and one thousand twenty-four white elements. Each element found within the grid is only differentiated by the colour that it keeps.

This means that in order to determine that number of possible combinations of elements on the grid, and thus Every Icon's function, a multiplication of the number two must be repeated one thousand twenty-four times. The result is two to the one thousand twenty-fourth power. This can be expressed mathematically as  $2^{1024}$ , or it can be expressed by the power of ten as the approximate numeric value of  $1.8 \times 10^{308}$ , which is Simon's preferred way of expressing this function (Simon, 1996; Mirapual, 1997; Baumgärtel, 1999). [11] In order to comprehend this number, imagine a one then an eight followed by three-hundred and seven zeros. If pressed to describe the number of combinations possible in Every Icon with only words, it could be said that there are approximately three googol images generated in this work, with a googol being ten to the one-hundredth power ( $10^{100}$ ).

## Things

Every Icon's function,  $1.8 \times 10^{308}$ , appears to present a well-defined system of coordinates and offers a state of affairs that reflects Simon's proposition to show every icon, as stated in the work's third statement. The function clearly indicates the number of icons that are to be shown. As well, the excessive potential of the chaos seems to be captured by the limitations of the two variables, white and black, and contained by the grid's system of coordinates on

the plane of reference. Chaos has been slowed down enough for forms to be actualised from the potential that resides within the virtual field by a process of counting that is generated by the combined efforts of the endoreferential functive (the colours) and the exoreferential functive (the grid).

However, Deleuze and Guattari point out that 'the most closed system still has a thread that rises towards the virtual' (1994: 122). Even with the soundest function on the plane of reference, there is the potential for any actualisations created on this plane to exceed themselves. Like a dam holding a large amount of water, there is always the prospect of leaks appearing within the plane of reference. When actualised forms begin exceeding the limits established by the function on the plane of reference, it is because these actualisations are applying pressure to these limits, causing cracks to develop in the plane's construction. This pressure that is being applied to the plane of reference is not physical pressure. Rather, it is the actualised forms becoming more than what the limits can actually handle. In order to plug the leaks generated by the ability of actualised forms' to exceed themselves, either new functions must be added to supplement those already present or the present function must be completely changed. These additions to the system create a more complex entity on the plane of reference. If any actualised forms completely surpasses the limits established by Every Icon's function, then the plane of reference constructed for Every Icon, like a faulty dam, will be need to be dismantled and rebuilt.

Any function that has been laid out on the plane of reference will eventually form cracks or bifurcations, which introduce the potential for different variables not originally included to alter the forms that have been actualised. These new variables can affect the operation of the established system by causing it to branch out into different directions, generating openings into what appears to be a unified whole. 'Science does not carry out any unification of the Referent but produces all kinds of bifurcations on a plane of reference that do not preexist its detours or its layout' (Deleuze and Guattari, 1994: 123). No system produced on the plane of reference is ever fully closed or completely unified.

As I have begun to suggest, when a function's state of affairs bifurcates and can no longer contain the excesses particular actualised forms generate, the addition of another function can curb an actualised form's ability to go beyond its own actualisation. This new function is formed when the older function acts in concert with one or more new functives. The older function becomes a variable, one of the functives, used in this new function. When there are two functions working together on the plane of reference, according to Deleuze and Guattari, a thing forms. 'When we go from a state of affairs to the thing itself, we see that a thing is always related to several axes at once according to variables that are functions of each other, even if the internal unity remains undetermined' (Deleuze and Guattari, 1994:

122; original emphasis). A 'thing' comes into being when one function is reliant on a new function to stop it from bifurcating and conversely when a new function is dependant on an older function for its inception. This new 'thing' works with the registers of both functions, meaning that it interacts with the state of affairs of both functions on the plane of reference. For example, a 'thing' may be comprised of a function that calculates space and another that calculates time. Both functions work on different registers, one with space and the other with time, but when they interact with each other a 'thing' appears. When a new function is added and a 'thing' emerges on the plane of reference, the bifurcation that appeared in the older function is then stopped and the exceeding actualised forms are re-contained and re-actualised once again.

Simon's proposition indirectly reveals how actualised forms exceed the limits established by the function in Every Icon by specifically indicating that all icons are to be shown. To display all of these icons and demonstrate every possible permutation on the grid, it requires more than just a single mathematical function. Time is needed to show all the icons, which is something Every Icon's function,  $1.8 \times 10^{308}$ , does not take into consideration. This single mathematical function presents a state of affairs that expresses how many possible black and white icons can be presented on the thirty-two by thirty-two grid. Yet, in order for this function to fully express itself and show every possible icon, it needs to proceed with a process of counting. This counting process takes time, which is something that exceeds the limits of this particular function as performed.

It appears that the new variable of time has emerged as the bifurcation that exceeds the limits the state of affairs of Every Icon's function can express. This starts to unravel the present system on the plane of reference. As soon as the grid is laid out on the plane of reference and Every Icon's first icon is accounted for, some amount of time must pass before the second icon is counted. Simon chose to begin Every Icon with all the one thousand twenty-four elements in the grid coloured white, forming a completely white icon. The second icon produced is all white except for the element that is in the upper left corner, which is black. The third icon produced is all white except for the square in the second column to the left in the first row. Yet the process of counting all the icons can only continue to the end if the bifurcation opened up by time can be plugged. If the system is to be sustained on the plane of reference, this new variable needs to be captured before it unfolds with infinite speed into the depths of chaos. This requires the addition of a new function, which will prevent time from enabling the already established actualisations from exceeding the function that is currently on the plane of reference.

In order to calculate how long it will take for Every Icon to count all of the icons on the thirty-two by thirty-two grid, new endoreferential and exoreferential functives need to be

revealed to determine Every Icon's function for time. The new endoreferential funcitive – the limit or set of variables – is the number of icons that will be made visible. The already determined function,  $1.8 \times 10308$ , becomes this new function's endoreferential funcitive. But more is needed. Thus the new exoreferential funcitive is the rate at which these icons are shown. This funcitive will state how fast the icons are to be counted. Simon explains that this rate of change depends on the speed of the computer's processor that runs the software for Every Icon. He states that, 'at a rate of one hundred icons per second (on a typical desktop computer) [in 1997], it will take only 1.36 years to display all variations of the first line of the grid' (Simon 1996). Simon did not arbitrarily choose this rate of one hundred icons per second. It is the actual rate of change that Every Icon is displayed at on his website. [12]

It should be noted that at this rate of one hundred icons per second, it will take approximately six billion years for Every Icon to show all the possible combinations of white and black in just the first two lines (Simon, 1996; Baumgärtel, 1999). Nearly six billion years will be required for all the squares in the top two rows to go from displaying the colour white to all of them displaying the colour black. The Earth is estimated to be only a little more than four and a half billion years old. [13] By the time the first two lines in Every Icon appear completely black, all the species of life presently on Earth will likely be extinct or will have evolved into other species many times over.

When this new exoreferential funcitive of one hundred icons per second enters into a relationship with the new endoreferential funcitive, which is the older function of  $1.8 \times 10308$  icons, a new function is determined. This new function establishes the time it will take for Every Icon to show all of its icons. It will also determine when the final icon will be reached. When this new function is expressed mathematically, it indicates that it will take  $1.8 \times 10306$  seconds, or approximate  $5.7 \times 10298$  years, for Every Icon to display every icon. This equation,  $5.7 \times 10298$ , becomes the new function that gives Every Icon its reference in time.

This means that there are now two functions on the plane of reference, one function that establishes the number of icons and the space the icons occupy, and a second function that determines the rate at which these icons are counted and the total time it will take to count them all. As was discussed above, the new function depends on the older function for its existence and, conversely, the older function relies on the new function to stop bifurcations that appear. The new function that expresses a closure of the variable of time is dependant on the older function, which expresses space, for its existence.

Because the relationship between the two functions is mutually dependent, it creates an internal unity on the plane of reference that enables a "thing" to be actualised. From the



correlation between the two functions' state of affairs, space and time, the 'thing' emerges as Every Icon's many icons. As a 'thing', the icon expresses a more complex system than any one function can alone. This is because the "thing" coordinates both space and time, whereas a function can only coordinate one of these systems. Neither space nor time can now be easily removed from the plane of reference without destroying the icon or the plane of reference itself. To do so would impinge on Every Icon's ability to fulfill its proposition of showing every icon and return any actualisations this work creates to the virtual field of chaos.

## Bodies

Despite the fact that all of Every Icon's variables and limits have been clearly delineated and the icon in Every Icon can now be defined as a 'thing', Simon's proposition is not yet completely expressed. So far this article has outlined how much space the icon occupies, how many combinations of white and black Every Icon can produce, how much time it will take to show all of these combinations, and how all of these limits and variables are coordinated within a unified 'thing'. The problem now is that the icon, as a 'thing', cannot express the manifestation of every combination available to it on the plane of reference. This means that a new variable, difference, needs to be addressed. Since the icon itself cannot express difference, a new bifurcation opens up on the plane of reference, again allowing established actualised forms to begin exceeding the system's capacity to keep them from returning to the virtual field of chaos. Unlike a 'thing', the addition of a new function cannot mitigate this new bifurcation. If the difference between each distinct permutation of the icon can be demonstrated, then the bifurcation can be sealed and the proposition of having every icon shown can be fulfilled. But this requires the formation of yet another more complex system, one that builds from the foundation of the icon itself.

Deleuze and Guattari call this new system a 'body'. They explain that a 'body' appears on the plane of reference 'when the thing itself undergoes changes in coordinates...and instead of the function taking the limit and the variable as reference, it takes an invariant and a group of transformations' (Deleuze and Guattari, 1994: 122). A 'body' is a 'thing', but a 'thing' that is subject to difference. It is a 'thing' that is capable of changing itself. A 'body' 'proceeds by a cascade of actualisations' (Deleuze and Guattari, 1994: 123). In order for change to occur, one element on the plane of reference must remain unaltered. This element is an invariant, which becomes the foundation of the 'body' within the plane of reference. No matter how many permutations a 'body' undergoes, the invariant persists. Because of the enduring nature of this invariant, a 'body' can manifest a number of transformations on the plane of reference without creating bifurcations that that would otherwise enable this actual-

ised 'body' to exceed its own actualisation.

In order to show all the permutations that the icon can undergo in Every Icon, an invariant must be chosen so that a 'body' can take shape on the plane of reference. The invariant will allow the 'thing' – the icon – to undergo the enormous number of changes that was originally calculated as the first function,  $1.8 \times 10308$ . This invariant is the grid itself and not the measurement of it, as expressed by the equation  $32 \times 32$ . This is because no matter how the colours white and black are arranged within the elements of the grid, the grid itself remains constant. The lines of the grid are like steel lattices that hold firm, while the numerous combinations of white and black manifest in the spaces in between. The invariance of the grid enables changes to occur within the space and over the time, which is all coordinated on the plane of reference

By establishing the invariant, a stream of difference can manifest in Every Icon. The invariant produces an opening to difference because it enables the elements within the grid to fluctuate between the colours white and black. The grid remains constant in contrast to the cascade of actualised icons occurring one hundred times per second. Recall that Simon starts this stream of actualisation with all the elements in the grid coloured white. Changes in the grid begin one-hundredth of a second later when the element in the upper left corner immediately turns black. Following this, that upper left element returns to white and the element to its immediate right turns black. Every Icon continues in this manner moving through every possible combination of white and black in the first row of elements. After all the elements in the first row become black, they all return to being white and the first element on the left in the second row changes from white to black. As Simon mentioned above, for the elements in the first row to become entirely black takes 1.36 years. The first element in the second row will not become white again until all the elements in the first row become black for a second time. This process will continue until all the elements appear black and the last icon is shown.

The grid and all of the possible combinations of white and black, from the all-white icon to the all-black icon, constitute the 'body' of Every Icon. The invariant grid's stable presence provides the skeleton that enables the elements within it to take on the unimaginable number of differentiated forms actualised on the plane of reference. Without the different combinations of white and black successively manifesting themselves within the invariant grid, there would not be a 'body' on Every Icon's plane of reference. Without this 'body' to stop the bifurcation that was created when the variable of difference appeared, the potential extracted from the virtual field would not be actualised into a cascade of differentiated icons and Every Icon would have proceeded to unravel with infinite speed.

With a constituted 'body' on the plane of reference, Every Icon can now be represented graphically. Simon's proposition can now be demonstrated. It is possible to show every icon, as illustrated on the right side of Every Icon's website. This is because the infinite speed of chaos has been slowed down enough by the plane of reference so that forms can be actualised from the virtual field of chaos. The plane of reference restricts the movements of chaos within the lattice of the invariant grid so that it can be shaped by limits and variables, by the functives and functions, in order to actualise the icons of Every Icon. As each icon is successively actualised (at a rate of one hundred per second) on the plane of reference, viewers see the fulfillment of Simon's proposition. By proposing to show every icon, Every Icon constructs a series of functives, functions, 'things', and a 'body' in order to actualise potential from the virtual field. Each actualised icon displayed on the invariant grid with its unique configuration of white and black is one step towards Every Icon's return to the virtual field of chaos. Recall that the virtual field of chaos can never be directly experienced as such but can only be felt via the effects that are actualised. Simon's proposition, from the perspective of science, lays a path that at every turn— from functions to 'things' to 'bodies'—attempts to restrain chaos' infinite speed and prevent any actualised forms from exceeding their own actualisation on the plane of reference.

## Lures for Feelings

If viewers look at all the elements that comprise Every Icon's plane of reference, they will notice that these elements appear to be quite similar to those situated within the work's technical composition. The plane of reference and Every Icon's technical composition can seem somewhat indiscernible because technical composition involves the arrangement of elements – which can be both material and immaterial – in a particular manner using a specific set of techniques. Deleuze and Guattari indicate that technical composition is populated by a variety of techniques that,

*... include many things that are individualised according to each artist and work: words and syntax in literature; not only the canvas but its preparation in painting, pigments, their mixtures, and methods of perspective; or the twelve tones of Western music, instruments, scales, and pitch (1994: 192).*

In digital art, technical composition involves both hardware and software, which can include computers, processors, monitors, digital cameras, and the internet, and also encompasses spatial and tonal resolution, algorithms, systems of coordinates, and binary code. Many of these materials and techniques found in digital art are also found in Every Icon; but Every Icon's technical composition also contains the functives and functions that constitute the

'body' produced on the plane of reference, which include the thirty-two by thirty-two grid, the colours white and black, the one hundred icons per second display rate, and the displaying of each icon successively beginning with the all-white icon. The mutual use of the functives and functions is what makes the indiscernibility between the plane of reference and technical composition possible. Both overlap because they share the same compositional elements in Every Icon.

These shared elements between the plane of reference and the work's technical composition also makes it difficult for viewers to clearly determine whether Every Icon is a scientific representation or an aesthetic composition. As Deleuze and Guattari would say, 'we find ourselves on complex planes that are difficult to qualify' (1994: 217). Nevertheless, if Every Icon is to transductively make the leap from scientific representation to aesthetic composition, then distinctions need to be made between the plane of reference and the work's technical composition. Sensations need to be foregrounded. 'We paint, sculpt, compose, and write with sensations' (Deleuze and Guattari, 1994: 166). The viewers' attention cannot solely be focused on the workings of Every Icon's 'body' found on the plane of reference. Focus needs to shift towards the emergence of sensations in order for Simon's work to pass from the plane of reference to its technical composition and then onto to the plane of aesthetic composition, or, as noted above, what Deleuze and Guattari simply call the plane of composition.

If the functives and functions laid out as a 'body' on Every Icon's plane of reference are to be understood from the perspective of art, then they can no longer be viewed as that which changes within an invariant system of coordinates, representing the calculations of all the possible permutations found within the icon. As the elements and techniques for the plane of technical composition, the functives and functions can no longer act as variables that impede the emerging excesses of that which is actualised. Instead, they need to be understood as activating parameters, or what Manning and Massumi call 'enabling constraints', which incite potential sensations to gather together in order to grab the viewers' attention. 'Enabling constraints are not rules as much as active parameters carving out an atmosphere for the event's potential realisation' (Manning, 2008b: 9). Recall the first two statements on Every Icon's website, which state that the grid is to measure thirty-two by thirty-two and that all the elements on that grid are to be white or black. When approached from the perspective of art, these two statements do not use the grid and the colours to establish limits and variables in order to calculate and count the number of possible permutations. Rather, as enabling constraints, the grid and the colours activate a perceptual field for white and black sensations to metamorphosise into visible images.

When the functives and functions of Every Icon are transduced into compositional elements and techniques for the plane of technical composition, the plane of reference can no longer

continue to prevent the actualisations it generates from exceeding themselves, opening themselves up to the virtual field. Instead, the compositional elements and techniques, as enabling constraints, modulate Every Icon's ability to go beyond its own actualisation so that it can emerge from its technical composition as the sensations viewers feel on the plane of composition. What viewers encounter in their experience with Every Icon is not able to fully exceed its own actualisation on either of these planes, but it is allowed to flow at an accelerated pace. More importantly, viewers can literally feel this acceleration as they watch the movement of the squares in Every Icon changing from white to black in the intense flickering in the upper left corner on the top row of the grid. The moment viewers feel this acceleration in the grid and perceive the movement of the squares in Every Icon, they have moved from the work's technical composition to the plane of composition itself. It is at that point that the elements and techniques pass into sensation (Deleuze and Guattari, 1994: 193).

Once sensations begin emerging for Every Icon, the 'body' coordinated by the invariant grid on the plane of reference is transformed into a perceptual field. In this field felt sensations generate the flickering image viewers see emerging from the plane of composition. For Anna Munster: 'It is as if images can no longer be located as distinct sets of coordinates upon a grid providing them with place and context in a system. They are now laid out on a plane, to be organised principally by directions and speeds in time' (2006: 174). When viewers watch Every Icon, they do not actually see the succession of clear and distinct representational icons that the invariant grid organises on the plane of reference; instead, they feel the accelerations of black and white sensations that generate the visible metamorphosis of a seen flickering image within a perceptual field on the plane of composition. Steven Shaviro explains: 'In metamorphosis, it is not the thing itself that attracts [viewers], over and above its qualities; it is rather the very unsteadiness of the thing that draws [viewers] onward, as it ripples and shifts in a kind of protean wavering' (2010: 8). Neither the invariant grid nor the icons themselves lure the viewers' attention; rather, it is the felt black and white sensations that generate the flickering image that draws the viewers' gaze. The invariant grid and the innumerable icons are backgrounded from perception in favour of the image generated by the oscillations of black and white. By proposing to show every icon, Simon's work has taken mathematical functives and functions and transduced them into what Alfred North Whitehead calls 'lures for feelings' (1929/1978: 25, 184). The functives and functions become Whitehead's lures, or sensational attractors, that instigate the incipency of images.

Simon's proposition to show viewers every icon begins on the plane of reference. As he was noted as stating in the above, Every Icon posited a 'computational promise,' which creates a 'body' capable of counting all the permutations of black and white icons on an invariant thirty-two by thirty-two grid. Once this system of mathematical representations is displayed – as seen on the right side of Every Icon's website – this 'body' can no longer be contained within the plane of reference. As the process of counting gives way to 'momentary sensa-

tion,' as Simon states, the functives and functions of the referential 'body' undergo a process of transduction. They become 'lures for feeling' or sensational attractors. The functives and functions, which were represented on the mathematical system as the variable set of two colours, the size of the grid, and the rate the permutations of icons change, become sensational attractors. As sensational attractors, these transduced functives and functions then become the enabling constraints for the incipency of images.

Once this transduction takes place, the functives and functions change into the compositional elements and techniques for the plane of technical composition. It is at this point that Every Icon transversally moves from the plane of reference, through the plane of technical composition, and emerges aesthetically on the plane of composition. Deleuze and Guattari explain:

*There is only a single plane in the sense that art includes no other plane than aesthetic composition: in fact, the technical plane is necessarily covered up or absorbed by the aesthetic plane of composition. It is on this condition that matter becomes expressive: either the compound of sensations is realised in the material, or the material passes into the compound, but always in such a way as to be situated on a specifically aesthetic plane of composition (Deleuze and Guattari, 1994: 195-6).*

Every Icon begins as a work that generates scientific representations but it is ultimately able to present itself as an aesthetic composition of sensations. It generates a seeing that exceeds the limits established on the plane of reference. According to Manning, 'to see is to feel-with, to participate in the intensive passage from the virtual to actualisation' (2009b: 95). Viewers experience this passage from the virtual to actualisation transductively as the incipency of images. As long as there is a computer to run the program and a monitor to display Every Icon, it will endure well beyond anything that is present today or that can easily be imagined for the future. This is because, according to Simon, Every Icon's 'theoretical possibilities outdistance the time scales of both evolution and imagination' (Simon, 1996)

## Biographical Note

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entitled 'Transversal Fields of Experience'.

## Notes

[1] For the purposes of this article, I will be referring only to the version Every Icon that can be seen on Simon's web site, which can be viewed at;

<http://www.numeral.com/appletsoftware/eicon.html>.

Simon made numerous editions of Every Icon that were sold over the internet. 'Produced at a time when very few artists or galleries could manage to sell net art, Every Icon was in fact marketable; it lent itself to the production of unique editions, each inscribed with its discrete starting-point and buyer's name, which were sold' (Greene, 2004: 92). Some of these other editions of Every Icon can still be viewed online. For example, one edition, owned by the Institute of Artificial Art Amsterdam, can be seen at;

<http://radicalart.info/AlgorithmicArt/grid/every/EveryIcon/eicon.html> (Simon, 2001)

and another edition, owned by Enterzone, can be seen at

<http://ezone.org/ez/e11/articles/jfsjr/everyicon.html> (Simon, 1997a).

As well, Simon created versions of the work that are to be mounted on a wall, which comprise of modified computers and monitors. He even made versions for projection and Palm Pilot, an early Personal Digital Assistant device (PDA) popular in the late 1990s (Ploug, 2003). Recently, a version of Every Icon has been made available as an application for Apple's iPhone and iPod Touch.

[2] In fact, these three statements are included in every edition and version of Every Icon. For a detailed account of the various versions see Note 2. As well, when the work is presented as a still image for publication these three statements are shown alongside an image of the grid. See Eckmann and Keopnick (2006: 10), Green (2004: 91), and Rush (1999/2005: 213).

[3] At the time this paper was written in March 2011, there were three black squares in the second row from the top. The squares in the first two columns from the left and the fifth square from the left were black.

[4] The reason Simon chose a thirty-two by thirty-two square grid was because, as he explains, 'that was the original Macintosh definition for an icon, when the first Mac system came out. With the old Macs, you went to the icon editor "ResEdit", where you could design your own icon by clicking on the different fields of the grid' (Baumgärtel, 1999).

[5] For further discussion on linear perspective see Alberti 1972; on the videos of Woody Vasulka see Dunn, Vasulka and Vasulka 1992, Hatanka, Koizumi and Ekiguchi 1998, Sturken 1996, and Vasulka and Weibel 2008; and finally, on Seurat's pointillist painting technique see Broude 1978, Fénéon 1966 and Homer 1985.

[6] According to physicist Ogden Rood: 'Any two colours which by their union produce white light are called complementary' (1879: 161). Because magenta and green are complimentary optical colours, when they combine, viewers will see neither magenta nor green. Instead, they will see the colour white.

[7] Stacy Reed notes: 'Some popular raster file types you are sure to come across are JPG, GIF, BMP, TIFF and PNG' (Reed, 2006).

[8] It must be remembered that internet art was still fairly new when Every Icon was uploaded to the World Wide Web in 1997. According to Green:

*By 1997, net art had become an established pocket of relatively autonomous art-making, though it had not succeeded in reaching a wider public. Beyond the spheres of internet communities, media festivals and artists' immediate social and professional circles, there was little interest in and even less money for net artists' work (Green, 2004: 73).*

[9] The term 'enabling constraints' has been in use for more than a decade prior to Manning's adoption of it. Despite this, she has been one of the few researchers – along with Brian Massumi – to fully develop the conception of this term. For early uses of the term 'enabling constraints' see Massumi 1998 and Hansen 2002. For further investigations into the conceptualisation of this term see Manning 2009b and Massumi 2009.

[10] These planes cannot be directly perceived. According to Deleuze and Guattari:

*The plane can be a hidden principle, which makes visible what is seen and audible what is heard, etc., which at every instant causes the given to be given, in this or that state, at this or that moment. But the plane itself is not to be given. It is by nature hidden. It can only be inferred, induced, concluded from that to which it gives rise (1987: 265).*

[11] For reference, one billion is ten to the ninth power ( $10^9 = 1,000,000,000$ ).

[12] This rate of change in Every Icon, as presented on Simon's website, can be verified by finding the square in which the one hundredth change takes place and timing that specific square's rate of change. If that particular square cycles between white and black only once per second, then the entire work displays one hundred images every second. The square in which the one hundredth change takes place can be ascertained by converting the number one hundred to its binary base equivalent. Because Every Icon is essentially a counting machine that works in binary numbers, once the number of digits necessary to express the number one hundred in binary is discovered, then the number of squares that are needed for the first one hundred changes can be easily ascertained. The number one hundred expressed in binary is 1100110. This binary number uses seven digits. Therefore, the one-hundredth change in Every Icon takes place in the seventh square from the left of the top row. When observing this seventh square from the left, it does indeed cycle between white and black once every second, thus proving that Every Icon, as presented on Simon's website, shows one hundred images per second.

[13] The United States Geological Survey estimates that the age of the Earth is 4.54 billion years old. See 'Age' 2007.

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## FCJ-126 The Becoming Environmental of Power: Tactical Media After Control

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*There is a last enterprise that might be undertaken. It would be to seek experience at its source, or rather, above that decisive turn where, taking a bias in the direction of our utility, it becomes properly human experience. (Bergson, 1991: 184)*

Tactical media (TM) was originally conceived during a period of widespread media diversification, enabled most dramatically through digital and networked technologies (Garcia and Lovink, 1997). In the original account, 'tactics' was used with reference to Michel de Certeau as an explanation for the material diversification and experimentation with media that could challenge and compete with forms of centralised mass concentration. In this respect, while TM was informed by the rise of the Web and a nascent participatory culture, in many ways the concept was still expressed in opposition to older hierarchical formations of congealed hierarchical power (The State, Mass Media). The key theoretical allusion carried along with de Certeau, of course, was the disciplinary dispositif of Michel Foucault, against which TM would be indirectly defined. This article re-examines theoretical legacies of tacticality in light of more recent debates on sustainable and strategic imperatives for politically invested media projects, particularly in the context of a transition to social media and organised networks.

A central underlying claim I make is that such discussions too easily accept the current spatio-temporal functioning of digital and networked technologies as preformed conditions of possibility. My argument works like this: while issues of scale and temporality are important for critical interrogations of media, these dimensions can no longer be anachronistically read through a lens based on disciplinary logics. The intensive and transversal qualities of networked power

that characterise the current socio-political moment have complicated prior distinctions between strategies and tactics. This is not to suggest that uneven formations of power are overcome or displaced; on the contrary, these concentrations persist through radically different registers, settings and modalities. There is a need to grasp the stakes of these conditions. Accordingly, I highlight aspects of a number of familiar narratives to revisit tacticality in some (hopefully) unfamiliar ways.

De Certeau's notion of practices is considered through multiplicity, the control societies of Gilles Deleuze are read against ecological concerns, and the role of levelling is foregrounded within the security dispositif of Foucault. Here, I am interested in the implications of practices in more-than-human registers for each social sketch. Picking up on what Brian Massumi has described as the globally amplifying threats for large-scale disruption characteristic of the becoming environmental of power, attention is given to a different conceptual approach for critical media art projects in terms of ontopolitical problematics. Accordingly, I argue that taking account of changes in power and governance can usefully clarify the work of critical art projects as materially attending to—rather than resisting, opposing or orchestrating—crises over the morphology of the social. I suggest, moreover, that this ontopolitical field escapes dominant understandings of politics, since critical media art aims to directly subvert the conditions through which those definitions are founded.

## The Concept of Tactical Media

For some time, TM has been a dominant theoretical framework for defining both politically engaged media art projects and aesthetically challenging modes of political mediation. The term 'tactics', of course, holds militaristic connotations (for better or worse) that refer to manoeuvrability and gaining advantage in warfare or conditions of battle. While Clausewitz famously outlined a distinction from strategy in terms of scale, tactics can be defined in terms of flanking, ambushes, negotiating or creating obstacles, provoking the enemy to make mistakes, and offering reconnaissance (Richardson, 2003: 123-128). The latter, in particular, was traditionally assigned to 'the vanguard' (avant-garde)—high-speed units that would scout out an adversary's movements in advance and secure positions of strategic importance. While such military techniques have been somewhat relegated to the past through the technologisation of war, these implications endure in the context of artistic practice, politics and everyday life in a number of interesting ways (Wilke, 2010: 39-55).

In the following section, I discuss subversive characteristics of TM carried over from these settings, but with an understanding of “the tactical” as multiplicity. Such traits include, for example, investments in critical knowledge work, and modification of standardised technologies and avant-gardism. Through this unpacking, I describe how characteristics of TM have been understood as contributing to the generation of radical political change; traits that have more recently been subject to criticism through new mappings or diagrams of power in network societies (Deleuze, 1999). Indeed, there have been calls to bury the concept, alongside a sense that the idea might simply need updating. To some extent, I move between these inclinations by advocating an emphasis on following errant practices in their complication of diagrammatic formats. This path is taken to argue for the more-than-human scope of intervention, suggesting a turn to working with the problematic complexity of things that should be taken as politics by other means.

Originally formulated during the 1990s, TM has shown remarkable resilience as a concept. In the statement first offered by Geert Lovink and David Garcia for the Amsterdam-based Next Five Minutes (N5M) events, de Certeau’s work on everyday life (tactics as ‘the art of the weak’) was famously linked together with the possibilities of digital consumer culture (‘cheap electronics’) to capture a sense of an emergent media aesthetic directed toward specific political goals:

*Tactical media are media of crisis, criticism and opposition. This is both the source their power (‘anger is an energy’: John Lydon), and also their limitation their typical heroes are: the activist, Nomadic media warriors, the praxter, the hacker, the street rapper, the camcorder kamikaze, they are the happy negatives, always in search of an enemy. But once the enemy has been named and vanquished it is the tactical practitioner whose turn it is to fall into crisis ... Tactical Media are never perfect, always in becoming, performative and pragmatic, involved in a continual process of questioning the premises of the channels they work with.*  
(Lovink and Garcia, 1997)

Now associated with groups like the Critical Art Ensemble (CAE), @TMark, The Yes Men, the Electronic Disturbance Theatre (EDT), Luther Blissett, UBERMORGEN.COM and the Bureau of Applied Autonomy (among many others), TM projects were originally defined by a shared technique of amplifying ‘provisional’ and ‘temporary’ reversals of power through appropriative uses of media technologies. This would operate through fleeting interventions and reflexive targeting of the micropolitical variety, resulting in conditions for agency comparable to the Temporary Autonomous Zone originally described by Hakim Bey (1991). In the orthodox account, this was related to an ‘end of history’ mindset: a shift from dialectical struggles to molecular events brought about by the general sentiment that strategic organisation only leads to blockages or authoritarian oppression, ‘born from a disgust with ideology’ (Lovink, 2008: 187).



While there are other non-European and non-Western histories of practice that can be mapped in terms of TM, it's worth stressing the key significance of Garcia and Lovink's framework. Their model suggestively linked together an array of experiments with these technologies into a broadly inclusive schema for widespread socio-political change. At the time, this mode of engagement was also positioned against an opposition to corporate capitalism and excesses of governmental power. As an artistic-activist practice, TM equally corresponded with the multifarious practices of culture jamming or 'subvertising' aligned with anti-corporate movements, although Garcia and Lovink's proposal extended well beyond the semiotics of advertising culture by allowing a broader spectrum of action to be linked by non-commercial socio-political agendas (Klein, 2000: 63-85; Dery, 1993). Reflexively performing the participatory ethos being invoked, the concept itself was offered up for reconfiguration—for Garcia and Lovink, TM would involve a constant relay between theory and practice. In 1999, the organizers of the third N5M event offered a useful summation:

*The term 'tactical media' refers to a critical usage and theorization of media practices that draw on all forms of old and new, both lucid and sophisticated media, for achieving a variety of specific noncommercial goals and pushing all kinds of potentially subversive political issues. (N5M, 1999)*

Although stressing a non-commitment to any particular technological form (old or new), as mentioned during the introduction, TM was actually first conceived against mass broadcast systems; for instance, with the possibilities of hacking, refiguring and utilising televisual and video technologies inspired by examples like Andrei Ujeika and Harun Faroki's Videograms of a Revolution (1993), or Brian Springer's documentary Spin (1995), and the new possibilities suggested by portable camcorders (van Bergeijk & van Dijk, 1992; Holmes, 2009). Activist AIDS campaigns during the 1980s also formed an important influence on the concept, along with deeper histories of alternative independent publishing, zines, subcultures, pirate radio and television, and feminist media activism. However, during the period of N5M events, the rise of the Web and popular use of the Internet quickly became a significant contributing factor. As Garcia explains, this was a communications revolution which, 'like the music of the 1960s, acted as a universal solvent not only breaking down discipline boundaries but also the boundaries separating long established political formations' (Garcia, 2007: 6). Here, the effectiveness of TM conceptually quickly became obvious by illuminating the makeshift pragmatism that underpinned a great diversity of experimental practices with new media technologies at the time, from hacktivism and electronic civil disobedience to journalistic initiatives like Indymedia (Meikle, 2002).

In this way, the N5M events brought together independent activists, artists, media practitioners, students, scholars and theorists in an attempt to delineate an emerging style of media practice. In a somewhat utopian register, the goal of TM might be favourably compared with

the notion of 'the artist as producer', the assertion famously made by Walter Benjamin that revolutionary change could only be inaugurated by directly altering the means of production or apparatus (Benjamin, 2008: 79-95; Cox and Krysa, 2005). The concept seemed to offer precisely such a flexible program for engineering difference by interrogating the conditions through which political content was materially shaped and distributed, and by pushing modes of work intended to bridge the divide between producers and consumers in the first place.

To a certain extent, by leaving open the specific manifestations through which a TM work could unfold, the malleability of this concept was initially met with widespread support from creative practitioners. As I gradually elaborate here, the ability of TM to encapsulate a wide diversity of projects was consistent with de Certeau's definition of tactics as individuating differences carried along as an immanent manifold. This set the concept in motion as an adaptive and responsive modality of engaging with both artistic and political conceptions of autonomy. While stating that any act of definition was risky since a concept might be easily co-opted through explication, CAE nevertheless described a 'feeling of relief' in both the interpretative and collaborative diversity that TM allowed—'artist, scientist, technician, craftsperson, theorist, activist, etc., could all be mixed together in combinations that had different weights and intensities' (Critical Art Ensemble, 2001: 5). This particular feature, moreover, drove the ongoing influence of the idea. There is a strong sense that TM has persisted since it has become a discursive space or topos—a topic that arranges theoretical and practical engagements with problematic themes of the network condition, including politics, standardisation, economics, agency and aesthetics.

An example can be seen in the 'Virtual Casebook Project at NYU' site, which contains the submission form with the question 'What is Tactical Media for You?'. The range of responses illustrates the multiple interpretations that can emerge around the term (and also potential disagreements): for instance, Garcia argues in favour of the radical variety of practices that should be aligned with TM, including individual projects, as opposed to examples of collective campaigns, but always working against 'legitimate objectives'; David Holmes suggests that TM requires a fundamental consideration of universal rights such as political representation to begin with; while Natalie Jeremijenko simply states 'tactical media is what tactical media artists do' (Virtual Casebook Project, 2002).

Arguably, this range of views is tied up with the conceptual design of TM in the first place. Such radical pluralism could even be seen as the most crucial asset: if anything, TM opens onto multiplicity—that is, conditions that complicate any reliance on an essence or a higher unity: 'multiplicity must not designate a combination of the many and the one, but rather an organisation belonging to the many as such, which has no need whatsoever of unity in order to form a system' (Deleuze, 1994: 182). On the one hand, this invocation can be read



as connecting with the complexities of contemporary network societies; however, it is also sustained through genealogical work. For tactical projects, a sense of multiplicity stems equally from relations forged with prior techniques of artistic, materialist and activist experimentation. This channels concepts of autonomy in labour, nonhuman agencies and avant-gardist institutional critique into specific interrogations of the socio-technical problems of the present. These genealogical sources are approached as virtualities to be actualised over and over again as individuated expressions.

TM then draw from the archival past, especially to the extent that the modality of the tactical is tied to lineages associated with the historic avant-garde. Another trajectory can be traced back to Benjamin here; in this case, the argument from his influential essay on technological reproducibility, that artistic works affectively anticipate regimes of experience and hold a capacity to prepare perception for the coming shocks of modernity (Benjamin, 2008: 19-55). With the shift in media technologies during the final decade of last century, TM similarly aimed to construct new ways of working with socio-technological infrastructures on both formal and political levels. Indeed, as Tobias Wilke observes, rather than medium, an important term throughout Benjamin's famous thesis is 'tacticality' (*taktisch*)—a neologism that combines both the tactile and tactical to describe technological art as an experimental act with futurity (2010: 39-55). This was, significantly, an idea that borrowed from the avant-garde in a reading of aesthetics as a militarised training ground for the senses; but the approach is also aligned with the material tangibility of art as work, a kind of knowledge only achieved by 'touching the world'. The perpetual reorientation and undoing of regulated experience meant that art practice was less concerned with the maintenance of a formal style, than with an ontological confrontation of differences in kind. TM has similarly inherited a tendency to defy being categorically pigeonholed beyond anything other than a differential field, routes that led to the virtual through praxis, what László Moholy-Nagy once described as an aesthetic for 'tireless pioneers' (qtd. in Wilke, 2010: 43).

But there is something more to this: through such mixtures of past practices, TM also highlights the significance of concepts for network societies, especially by elucidating a nascent field, even a set of disregarded prospects. If Lovink's work is familiar, it is for this conceptual approach to socio-technological networks. Think of terms like *Data Dandy*, *Distributed Aesthetics* (with Anna Munster), *Organised Networks* (with Ned Rossiter) and *Internet Criticism* (in general). That many such concepts are co-created is further evidence of an investment in the connective principles of networking. Lovink's earlier writings with ADILKNO (The Foundation for the Advancement of Illegal Knowledge) similarly took the form of collectively authored small manifesto-like statements described at the time as 'UTOs' or 'unidentified theoretical objects'—*Sovereign Media*, *Total Media*, *Vague Media* and so on—all of which can effectively be read as precedents for TM (ADILKNO, 1998). While this approach is not easily reduced to a 'method' per se, since concepts emerge through intuitive

inquiries, Lovink has nevertheless consistently placed an emphasis on the importance of this aspect in his writing. For instance, in a short piece with Florian Schneider, 'New Rules for the New Actonomy' (2001), concepts are highlighted as mobilising desire to particular socio-political ends through viral dynamics: 'these days a well-designed content virus can easily reach millions overnight. Invest all your time to research how to design a robust meme which can travel through time and space, capable to operate [sic.] within a variety of cultural contexts' (2001). Similarly, in discussing the failed fortunes of the dotcom era, he writes:

*The crucial step is to shape, armour and then blow up concepts, 'memes' and ideas so that they then become operational entities. A productive discourse is not mere talk. The creation of a compelling ideology is not just a matter of talent. The killer application is not just people but the collective ability to mobilize and direct the Network Spirit.*

(Lovink, 2002)

Striving to pursue change through connectivity—if not with the Network Spirit, than at least it's unconscious—Lovink's program suggests an abstract yet ultimately pragmatic model of cultural activism (2011). The technique might be compared with Scott Lash's assertion that any critique of information can only occur immanently by connecting up with information itself (Lash, 2002: vii, 220). Here, the most crucial aspect is based on distributing critical ideas through viral contamination: a recurring characteristic of the informational aspects of digital networks that evokes properties such as emergence and non-linear causalities (Terranova, 2004; Sampson, 2007). This situation is related to the infrastructural deployment and maintenance of 'panspectric' media that are not concerned with cultural containment per se, but on premediating modes of contagion (Kullenberg and Palmås, 2009). While TM is clearly subject to these contexts, whether the goal should be based on competition—fixated on attempts to outgame Silicon Valley, for instance—is perhaps unclear. There are more productive ways to approach this kind of work than simply going viral.

In general, Lovink tends to avoid the idiosyncratic vocabulary of Gilles Deleuze and Félix Guattari. Their description of philosophic concepts is, however, helpful for providing some insights into how TM and tacticality might be otherwise conceived. Concepts for them are 'anenergetic' condensations that channel energies into a range of sites and practices (Deleuze and Guattari, 1995). Rather than fixed solutions, concepts are intensities that immanently transform states of affairs (Alliez, 2004: 17-31). They are formed, moreover, in confrontation with badly posed or understood problems. However, this cannot be taken as a subjective projection, since problems 'do not exist only in our heads but occur here and there in the production of an actual historical world' (Deleuze, 1994: 190). They serve a pedagogic function by seeking a resolution through novel re-configurations or modifications to other pre-existing concepts on an immanent plane or network: 'a concept requires not only a

problem through which it recasts or replaces earlier concepts but a junction of problems where it combines with other coexisting concepts' (Deleuze and Guattari, 1995: 18). These resolutions, however, are only found at a virtual point; they are set in motion along such dimensions through processes of experimentation and learning.

While Deleuze and Guattari refer strictly to philosophy as operating in this register, their formula ('the concept of the concept') can be usefully translated into the context of TM. More specifically, it can illuminate something of the 'non-philosophical' transversal dynamics brought about at divisions between scientific method, political activism, artistic practice, cultural theory and philosophy (Fuller, 2008). I refer to this transversal tacticality as reticular aesthetics—a transformative practice that engages with problems or topical issues (Dieter, 2009). Drawing from Bergsonian thought, reticular aesthetics can be described as inquiries that counter the tendency to fabricate the world as differences in degree. The role of such approaches, rather, is to intuitively move through cases of solution towards an alternate sense and perception of the problem; as Deleuze puts it, 'only intuition decides between the true and the false in the problems that are stated, even if this means driving intelligence to turn back against itself' (1991: 21). To be clear, problems are multiplicities. Nevertheless, as I go on to discuss, exclusively associating such dynamics with TM has become an increasingly complex exercise today. Critical discussions around 'the tactical' has, accordingly, begun to question how critical media art is tied to problems for politics, including temporal dynamics of appropriative action and a tendency to become easily re-absorbed after execution.

## Circuits and Circulations

Despite the resilience of TM, there is no question that changing historical conditions have significantly complicated investments in tacticality. This is most obvious in discussions that have fixated on the sustainability of TM as a viable program for long-term change, or more recently, in a turn to consider durable strategic realities (Becker, 2009). While altering the debate to focus on persistent structures or formats of power might seem like an inevitable case of the pendulum swinging from one extreme to another, there are immediate issues that explain this interest (Krapp, 2005). In particular, certain projects aligned with TM have been perceived as a threat from the perspective of the United States government in the context of a post-9-11 world and the so-called 'war against terror'— notable here is the arrest of Steve Kurtz from CAE (a case that was eventually be dropped after being cleared of all charges) and more recent accusations against Ricardo Dominguez, for instance. While acknowledging the significance of these events, the judico-legal injunctions imposed against critical media art projects need to be interpreted through an analysis of security and control regimes established for managing networked materialities (Munster, 2005). There is a related

concern regarding the presumed natural correlation between the tactical and progressive politics. However, critiques of this sort deliberately confuse 'tactics' with militaristic connotations of violent conflict, rather than 'tactics' taking on a particular mode of inquiry (von Clausewitz, 2003: 132-137).

My interest lies mainly with the relation of these practices to communicative capitalism and the possibilities of reshaping existing patterns of social organisation. Of course, it should be obvious that no technique or technology is ever 'neutral'; approaches are transformed over time, even altered diagrammatically. This section deals with some of those changes by offering a broader understanding of power capable of gauging concerns that inform critical readings of TM. Of particular importance in these settings are the uncertainties of capture and the circulation of content. TM is often criticised for the fleeting eventfulness underpinning its model of intervention; my argument is that this critique is centred on a conception of politics that does not account for the transversal tacticality of these projects, a reticulation of things that works on problems in ontopolitical conditions.

A special issue of *Third Text* edited by Gene Ray and Gregory Sholette—'Whither Tactical Media?'—is exemplary of the sense of malaise that has gathered around the idea of doing political mediation differently. The issue is premised on a claim that the influence of neo-conservative macro-politics and grand narratives, along with the global consolidation of economic rationalism, has brought about a situation where TM appears as a futile and inhibited gesture. In their editorial, Ray and Sholette view tactics as struggling to perform radical modes of criticality, especially by connecting with conditions of labour and scaling otherwise temporary interventions. Regarding the former, they highlight conditions of global precarity, from maquiladoras and export processing zones to knowledge-intensive or creative sectors of employment. Anything tactical is described as lacking legitimacy by being too far removed from the most brutal politico-economic realities of these almost uninhabitable worlds. While TM demonstrates a capacity to liberate desire by appropriation of the apparatus, precisely in a Benjaminian mode, this characteristic has so far failed to effectively translate into applications or involvement at the level of collective enunciation in conditions of immiseration. This critique is driven by a concern with how tactical practices are vitally connected to socio-political formations; however, it additionally presumes a specific definition of what TM currently is and might become (it would be interesting, for example, to examine such claims against the recent events of WikiLeaks, Take the Square and the Arab Spring). While historically, avant-garde and activist movements might have aligned themselves with subaltern and minoritarian politics, the TM ideal, as Ray and Sholette have it, is now a terminal figure: 'a dissipated and distracted spectator constituted by historically unique sensory experiences made real by the rise of new media technologies' (Ray and Sholette, 2008: 521). This image of the perceptually and sensorially overloaded is a disaster: how do the performative aspects of any project register in the 'creative noise' of informationalism? What is the relationship

between this panic-inducing informational excess and immediate political matters? Even with the possibilities of alternate pathways for distributing content via networked technologies, there is the recurring question of what reconfigurations can be claimed from these projects. Jodi Dean's commentary on the flattened network as ultimately subservient to communicative capitalism is relevant here. This situation, more often than not, undermines the formation of viable solidarities:

*Instead of engaged debates, instead of contestations employing common terms, points of reference, or demarcated frontiers, we confront a multiplication of resistances and assertions so extensive that it hinders the formation of strong counterhegemonies. The proliferation, distribution, acceleration, and intensification of communicative access and opportunity, far from enhancing democratic governance or resistance, results in precisely the opposite, the postpolitical formation of communicative capitalism. (Dean, 2005: 102)*

Dominant networked media systems are also configured for exploitation in significant ways (Dean, 2010). Moreover, in relation to political discourse, it is the wrong kind of expression or engagement that pervades: individualising, scattered, consumptive. In this situation, progressive interventions then encounter the dilemma of competing with all manner of sentiments that also feel appropriate. Tactics appear as the norm; perhaps supported by the presence of avant-gardist techniques as presets of the 'meta-medium' of software (Manovich, 2001; 2008). This network is of another cast; inhabited by what Quentin Meillassoux calls the communicator, a persona that embodies 'a certain obstinate silliness, of a frenetic openness to whatever appearances of novelty come along' (2007: 105). Everyday practices are folded into flexible formations governed by logics of possession and profit; niche-orientated Web platforms accept all content, just another segment of the Long Tail.

Excesses of memes, remixes, mash-ups and the churn of Net flotsam are indicative of these accelerated conditions of communicative capitalism (Parikka and Sampson, 2009). But what happens when contagion, creativity and modifiability (some cited goals of TM) have become default settings? Arguably, these circumstances are well beyond what Deleuze and Guattari perceived as the appropriation of conceptual thinking for commerce, that 'most shameful moment' where computer science, marketing, advertising and design come together for 'products to be sold' (Deleuze and Guattari, 1994: 10-12). Here, a representative example of the embedding of tacticality into the flows of participatory network dynamics is The Contagious Media Experiments (2005) initiated by Jonah Peretti, a media project funded partly by the Eyebeam Gallery in New York. Tapping into the possibilities for disseminating content through media convergence, the main goal of this initiative was targeting what Peretti described as 'the Bored at Work Network (BWN)'—a population estimated at hundreds of millions of office workers constantly using social networking sites, instant

messaging, blogging and email:

*These experiments illustrate the practical application of concepts like emergence, 6-degrees of separation, and tipping points. Each project starts small and spreads virally to millions of people without any promotions, advertisements, or press releases. In the end, the mass media picks up the story as a trend, and the project is able to permeate the culture at multiple levels. This low-budget, bottom-up approach makes it possible to create a global cascade that begins with a small group of friends and extends to the set of CNN or the Today Show. These Contagious Media Experiments suggest new opportunities for artists, activists, companies, and entertainers in the networked age. (Peretti, 2005)*

Recalling Alan Lui's study of informational cool and 'cyber-bad attitude', this audience is potentially analogous to that envisioned by TM with the info-worker enrolled as anticipated 'participant' or witness (Lui, 2004). The Contagious Media Showdown (2005) is one project in this series, which combined the efforts of Peretti, Cory Arcangel, Ze Frank, Ann Poochareon, Paul Berry and Mike Frumin to compete over a period of a month to create content memes. The success of this project led in part to the establishment of BuzzFeed, a website dedicated to tracking all manner of viral and user-generated content, offering tags to further disseminate trends such as 'geeky', 'LOL', 'WTF' and 'OMG'. In this way, the site aims to chart what content is massifying across various network segments; often resulting in a deluge of celebrity scandals, amateur art, viral marketing or YouTube remixes. While electronic civil disobedience might persist in IRC chatrooms and distributed denial-of-service attacks, unruly innovation is here a consumable circuit of vernacular content, what David Berry sees as the riparian user of real-time streams (Berry, 2011: 144). Tacticality is both promoted and tamed by computational devices; an RSS feed, viral dashboard or downloadable app away.

From another perspective, the actual impact of socio-technical activism has been where TM has come under intense scrutiny. Significantly, in their theoretical proposal for the concept of organised networks, Ned Rossiter and Lovink offer an incisive critique of the concept as a pragmatic approach for progressive political change in light of accelerated changes associated with post-Fordism:

*Tactical media too often assume to reproduce the curious spatio-temporal dynamic and structural logic of the modern state and industrial capital: difference and renewal from the peripheries. But there's a paradox at work here. Disruptive as their actions may often be, tactical media corroborate the temporal mode of post-Fordist capital: short-termism. (Lovink and Rossiter, 2005)*



By highlighting the affinities between this style of working and conditions of flexible capitalist accumulation, they claim that tactics are now politically inadequate as an end in itself. For Lovink and Rossiter, the main challenge is to shift attention towards the strategic dimension of networks in an appeal for new institutional forms of sustainability built on creative labour. As Rossiter states elsewhere, however, tactics are still relevant as a legitimate 'source of renewal' in this theoretical schema—'without the tactical, organised networks collapse into stasis' (2006: 23). Indeed, a number of long-term TM experiments like The Yes Men, Indymedia, Makrolab are seen as viable resources, but they are not seen as relevant examples for the formation of organised networks themselves (2008). The latter are emergent institutions immanent to the socio-technical dynamics of Internet-enabled systems. They are described at times precisely in the language of meta-modelling developed by Guattari (Rossiter, 2006: 17-24). For Lovink and Rossiter, organised networks resemble hybrid arrangements that lie somewhere between tactics and proper institutional structures. The challenge is to scale up otherwise short-lived projects to allow for more long-term alternatives to be established during the period of uncertainty or structural instability marked by neoliberalism.

Whether or not this specific critique of TM that informs the organised networks concept is convincing—and it needs to be acknowledged that critical media art projects are generally not concerned with building institutional formations in any obvious way—I nevertheless draw attention to the conceptual ambiguity of the conjoined aspects of these apparently distinct modes of operation. This can be considered as a result of a framework cast as a flat ontology. However, it additionally refers to a well-known characteristic of networks. They consume difference: even strategic positions cannot be maintained against their purported inverse, but must be rendered as tendencies, scales and gradients. For Rossiter and Lovink, only through the intensification of networking can subsumption be outpaced and alternatives projected as scalar formations. Organised networks, interestingly, can be said to broach upon a missing third military-inspired term between strategies and tactics in this appeal: the role of logistics (Wark, 2003). But here, I should highlight another rather obvious point, that organised networks must additionally 'corroborate' somehow with speculative economics. They are, therefore, forced to confront another quandary raised by following neoliberal conditions, including a struggle to offer differential categories of access, accountability and legitimacy. I would say that the ramifications from such dilemmas, in this respect, are greater than simply speaking in 'the unattractive language typically associated with neoliberalism' (Rossiter, 2006: 14).

Adopting languages involves translation; things necessarily get formatted. I mean this not just abstractly, but concretely, in terms of funding, resources, labour and measures of success. These moments of translation have implications for the constitution of a network, including what actors, agencies and actants benefit from getting organised or not. It has

been a clear tendency of neoliberal governance to exacerbate hierarchies precisely by eroding frameworks for regulated procedures. For organised networks, beyond the continual search for material resources other than free labour and grant funding, learning to deal with these uneven tendencies and inequalities is an additional problem; and perhaps this is also why the question of tactics cannot be so easily done away with.

Elsewhere, Rita Raley has outlined her own interpretation of TM and offered a rejoinder to the organised networks proposal with an analysis of projects that have responded to the global neoliberal order (2009). Raley does so by acknowledging the changes in tactics characterised by increasingly sophisticated yet more dispersed techniques of intervention, and offers readings of border hacks, persuasive gaming and the data visualisation of financial markets. Well-known work by Electronic Disturbance Theatre, John Klima, DoEAT, Joseph DeLappe, Anne-Marie Schleiner and Luis Hernandez, UBERMORGEN.COM, Lise Autogena and Joshua Portway all feature in Raley's discussion of heroic dissent within these transformed conditions of power. She responds directly to the 'radical media pragmatism' of Lovink and Rossiter by stressing the performativity of these works:

*The right question is not whether tactical media works or not, whether it succeeds or fails in spectacular fashion to effect structural transformation; rather, we should be asking to what extent it strengthens social relations and to what extent its activities are virtuosic. (Raley, 2009: 29)*

Accordingly, Raley's position places an emphasis on the aesthetic dimension of TM and highlights, in particular, the participatory significance of the audience with reference to the concept of relational aesthetics from Nicolas Bourriaud and the performative qualities of virtuosity drawn from Paolo Virno's writings on multitude (Bourriaud, 2002; Virno, 2004). Her argument hinges on the role of spectators as witnesses that complete the 'signifying field' of the piece by 'recording a memory of the performance' (Raley, 2009: 12). Raley suggests that there is no obvious extrinsic product from these events since they are engagements that experientially transform the social or 'general intellect'. This claim is, to a certain extent, congruent with the move towards thinking of how to inhabit the common; it's based on searching for other ways of doing politics since 'there is much in the world to protest' (1). And in this respect, I am in sympathy with her position, even allied. Nevertheless, I phrase my response like this: TM has never been concerned foremost with solutions, but with problems. This has involved a confrontation with differences in kind cast through the artistic, political and everyday notions of autonomy that are made available by existing legacies of institutional critique. Such genealogies are (re)sources for tactics as it becomes an embodied discourse based on imaginative transgressions, refigured modes of knowledge and experimentation with problems for politics. Materialist trajectories increasingly matter in this contract with difference; in other words, the relations that critical media art establishes

by occupying the emergent terrain of environmental power are key. In the next section, I elaborate on this perspective through the becoming environmental of power. Suffice to say, Raley's study mainly leaves questions of anything more-than-human unexamined; or more accurately, she does not deal with how tactical behaviours twist the machine and non-machine within apparatuses of social reproduction.

Whatever the consequences of social media and the infrastructures of neoliberal capitalism, it has become obvious that the very notion of tactics is now complicated, even confused. Critical media art projects perform some kind of important work. However, the debates outlined above demonstrate the inability of existing frameworks to adequately take their political significance into consideration. In what follows, I reflect on these dilemmas by discussing a number of ambiguities in the notion of the everyday first devised by de Certeau, especially regarding differences along more-than-human registers. Arguably, channels of distribution (circuits and circulation) have not been a concern of TM due to an emphasis on alterity founded on an orientation toward processual politics. Or, perhaps more accurately, it has been because TM has remained antithetical to the particular model of quantification proper to calculative regimes of informationalism. I offer a particular reading, in this respect, of the everyday that argues that an important facet of de Certeau's work is a recurring sense of multiplicity. This term is perhaps often used in a rather straightforward sense as referring to the multiple or numerous, rather than philosophically linked to duration, sense and ontology, the conditions of making and unmaking experience. Acknowledging that political action is forced to reckon with the new diagrams of power, I suggest this concept illuminates an important strand of TM: multiplicity makes 'the tactical' germane as a mode of work for uncertain lives. In this respect, the final section of this article can be read as returning to the question of whether tactics should be taken as an intrinsic 'good' or end in itself. In some ways I question the sovereignty of the actions involved. Here, my argument is that the tactical involves reticulating problems in a confrontation with difference.

## From Infopolitics to Ontopolitics

I want to begin this final section with an assertion: critiques of TM tend to reduce their field of operations to the spatio-temporal functioning of digital and networked technologies. Rather than striving to consider the conditions of immiseration and crisis within which these systems are enveloped, too often discussions of new media, networking and politics are refracted through informational media where a kind of 'exaggerated humanity' is expressed (Thrift, 2011). Critical accounts of software can go a long way to address this problem, but I argue they can only be established through a consideration of factors anterior to the regime of computation (sense, attention, memory, perception, maintenance, energy, waste, capital); but just as compositions of human labour are prone to exhaustion, insubordination and

resistance, so too are nonhuman actants driven to breakdown and collapse by exploitative relations. Crucially, my investment in this basic premise is connected to a range of recent inquiries in a long-standing discussions of distributed agencies, these include the Latourian actor-network, assemblage theory, object-orientated philosophy, speculative realism, neo-materialism and vitalist currents of media ecology (Fuller, 2005; Bryant, Srnicek and Harman, 2011). Whether understood as a 'material turn' or not, I interpret these moves as establishing a dialogue with increasingly felt pressures in the lived environment and the anxious need for resources capable of gauging the more-than-human, beyond current diagrammatic modes of organisation. Critical media art contributes to this task by exiting informationalism. It does so by undoing distinctions between the machine and nonmachine in surprising and unexpected ways. These practices can be read through de Certeau, however only with some critical adjustments.

How I read de Certeau's concept of everyday life: the famous distinction between tactics and strategies is the basis for approaching the everyday; it becomes an orientation device for conceiving how oppositional practices can be imagined more specifically. Out of this apparent binary, or asymmetrical dialectic, between tactics and strategies, a series of distinctions then emerge: the everyday as a counterpoint to discipline, the indeterminacy of manifold actions against technocratic rationality, an interest in memory practices and *kairos* over spatialised temporalities. Strategies, as a central point of contrast, indicate a 'proper place', an institutional form characterised by a calculus or manipulation of relations. The proper is characterised by three major functions: 1) a triumph of space over time in building an autonomous territory, 2) the calculated use of sight or panoptics to draw exterior objects within a scope and range of influence, and finally 3) the constitutive force of power/knowledge as a mode of territorialisation (de Certeau, 1980: 5).

Here, de Certeau's work is most clearly positioned as a response to the disciplinary dispositif of Foucault, especially the kind of modern ordering portrayed throughout the 'Panopticism' section of *Discipline and Punish* (Foucault, 1977: 195-228). In these well-known passages, a detailed reading of the English philosopher and social reformer Jeremy Bentham's proposed ideal prison, the Panopticon, was used to diagnose how a new expansive 'physics' or 'anatomy' of power arose during the 18th century in Europe. To be clear, de Certeau's reading of everyday practices was partly theorised as a rejoinder to Foucault, particularly from the perspective of subjects already caught up in such machinations of power. It was an attempt to invert Foucault's analytic method to arrive at an alternative diagnosis. While still focused at the level of microphysics, the goal shifted from processes of arranging consistencies to the extreme edges of a purported anti-discipline. It is worth noting that the struggle here, additionally, is a reflection of sorts on the relationship of a researcher to a subject of inquiry and, therefore, is also a consideration of the proper place for knowledge (the university).

Defined through the slogan, 'the art of the weak', tactics feature everywhere in the everyday as an undercurrent to the revolutionary upheavals and structural delineations of modernity (systems of 'technocracy'). Practices in general are understood as non-representational actions that flow in 'non-traceable dimensions', or movements that precede the purview of the panoptic. Interpretations of de Certeau often seize upon 'visible cunning' as the fundamental expression of resistance; however, there actually exists a diversity of meanings linked to the concept, including several overlapping categories: hidden, heterogeneous, extensive, devious and stubborn (Highmore, 2006, 108). All these modalities work together to produce a sense of complex qualitative rhythms. Multiplicity in itself, as a result, is a key concern: a constitutive milieu of difference that complicates the diagram of disciplinary consistencies or regularities charted by Foucault.

The language recalls another influential theorist of the everyday, Henri Lefebvre, however, strong continuities also exist with Bergson's concept of duration. Similarly proposing a critical view of models of time based on marking out successive instances, Bergson perceived the type of intelligence based on this delineation as perpetuating 'impure' spatio-temporal compounds that privileged space as a quantitative multiplicity and, therefore, an infinitely divisible plane (Deleuze, 1991). In this way, process as difference in kind was elided: the map displaces the territory. De Certeau also holds a comparable interest in experience, or, at the same time, a sense of things and what disciplinary methodologies are capable of saying about them. However, this specifically took the form of a defence of the everyday against its reduction to 'lateral inspection' (de Certeau, 1980: 10). Storytelling and imaginative facilities could assist with this task of expressing the elusiveness of the tactical, if only to participate in urgently needed therapeutic rectification against the instrumental demands of 'the proper'. On an abstract level, tactics are a kind of conceptual stance toward the problem of asymmetries in power and accounting for difference in the production of knowledge. In this sense, tactics allow an important way of thinking 'culture in the plural', but only to the extent that an expanded field of action and experience is evoked. This suggests, I would add, something like 'nature in the plural', precisely by rejecting an exclusive embrace of modern ordering principles.

As a polyrhythmic multiplicity, de Certeau imagined everyday practices to be a vast oceanic expanse. Indeed, a more profound claim is advanced along these lines: that socio-economic and political institutions are subject to this field of singularities, arising from below as 'ephemeral islands' or temporary archipelagos. Practices are origins or ontologically prior; they move through dimensions of being that exceed the proper, since tactics are emblematic of a prodigious or primordial virtuosity, an immemorial intelligence of coups and tricks, found even in plants and fish (de Certeau, 1980: 9). Tacticality complicates not only the abstract regularities imposed by strategic organisation, but even anthropos and certain conceptions of rational consciousness. Indeed, this layer of activity can only be grasped as a dynamic genesis or inventiveness that 'assures formal continuities and the permanence of a memory

without language, from the ocean's depths all the way to the streets of today's megalopolis' (9). These are strange assertions that seemingly invoke a Universalist pan-nature. Indeed, Nicole Shukin questions precisely such moments by arguing that de Certeau fetishises mimesis. This is problematic, according to Shukin, since it involves privileging analogous relations between human and nonhuman in a way that uncritically reiterates the contemporary machinations of capital, especially within conditions of real subsumption (Shukin, 2009: 54). This is a valid critique, but I have another interpretation in mind. I understand tactics here as involving moments where what might be defined as properly human, where the limits of social life itself, are surpassed as a self-evident representation. This can be conceived through a distinction between analogy and univocity: analogy ushers in a hierarchy of being based on the regulation of life, while univocity refers to a radical pragmatics based on concrete situations. However, as Deleuze would put it, the latter requires a pre-individual set of conditions to be acknowledged, a processual world, a making and remaking of distinctions that is only ever contingent and situated. It is a question of: 'how individuating difference precedes generic, specific and even individual differences within being; how a prior field of individuation within being conditions at once the determination of species of forms, the determination of parts and their individual variations' (Deleuze, 1994: 38).

For media theory, the political implication of individuating difference—in contrast to the possessive majoritarian mode cited by Shukin—runs on communicative univocity. Tacticality, therefore, is further understood, and assisted, via intensities; 'the trees communicate with the sun, the seas with the moon, our eyes with ancient light from dead galaxies, our skins with the cosmic background radiation' (Cubitt, 2006: 36). Practices are antecedent to social diagrams, fluctuating throughout experiential worlds, and more troublingly, set conditions that appear to both challenge and retain divisions of power. The question then becomes, within this field, how can oppositional practices be understood, what would this consist of anyway? For now, my claim for TM specifically is that these approaches attend to problems in a manner antithetical to present cases of solution, drawing from pre-individual relations to do so. Tactical practitioners, in other words, make inquiries into individuating difference in terms other than quantification or a neoliberal economics of disequilibrium. This aspect is crucial for grasping the continuing occupation of TM beyond the conditions of communicative capitalism and the transformations of media ecologies signalled by the critiques outlined above.

Here, it's worth discussing de Certeau's view of digital and networked technologies as a further encroachment onto the everyday; that is, how tactics are imagined as overrun by their incorporation into the flexibility of a computerised megacity. Appearing as a vast homogeneous expanse guided by the techno-scientific rationale of cybernetics, this future system illuminates the 'dark sea' or 'maritime immensity' of life as a continuous patterning or weave of data:



*Number has arrived, the time of democracy, of the big city, of bureaucracies, of cybernetics. It is a supple and continuous crowd, woven tightly like a fabric without tear or seam, a multitude of quantified heroes who lose their names and faces while becoming the mobile language of calculations and rationalities which belong to no one. Ciphred currents in the street. (de Certeau, 1980: 3)*

In an insightful analysis of this calculative turn, Brian Holmes draws attention to the historic influence of the cybernetic paradigm as a foundation myth for network societies (Holmes, 2008: 525-534). Indeed, Norbert Wiener first conceived of his science of steering precisely in response to the problem of tracking, anticipating and predicting the flow of things in an ongoing stochastic process (originally, enemy aircraft) (Galison, 1994: 228-266). The reliance on statistical probability in cybernetic thought would enable a reflexive responsiveness to the regulation of a system by registering input and calculating adjustments in search of an allusive ideal equilibrium. Cybernetics tethered contingency or movement, thriving on differences in a system, or precisely the kinds of activity that TM might be said to induce. With this in mind, Holmes questions whether tactics remains an effective framework for politics. He notes that the mathematical innovations from cybernetics now underwrite the principal equations for pricing options in financial markets, especially to predict the drift and volatility of equity values through the Black-Scholes model. This is a sort of rhetorical challenge, but is based on serious real-world conditions. As a global socio-technical ensemble, financial systems can arguably be taken as the proper place of the present. Poised as the authentic function of digital and networked media, finance works through a neoliberalism of non-normalisable accidents that requires far-from-equilibrium conditions (Cooper, 2008). Diagrammatic characteristics, therefore, can easily be read off an analysis of the operations of these socio-technical markets.

To this end, the cybernetic society of de Certeau recalls another familiar narrative by Deleuze from the short 'postscript' on societies of control, an important text for new media studies that similarly grapples with the Foucaudian disciplinary dispositif (Deleuze, 1995: 177-182). As is well known, this Deleuzian image of power traces a flexible network that continually responds to, adjusts and modulates variable changes. The result is a highly regulated openness perpetuated by the calculation of aggregate motion and the continual guidance of change. Here, the purported exterior is utilised as the source for further organisational patterns. A kind of binding together or knotting takes hold, a weave aimed at capturing the diverse potentialities traversing an environment. Needless to say, a reading of cybernetics also pervades this brief postscript. Allusions are made to Wiener's narratives of technological periodisation, especially his discussions of utilising Bergsonian ideas of duration to build feedback systems and black boxes, therefore, rendering obsolete apparent oppositions between mechanism and vitalism (Wiener, 1961: 38-39).

The concept of “Control Societies”, meanwhile, has become influential in the analysis of organisational principles in new media, such as the logistics of surveillance, flexibility, standardisation of flow (protocol), data aggregation, and predictive tracking, studies often in dialogue with the concept of TM (Elmer, 2004; Galloway, 2004; Galloway and Thacker, 2007). A significant portion of this work can be read as exploring tendencies toward the emergent episteme first identified by Deleuze, but through technical registers. Without going into detail, I refer simply to an important caveat offered by Wendy Hui Kyong Chun for this line of inquiry: ‘we need to insist on the failures and the actual operations of technology’ (Chun, 2006: 9). While “control societies” as a concept has allowed a consideration of the constitution of new media in ways that reconsider the nonhuman, Chun’s turning to limitations and failure also suggests a consideration of care-taking, rather than the pursuit of accidents. This might involve, for instance, questioning the disinvestment of expenditures carried along through the image of software as a vitalist substrate or a medium capable of transcending material limits. It might involve a consideration that up to 50 million tons of e-waste is generated globally each year. This alone should force some acknowledgement of the exteriorities to cybernetic control and informationalism (Feilhauer and Zehle, 2009). The agential weight of lead, cadmium, mercury, brominated flame-retardants and other hazardous components participate in a renewed set of problems for life, not to mention the contingencies of metal resources (especially rare earth elements) that follow intensifications of capitalist development in the shadows of climate-based crises at the limits of the earth.

There is a final connection to be made. As a social diagram, the distributed networks of control societies resemble a set of governmental dynamics analysed in later work by Foucault (2007; 2008). Indeed, the work outlined in his lecture series at the Collège de France during the late 1970’s presents a significant challenge to the anti-discipline of de Certeau in a number of ways. While ostensibly aimed at mapping a genealogy of the regulatory apparatuses that operate at population levels (‘the biopolitical’), it’s worth concluding with a consideration of his account as an explanatory ground for a revised tacticity. Here, Foucault makes important distinctions from ‘generalized disciplinary societies’ in a genealogy of the welfare state and, eventually, early expressions of neoliberalism. This initially took the form of a new dispositif directed at a ‘global mass’ of statistical variations that work upon the species-being of the human: birth rates, illnesses, death, productivity, disease. As ‘apparatuses of security’, these allowed circulations to occur by establishing territories that blur the prior distinctions that characterised disciplinary societies. Security, therefore, depends on spatialising logics aimed at ‘a series of possible events; it refers to the temporal and the uncertain, which have to be inserted within a given space’ (Foucault, 2007: 35). This is achieved by coordinating a resonant milieu, a middling or medium, or ‘that which is needed to account for action at a distance of one body on another’ (36). Crucially, this was a direction that could already be sensed in aspects of Discipline and Punish, where the swarming of mechanisms arises in the gradual propensity for such devices to become ‘de-institutionalised’, expanding out of enclosures (molds) in order to circulate in a ‘free’ or liberated state (modulations): ‘the

massive compact disciplines are broken down into flexible methods of control, which may be transferred and adapted' (Foucault, 1977: 211). For Foucault, security does not supplant discipline, so much as functions with sovereignty and disciplinarily to form an institutional triad geared at the figure of the population. This is known as governmentality.

However, an important distinction is made between 'normalisation' and 'normation': the latter is the capacity for the disciplines to separate so the normal and abnormal are classified against an imposition or structural consistency ('the permitted and forbidden'). This was precisely the dynamic leveraged by de Certeau in the argument for polyrhythmic tactics outside the linear range of the disciplines. Under governmentality, Foucault describes how the imposition of discipline is now annexed to a relational coordination of security mechanisms (Foucault, 2007: 67-69, 85-91). Normalisation, then, comes to refer to modulations that traverse anatomo-politics as a curvature of aggregate metastabilities. The purported aim is the correct distribution of things: equilibrium. This is how the birth of governmentality equates with the rise of economic liberalism to a significant extent, an aspect that distinguishes this diagram of power, for example, from a purely sovereign or disciplinary regime. However, what is interesting is the notion of 'naturalness' that arises from normalisation under this model, a naturalness that is ideally dependent on the insertion of freedoms to generate aleatory movements. This is the ironic basis for the effectiveness of governance. While it might be taken in terms of an opposition to power, the broader goal is to allow for movement as circulation: 'I think it is this freedom of circulation, in the broad sense of the term, it is in terms of this option of circulation, that we should understand the word freedom, and understand it as one of the facets, aspects, or dimensions of the deployment of apparatuses of security' (Foucault, 2007: 71).

Significantly, generative change in this diagrammatic spatialising milieu takes the form of instrumental accidents—the radical exteriority of the contingent is what traverses the mechanisms and interrelated subsystems of security. While the terminus of governmentality is aimed at the population structure, such transformations emerge at once from the aleatory forces involved, as multiplicity. Interestingly, such 'freedoms' apply to the circulation of disease, water, insects, weather patterns, fires and animals. The stakes of biopolitics are based on amalgamations whereby conditions for life are reproduced, or 'the perpetual intrication of a geographical, climatic, and physical milieu with the human species insofar as it has a body and a soul, a physical and a moral existence' (36). Of course, the calculative responsiveness of digital and networked systems also appear to fit lockstep with this binding together of liberalism, security and modulating power. The account offered by Foucault, however, gives a genealogy to these logics that does not concern strictly technical agencies, but resembles an abstract machine. Indeed, the stakes of rethinking the tactical remains highly significant here precisely because of the way in which privileging operates on population levels.

In a recent commentary, Brian Massumi suggests taking Foucault's governmental schema as a theoretical premise for reading political ventures today. Examining recent catastrophic socio-environmental problems—specifically, responses to the aftermath of Hurricane Katerina—Massumi describes a becoming environmental of power, a phrase that I have borrowed for the title of this essay (2009: 153-185). Market-based economic rationalism and speculative finance are read as intensifying the conditions of Foucault's diagram by unleashing an extreme crisis-ridden milieu. For Massumi, the becoming environmental of power resembles a kind of ontopower, since its 'field of application' is now proto-territorial: as opposed to a normalised population, it operates from a deadly landscape across which innumerable problems are encouraged to circulate and reach destructive thresholds to wrest back the conditions for social reproduction. The distinction is important, since his concern lies with the stakes for life to persist through an emergency-prone dynamism that perpetuates extreme inequalities in wealth and poverty. This is notable not simply in the rise of industrial pollution, but implementation of disassociated milieus or spaces of circulation, from the bio-economics of overfishing to urban inner cities scarred by social insurrection. For Massumi, this mode of power attempts to intercept force by distributing disruptive ontogenetic waves toward global flow-on effects. It attempts to induce change as a first responder, or initiates a full-spectrum securitisation by waging total war.

Dominated by a conservative political register, I argue these trajectories of action set the conditions through which critical media art projects gain traction to operate therapeutically. This is based on asymmetrically countering such logics by developing sympathies and connections with entities pressed by crisis, relayed instrumentally or left to suffer. If the nonhuman is turbulently fed-forward to achieve ends for those 'pertinent' levels of the population, this is where projects associated with TM find a role through a reversal marked by intuitive and untimely inquiries. In other words, this work is not aimed at a projective force of global flow-on effects, but implies returning to sources of experience—to riff on Bergson's durational ontology—before bifurcations of human and nonhuman, objects and commodities, production and consumption, creation and waste. In this case, tactics, framed by univocity, refers to differences in kind; they are alter-referenced practices. Systems, meanwhile, contain tendencies toward self-preservation; they become self-referenced (Massumi, 2009: 168-169). TM, in this revised formula, works with problems in a process of learning to live with ontopower differently, in order to make pragmatic contributions on the level of everyday practice and experience. The capacity to touch on these conditions is central to the salience of tacticality. This is not a case of circulating content, but reticulating material circumstances.

Finally, what is useful about this Foucaudian-influenced narrative is that the organisation of digital and networked technologies—among many other agencies, actors and actants—might be considered in terms of a wide array of power relations that concern conditions of possibility. Let us return to discussions of materiality and objects, or the trend of thinking

in terms of radicalising distributed agencies away from exclusive dominion of a perceived anthropocentric bias. I suggested earlier that my approach was related to these conversations by considering how the more-than-human currently is and might be negotiated otherwise by TM. I have been implying, at times insisting, that this is a directly political concern. By contrast, discussing his proposition for an object-orientated philosophy, Graham Harman observes: 'Foucault is not among my philosophical heroes precisely because 'human subject' and 'world' remain two dominant poles of his universe, even if they are now glued together rather than left in lonely Cartesian solitude' (2010: 772). What might be a throwaway remark, this characterisation can nevertheless be taken as highlighting a deliberately misrecognition of Foucault's significance for materialist thought and offers a useful foil through which to reiterate my argument. Here, I argue the significance of his work is not strictly founded through a dualistic ontology of subject and world, or the metaphysics of things, but how such divisions in the world are forged and made powerful as pertinent levers of strategic organisation. Rather than a speculative proposal on the partitions of the world, this is a question regarding the quality of existing relationships. Part of my intention in re-telling this story has been to keep in play a sense of the agency of things without further naturalising a historically specific set of conditions or arrangements. It should not be forgotten that a central component of Foucault's work involves an inquiry into the inversion of sovereignty through biopolitics; a social investment to 'take life' and to 'let die', or what can be understood later as the neoliberal break between two levels: one characterised by 'economic-political action' (population) and the other by a multiplicity of individuals that 'are no longer pertinent as the objective, but simply as the instrument, relay, or condition for obtaining something at the level of the population' (2007: 65). The major challenge, one I have been pursuing conceptually, is to forge new ways of participating in these new processes by attending to how some modes of life are encouraged, while others are curtailed, or willfully wasted under conditions that are subject to speculation and the accumulation of profit. This challenge would involve experiences that are not entirely calculative, but it cannot rely on weird realisms alone (although they also might have an important role). As a consideration of multiplicity pitted against diagrammatic organisation, tacticality contributes to this process of generating alternative relations, within, for example, the exacerbation of inequalities from crisis-ridden dynamics.

## Conclusion

If the becoming environmental of power defines networking in our time, then this emergent terrain resonates with an interest in politics through other means. TM works in this context to connect with problems that are poorly understood, that gather up agencies and remain still unsettled. In writing this lengthy article, I have had a number of projects in mind, such as: CAE, Preemptive Media or Natalie Jeremijenko's involvement in scientific practices;

critical inquiries into commercial Web and economics conducted by UBERMORGEN.COM, Alessandro Ludovico and Paolo Cirio; locative practices of Esther Polak or Loca Lab; or the explorations of the materialities of borders pursued by Health Bunting, Electronic Disturbance Theatre and b.a.n.g. lab; among many others. Indeed, such pieces explore the general reticulation of things with differential consequences: their role is based on a confrontation with multiplicity facilitated through alternate political expressions of more-than-human agencies. This involves a question of collaboration in ways that overturn the normalised categories by which entities or visibilities are arranged. Such approaches, in my understanding, are attempts to refigure problems. They are reminders, moreover, of how uncertainties and silenced crises often underpin diagrammatic solutions.

As stated earlier, I insist that frameworks for TM cannot be fixated on informational systems as an exclusive domain of political power. By point of contrast, the alternate sketch provided here of ontopolitics might be interpreted as becoming imperceptible to the extent that tactics as a concept involves an opening onto multiplicity. This is the case given the demands for sympathetic modes of encounter and involvement with problems. TM, as described in this article, might then be read in the terms of Alexander Galloway and Eugene Thacker's statement that 'future avant-garde practices will be those of non-existence' (Thacker and Galloway, 2007. p. 136). They list sabotaging video cameras or cloaking one's presence on a network server as relevant examples, stating that these modes of subversion are full in their subversive abandonment of informational or strategic representation: 'absence, lack, invisibility, and nonbeing have nothing to do with nonexistence' (136). However, the argument of this article is not nearly as obsessed with models of politics abstracted exclusively from the workings of technical systems. An over-emphasis on exploits and hacking makes the dual mistake of indexing politics exclusively to the (heroic) informational subject, advocating war and taking the technicity of computational regimes as an essential partition for progressive social change. While control systems cast an overbearing influence on the present, other ways of acting are articulated both conceptually and practically in terms of sensing and perceiving things beyond their current organisation. My position is less interested with spectacular mastery, and more concerned with encountering multiplicity as a pedagogical practice or a process of learning. That is, learning to experience differences in kind, to connect with things in ways that complicate formats of catastrophic economics. For Deleuze, the experience of learning was once described as swimming in the open sea or learning a new language, an oceanic expanse as 'composing the singular points of one's own body or one's own language with those of another shape or element, which tears us apart but also propels us into a hitherto unknown and unheard-of world of problems' (1994: 241). This is the kind of sensory-motivity or tacticality I have in mind as a kind of involvement with the world; it initiates a double becoming by implicating the untimely agencies of nonhuman things. Tacticality, as described throughout this article, expresses an encounter with multiplicity. It complicates existing formats and badly posed problems, grappling with the ontopolitics of environmental power.



## Biographical Note.

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## FCJ-127 Concrete Software: Simondon's mechanology and the techno-social

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In this article I will discuss the philosophy of technology developed by Gilbert Simondon, predominantly in his 1958 book *The Mode of Existence of Technical Objects*, with a particular concentration on his concepts of associated milieu and concretization.

The article provides an introduction to Simondon's theory of technological genesis and indicates the problematic nature of the cultural for Simondon's account. This is made apparent by contemporary developments in techno-social networks. However, I will also argue that this insufficiency is not insurmountable given Simondon's overall ontology. Instead, it is a result of his own bias regarding technological development at the time when he was writing.

In the latter part of the paper I will attempt to demonstrate how this insufficiency can be overcome and Simondon's theory can be fruitfully applied to the theorization of contemporary social media and software. Additionally, I hope this paper will go some way to indicating Simondon's relevance to current ethical concerns regarding the relation of the technological to nature.

Although there is not room here to expand on Simondon's wider project it must be remembered that Simondon's work on technology complements and builds upon his work in other areas and that it is a further application of his relational ontology and theory of individuation. In fact, technology holds a special place in his thought as it is the domain which traverses all three of the regimes of individuation which demarcate the progress of the process of individuation, which constitutes nature for Simondon.[1] In fact it is his failure to fully articulate the connection of the technical with the regime of the psycho-social in *The Mode of Existence of Technical Objects* that will concern us here.



For Simondon, the development of technical lineages are not to be thought of as functional or instrumental progressions (e.g. interpreting the history of recording devices as a lineage) but by the development of their internal operation. Thus a steam train is not of the same lineage as an electric train, even though they fulfill the same purpose, because their actual technical mechanisms have developed from different origins.

Instead technical development should be understood as a development that is led by the technical structure itself, which in the course of its operation unveils and concretizes previously undiscovered synergies and relationships.

This mode of existence is framed as the process of a technical object's development via the notion of concretization, which can be understood as a directed and unifying transduction within the regime of physical matter. Simondon describes a concrete technical object as:

*... one which is no longer divided against itself, one in which no secondary effect either compromises the functioning of the whole or is omitted from that functioning . . . The essence of the concretization of a technical object is the organizing of functional sub-systems into the total functioning . . . Each structure fulfills a number of functions; but in the abstract technical object each structure fulfills only one essential and positive function that is integrated into the functioning of the whole, whereas in the concrete technical object all functions fulfilled by a particular structure are positive, essential, and integrated into the functioning whole. (Simondon, 1980: 31)*

The shift from abstract to concrete is key here. The abstract form of a technical object describes a technical object that has 'an intrinsic perfection of its own that needs to be constituted as a closed system in order to function' (Simondon, 1980: 14). Simondon uses the example of the move from water-cooling to air-cooling systems for combustion engines to demonstrate this shift.

Although a water-cooled engine consists of two systems which are perfectly suited to carrying out their specific functions, when linked together a degree of disparity emerges between them. Simondon refers to the joining of these conflicting technical individuals as creating a 'series of problems to be resolved' (Simondon, 1980: 14).

The concretization process is one where such problems are resolved. Thus, the development of air-cooled engines, by the addition of gills to the cylinder, is seen as a measure of concretization because the engines cooling function is no longer provided by a separate closed water-cooling system, which requires its own conditions for operation that conflict with the operation of the engine, but as part of the normal operation of the single technical system.

Additionally, a further degree of concretization can be discerned because the same gills that are used for air-cooling also act as structural supports for the cylinder head. We therefore witness in this progression a move from conjoined abstract structures which are problematic, to a single concrete system which supports multiple functions.

Another aspect of the definition of an invented technical individual (ITI) is that, as part of the organization of functional sub-systems into a total functioning, an associated milieu is invented and maintained.

It is important that the specific meaning Simondon gives to the term invention is grasped here. Invention does not refer to the traditional hylemorphic notion in which a person has an idea and then builds something that corresponds to that idea; rather it is the 'birth' of a new environment or 'regime of functioning' (Massumi, 2010: 39) brought about by the operation of recurrent causality involving the actual operation of the technical individual itself.

The invention happens because a jump is made and is justified by the relationship which is instituted within the environment it creates. (Simondon, 1980: 59)

This new environment is what is named the ITI's associated milieu. When discussing the associated milieu Simondon writes:

*Such individualization is possible because of the recurrence of causality in the environment which the technical being creates around itself, an environment which it influences and by which it is influenced. This environment, which is at the same time natural and technical, can be called the associated milieu. By means of this the technical being is conditioned in its operation. This is no fabricated milieu, or at least it is not wholly fabricated; it is a definite system of natural elements surrounding the technical object. The associated milieu is the mediator of the relationship between manufactured technical elements and natural elements within which the technical being functions. (Simondon, 1980: 60)*

Of particular importance in reading this passage is how the word 'natural' is understood. In Simondon's ontology nature consists of three regimes of individuation: the physical, the vital and the psycho-social. Therefore it is possible to interpret this passage as stipulating that a technology's associated milieu can be constituted in relation to any of these regimes. However, in *The Mode of Existence of Technical Objects* the description of concretization presented gives an overwhelming impression that by 'nature' in this passage Simondon is limiting his scope to the regime of physical individuation. This impression is emphasized by the disdain with which Simondon greets the intrusion of cultural factors into technical concretizations – witness his scorn for decorative fins, power-steering and starter motors for automobiles which he explains away as advertising driven gimmicks – which either add abstraction and disparity to a technical individual or disrupt its concreteness.

Such is his dismay at how cultural influences have infected automobile design he despairs: 'The automobile, this technical object that is so charged with psychic and social implications, is not suitable for technical progress' (Simondon, 1980: 21).

The concretization process, which Simondon describes as the true evolutionary principle of technical objects (which he also calls mechanology), operates separately to economic and cultural concerns and can't be reduced to 'anterior scientific principles' (Simondon, 1980: 48). It is the study of technical individuals that aids the discovery of synergies, boundaries and indeterminations in their operations which lead to the possibilities for further invention.

Mechanology is also framed as a type of scientific development in that it reveals previously hidden virtualities and makes them available for further concretization. There is thus, to some extent, a resemblance between mechanology and technoscience. As Bernard Stiegler writes:

*If a mechanology is necessary, this is because the laws of physics, no more than those of sociology or psychology, or all of these as a whole cannot suffice to explain the phenomenon of the technical object qua the genesis of an individual and production of an order. (Stiegler, 1998: 76)*

This account of mechanology as a scientific investigation again emphasizes the distance Simondon keeps the process from cultural influence. Given the non-separation of culture (psycho-social) from nature in Simondon's ontology why is there this apparent denial of cultures involvement in mechanology and the concretization of technical individuals in *The Mode of Existence of Technical Objects*?

Because of this distancing it is tempting to see mechanology as a process of purification as described by Latour (1993) in *We Have Never Been Modern*; that is, as a process that constructs an account of nature purified of any social involvement and vice versa. As such, Simondon's account must fail to give an adequate account of the processes of translation and mediation, in Latour's sense, of the melting-pot of nature-culture hybrids we increasingly find in contemporary reality.

This sense of mechanology as a purified process can also be discerned in Paul Dumouchel's summation of Simondon's position:

*It is not because of the uses we put it to that modern technology radically transforms the world, but because technology gives existence to phenomena which were not there before and because technical individuals provide the conditions of the processes which constitute them. Thus there is no alternative technology which contains different values with respect to nature. What technology teaches us is that there is no 'nature' in the sense of a set of events and processes which are essentially different from those which are produced artificially. According to Simondon there is no technology which can respect what is, for technology is essentially the coming into existence of the virtual. (Dumouchel, 1995: 268)*

Dumouchel makes clear that any leap of invention requires the existence of the technical object. There is a sense in which the technical object comes first and transitions occur around it. But these developments progress through an internal logic divorced from the normative domain. Even as a purified account of technical development Simondon's account is important for its description of the operational development of technical individuals. It is the aim of this article to demonstrate that not only is the involvement of the psycho-social regime not contradictory to this account but actually necessary given the recent proliferation of technologies whose operation relies on their relation with the psycho-social.

## Andrew Feenberg's humanist account of concretization

Though by no means asserting concretization as a democratic socialist theory, Andrew Feenberg uses it to support the political idea that 'socialist demands for environmentally sound technology and humane, democratic, and safe work are not extrinsic to the logic of technology but respond to the inner tendency of technical development to construct synergistic totalities of natural, human and technical elements.' (Feenberg, 2002: 188)

His proposal is for a concretization the scope of which is expanded beyond Simondon's to include within its operation the aims of critical politics. It is then a social form of concretization. This is one where social rules and constraints are embedded into technology, from which they are often forgotten or even assumed to be part of the object's 'inevitable technical destiny'. For Feenberg social values are another area of virtuality which can be concretized into technical objects as what he describes as a 'technological unconscious'.

The inclusion of these concerns into the operation of technology does not require that these technologies need become less productive. Indeed the social codes incorporated into any technology could just as well be capitalist in nature as critical. Importantly, Feenberg maintains that the choice of social codes concretized into technology is essentially a political choice and is evidence of technology's ambivalence.

For Feenberg, technological systems help structure our everyday life but are open to concretization according to a different trajectory than that supplied by contemporary capitalist operations; through the condensation of more social aspects such as an appreciation of 'workers' skills, human communication, and environmental limits' (Feenberg, 1996) into their actual operational structure.

If there are invariably social aspects involved in concretization this would contradict the purified account of technical concretization that Simondon describes. It is true that if we wished to maintain this purified position, we could just maintain that any such introduction of social concerns into technological development is de facto strictly not mechanological. Yet this article wishes to show that the operation of contemporary techno-social networks makes this position untenable. However, this does not mean that we must therefore agree with Feenberg's position that an ethics of technological development be founded on a humanist 'politics of technological transformation.' Instead we will argue that this widening of the scope of mechanology is still in accordance with Simondon's overall ethics of process and development.

## Simondon's account of Human Progress

In his text *The Limits of Human Progress: A Critical Study* Simondon (2010) sketches an account of human cultural progress as developing in the same manner as technological development: as the progressive operation of concretizing relations between differing domains to resolve disparities.

To give this universal account Simondon states that he must take into consideration 'the entire system of activity and existence constituted by what man produces and what man is' (Simondon, 2010, 230). He divides these activities and their products into ontological domains (e.g. language, ethics, religion as well as the technical) to achieve this broad scope. These domains come into problematic relation with one another and produce emergent concretizations.

For Simondon, during different historical periods the concentration of human activity occurs in different domains. For example, in ancient classical civilizations there was a concentration of activity on language development whereas in the medieval period development mainly concentrated in the religious domain. During the current period, Simondon contends, the concentration of activity focuses on developments within the technological domain.

As with mechanology, development within each domain is described in terms of concretization and saturation. Importantly, progress within any domain occurs between humanity and the concretizations of that domain that have already occurred and with which humanity is said to form a system. The further development of this system requires that it isn't saturated but remains in a state of internal resonance thus engendering further progression.

The saturation of any domain leads to its stagnation. This is because saturation consists in the complete determination of all available potentialities or 'virtualities' for development in any given system. Thus regarding the domain of language at the close of the ancient world Simondon asserts:

*... it became purely a matter for grammarians and formalist logicians seeking etymological rectitude in naming. Surely, a grammar or a formal logic do not reflect man, or at the least reflect only the smallest part of man, one that should not be inflated.*  
(Simondon, 2010: 231)

Though much of the world is currently in a period that is heavily invested in the development of the technical domain there is no reason to believe that this process will not also reach saturation and the focus for investigation shift to another domain. However, Simondon also notes that the chances of humanity becoming alienated from technological concretizations are less likely than from those of the domains of language and religion because:

*Technology is even more primitive than religion: it connects with the elaboration and satisfaction of biological desires themselves . . . Thus there is at least the chance that the seeds of the decentring of man, and thence of the alienation of the objective concretizations which he produces, may be feebler in technology than in language and religion. (Simondon, 2010: 232)*

Simondon claims that technology's importance for human progress derives from its close relation to biological desire. This is why he argues so strongly for the development of a technological culture.[2]

Although the development of technology occurs via the progressive uncovering and utilization of virtualities in nature this operation must also be contextualized within this broader account of human progress which requires an ongoing internal resonance between all domains, as well as 'durable overlappings' between them.

Simondon maintains that this is achieved via reflexive, philosophical thought which, as the 'conscious form of the internal resonance formed by man and the objective concretization', can prevent alienation between man and technology by ensuring that technological progress becomes an 'integral part of human progress, by forming a system with man.'

We are now in position to contrast Simondon's and Feenberg's positions. Whereas Feenberg argues for a 'politics of technological transformation' ensuring that humanist values are concretized in our technology thus engendering a better society, Simondon espouses a more Spinozan ethical outlook.

Rather than limiting technological development by the application of humanist values this outlook asks what nature-technology and man-technology relations are capable of. It argues that progress depends on the liberation of the potentials these relations uncover rather than those that might be considered 'given in advance'. So although it is true that any given technology may be close to and satisfy certain desires this does not rule out that it may also



create further desires or leave other desires unfulfilled. In which case alienation should not just be seen as a negative condition but one that leads to production. There is then, with the development of technology, also an immanent human development, the development of a relationship to a new milieu which Simondon urges us to explore, as opposed to a politics which tries to steer technological development by assuming and fixing a humanist perspective.

This is not to say that Simondon does not see dangers relating to technology or indeed the potential for harmful forms of alienation. He fully understands why some substantive theorists of technology (e.g. Heidegger) feel threatened by machines and acknowledges, for example, that to an extent thermodynamic machines have replaced man 'as tool-bearer'. He also admits that:

*To this phase [industrial thermodynamic] corresponds the dramatic and impassioned idea of progress as the rape of nature, the conquest of the world, the exploitation of energies. The will for power is expressed in the technicist and technocratic excessiveness of the thermodynamic era, which has taken a direction both prophetic and cataclysmal. (Simondon, 1980: 8)*

However, Simondon goes on to add that the development of technical ensembles governed by informational theory lead to a more stabilizing form of technology and must be recognized as having the potential for supporting a different form of culture and society.

The machine, as an element in the technical ensemble, becomes the effective unit which augments the quantity of information, increases negentropy, and opposes the degradation of energy. The machine is a result of organization and information; it resembles life and cooperates with life in its opposition to disorder and to the leveling out of all things that tend to deprive the world of its powers of change. The machine is something which fights against the death of the universe; it slows down, as life does, the degradation of energy, and becomes a stabilizer of the world. Such a modification of the philosophic view of technical objects heralds the possibility of making the technical being part of culture. . . . Today, technicality tends to reside in ensembles. For this reason, it can become a foundation for culture, to which it will bring a unifying and stabilizing power, making culture respond to the reality which it expresses and which it governs. (Simondon, 1980: 9)

In this statement we can discern a rebuttal of Heidegger's antipathy to technological culture. Simondon not only points to the stabilizing effect technology can have for a culture but,

more than this, that technology is actually a tool to combat entropy. Technology offers a revealing of being (or relationship with the physical regime) that is ethical in that it opens up new potentials and concretizations hitherto unknown.

In Simondon's account part of what it is to be human naturally emerges from technology use. As such our culture must reflect that technology is currently an important factor in its ongoing individuation lest it risk alienation from the contemporary technical reality. It is precisely the application of cultural values to regulate technology (as Feenberg suggests) which, from this perspective, helps maintain this form of cultural alienation.

The revealing processes associated with technology do not just occur in relation to the physical regime but also to the psycho-social regime of individuation. Once this is accepted, a new recursive level can be added to Simondon's account so that it acquires greater resonances with today's technological situation.

## Concretization and Social Software

I now turn to looking at Software. This ontic domain has implications for Simondon's approach.

Matthew Fuller suggests the establishment of the discipline of Software Studies would show 'the conditions of possibility that software establishes.' (Fuller, 2008: 2). As well as echoing the method of Deleuzian transcendental empiricism, this resonates with Simondon's mechanism, especially its emphasis on the previously undiscovered synergies and relationships that technological development reveals. To maintain a Simondonian perspective software will be considered in terms of its operation. Although much has been written about how software can be defined (Mackenzie, 2006; Fuller, 2008; Manovich, forthcoming; Galloway, 2004), for example regarding its materiality as code (Hayles, 2002), we will focus on its operation, thus not separate from its instantiation within a working technological situation.

The questions I want to ask are, firstly: 'As a technology, what is software's relationship to the regime of the psycho-social?'; secondly: 'Does this relationship warrant the broadening

of mechanology's focus outside the regime of the physical?' and finally, if it does, 'Can this give us a way of understanding what differentiates new media networked technology from the kind of mechanisms on which Simondon focused?'. My claim is that one of the ways we can understand the operation of certain types of networked, software-based technology is that the associated milieu that is invented and maintained is constructed in association with the regime of the psycho-social and not just that of the physical.

We will now look at two examples in order to explore this.

The first is developed from Urs Bruegger's and Karin Knorr Cetina's discussion of the networked operation of the Foreign Exchange Market, a system which is an example of techno-social concretization underpinned by software (2002a, 2002b).

The market is comprised and maintained by the global interactions (via a multitude of devices) of traders with a software-based system which records, structures and displays these interactions back to the traders:

*Like an array of crystals acting as lenses that collect light, focusing it on one point, the systems collect and focus activities, interests, and events on the surface of computer screens. The screens themselves are identically replicated in all connected institutions and trading floors, forming, as it were, one huge compound mirroring device and site (2002a).*

It is the relationship that the traders have with the market as it appears on the screen which interests the authors. The screen is not just a medium to receive information but 'is a building site on which a whole economic and epistemological world is erected' (2002a: 395). The traders interact with this world as if with a living organism (the authors describe this as a postsocial relationship). However it is clear that this market-world is not an object, in that it is not spatial. Its existence is rather one of process and flow.

The development and operation of this market system can be theorized in a Simondonian way as not only a process of concretization but also the development of an associated milieu.

Bruegger and Knorr Cetina describe the market prior to computerization:

*Before the introduction of the screen, interbank currency markets were network-markets: transactions were conducted in the bilateral mould via the phone or telex, and most of the traders' time was spent finding out 'where the market was'. Any coordination that did come about was limited to those moments and parties involved in particular connections. The market nested in territorial space; it lay hidden in a transnational banking network of institutions that did not share the same information. (2002b)*

From just this short passage we can discern that one disparity that resided in the previous system was the tension between the information held about markets at the local level and the global reach of the market. It was then a problem of the speed of global information sharing which required resolution via concretization.

However:

*After the introduction of screens, the market became fully available and identified as a separate entity in its own right for the first time – with prices, interests and the relevant information all visually indicated on screen. The market on screen is a 'whole' market and a global presence; it subdivides into different information feeds and dealing systems, but these are configured to form a global picture framed by the boundaries of the screen, which also serves as a medium for transactions. (2002b)*

With the development of the computerized market-system there is an overcoming of the local-global disparity by the construction of a single, global market.[3]

Additional to this concretization, and what marks the market-system out as a true Invented Technical Individual is the creation and maintenance of an associated milieu. What makes the associated milieu of this particular individual significant is that it is constituted by activity from the psycho-social regime and not, as with Simondon's examples, the physical regime.

From Simondon's text we can discern three general requirements for the stipulation of an Invented Technical Individual having an associated milieu. These are that:

- i. the operation of the ITI partially determines the necessary conditions for its ongoing operation
- ii. a satisfactory environment for the technical object is created by some transformation of a part of the natural world
- iii. ITI's operate with a level of indeterminacy which enables them to adapt to their environment.

What is the Invented Technical Individual in this example? It is the market-system, which is the whole network of devices and instantiated software as well as the traders interacting with it. Without these traders the individual would not exist because its associated milieu (the market-world) would not be operational. Although we can imagine the network operating without any trader interactions it is only with these interactions that the system operates fully as a system and original virtualities are uncovered.

In relation to the first requirement listed above the operation of the market-system creates and maintains the market-world ('market on screen') with which the traders interact and which is a necessary condition for the system's continued operation.

The part of the natural world that is transformed to create the satisfactory environment (second requirement) is the trading activity that is mediated by the instantiated operation of the software. As mentioned previously, in Simondon's own examples the portion of the natural world transformed was always part of the physical regime of individuation. In this example I suggest the associated milieu is, at least partially, constituted by activity from the regime of the psycho-social.

The third requirement refers to how an ITI and the associated milieu it creates and requires for its continued operation integrates with the environment in which it operates. As Simondon writes:

*... the existence of the technical object is sustained by a double relationship — a relationship with its geographic environment on the one hand, and with its technical environment on the other. The technical object stands at the point where two environments come together, and it ought to be integrated into both these environments at the same time. Still, these two environments are two worlds that do not belong to the same system and are not necessarily completely compatible with each other. (Simondon, 1980: 54)*

This passage reminds us of the Uexkull inspired later writing of Merleau-Ponty on organism-environment relationship (Merleau-Ponty, 2003). For Simondon different technical individuals require differing levels of openness and adaptability to their working environments depending on their function. For example a traction engine must be able to operate on various inclines and in different climatic extremes and so requires a different level of openness and adaptability compared to a similar engine operating in relatively stable factory conditions.

It's clear that an extraordinary amount of technical infrastructure needs to be in place for the market-system to exist (e.g. global networks, server farms, computing hardware and software). However, this form of technology also requires engagement from the psycho-social in order to generate an associated milieu and become truly technological. This does not just mean economic, political and institutional structures but also the affective engagement of the traders themselves. This kind of engagement is demonstrated by one trader who, when asked what the market was for them, responded:

*Everything. Everything. How loudly he's screaming, how excited he gets, who's selling, who's buying, where, which centre, what central banks are doing, what the large funds are doing, what the press is saying, what's happening to the CDU, what the Malaysian prime minister is saying, it's everything – everything all the time. (2002b)*

A novel aspect of this technology then, is that the cognitive and affective reactions of those who use it become part of its operational structure.

The Foreign Exchange Market is an example of quite a closed system where the instantiation of the market's rules in the hardware and software, as well as the relations of the activity of the traders within those systems, creates the emergent individual of the 'lifeform' of the market as an ongoing temporal 'object' with which traders forge a relationship. If we shift our attention to more open systems based on software we can see that a similar Simondonian analysis can apply.

The label 'Web 2.0' is a contested one (Everitt & Mills, 2009). However, Tim O'Reilly's seminal article of 2005, *What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software* attests, at least, to a new structuring of online sociality.

Of core importance to the operation of the software involved is the notion of network effects. What is a network effect in this context if not the establishment and exploitation of a techno-

logically mediated, constantly updated milieu of social data? The virtualities that are excavated in the software's operation are the captured operations and interactions of the users of the software. The capture of these operations is usually via databases but the process is more precisely described by the phrase 'architectures of participation' (O'Reilly, 2005) (a phrase which resonates with Deleuze and Guattari's 'apparatus of capture'). 'Architectures of participation' also invokes the cultural, aesthetic and social aspects of the software which both attract and enable capture/participation.

The importance of network effects for the actual operation of these systems can be found in the slew of Californian style aphorisms that are used to describe them, such as the call to build systems 'that get better the more people use them', or that 'data is the next Intel inside' or the more forthright: 'Network effects from user contributions are the key to market dominance in the Web 2.0 era' (O'Reilly, 2005).

What these systems usually involve is some form of retention of user engagement coupled with ongoing real-time interactions. In Simondonian terms, there is therefore an on-going transduction of the technical with the psycho-social.

This kind of operation forms the basis for retail websites such as Amazon and eBay. Of the latter, O'Reilly states 'eBay's product is the collective activity of all its users; like the web itself, eBay grows organically in response to user activity, and the company's role is as an enabler of a context in which that user activity can happen' (O'Reilly, 2005).

The social network Twitter provides another example of a more open ITI. Although we can conceive of the total ongoing traffic flowing through the Twitter data centre as the associated milieu maintained by Twitter qua ITI, the magnitude of this flow is such that an individual person is unlikely to experience it as such. Unlike the unified and integrated experience of the Foreign Exchange Market, which is 'identically replicated' on all trader screens, Twitter's users only seemingly experience such global identity through occasional widespread participation in the discussion of trending topics. However, even these trending topics are usually localized and experience of them is nuanced by the constitution of the individual's network. Where traders feel they all simultaneously experience one 'life form' via their screens for Twitter users it is perhaps more accurate to say their streams are so individualized as to be more akin to separate 'life forms'. Indeed users often edit their stream's membership in order to modulate the level of information flow and character of their personal Twitter milieu. Additionally the ability to access one's Twitter stream via different client software further increases the possibility of different user experiences.



The development of such third-party software is made possible due to the availability of Twitter's milieu of social activity via its API (Application Programming Interface). API's are openly available code-based protocols that third party software developers can use to build applications that interact with proprietary data systems. The overall Twitter API actually consists of three API's; the REST API, the Search API and the Streaming API. Each of these API sub-groups enables developers to utilise different aspects of Twitter functionality. The REST API lets developers build basic Twitter functionality into their software such as the ability to send tweets or re-tweets and unfollow or follow other users. As the name suggests the Search API enables developers to integrate Twitter search functionality into their software as well as access trending data. The Streaming API enables developers to access and publish content from the ever-changing milieu of Tweets that are currently in the system in real time.

The range of software the openness of the Twitter API enables is diverse and is important for Twitter as it allows the low-cost expansion of an Architecture of Participation to emerge which both maintains its associated milieu but also suggests lines for possible further development.

Examples of the types of software developed using the Twitter API include a range of client tools which help users access and publish to the Twitter milieu in various ways (e.g. the Tweetdeck client brands itself as for the 'power-user' and lets users simultaneously follow multiple streams, whilst a number of other apps enable Twitter functionality from mobile devices). Other tools focus on enabling the easy linking of multimedia content from within the restrictive 140-character limit of a Tweet (e.g. Instagram, YFrog and Twitvid). Additionally there are analysis tools which help users track and measure activity within the Twitter milieu, in much the same way as financial tools aid analysis of specific conditions in the financial market. A client like Hootsuite, for example, statistically tracks the uptake of tweeted content or the number of mentions a specific word or phrase has in a specific period. Another service, Klout, claims to be able to calculate a users level of influence within their online social milieu.

It is debatable that all these developments can be described as concretizations or true inventions as they don't tend to develop the operational nature of the system overall. [4]

To understand the importance of code for the establishment and further concretization of an associated social milieu it is first necessary to take a brief look at the composition of a tweet. This will enable us to understand how limitations imposed on software development helps structure its dynamism. In particular we can see how this is played out in the case of

Twitter with regards to its proposed development of 'annotations' and subsequent suppression of client software development.

A tweet consists of more than just the 140 characters (or less) that a user posts to Twitter as a status message. Every tweet consists of a number of namespaces each of which is reserved to contain a certain type of data relating to that tweet. In non-technical language a namespace is a labelled container into which data can be put. The name applied to this container (space) is a piece of meta-data that describes the kind of content it contains.

In the case of Twitter there are a number of namespaces which are stipulated and which all tweets possess. For example all tweets have the following namespaces as part of their construction:

- id – this is the unique identifying number of a particular tweet
- text– this is the 140 character limited text body of a tweet
- source– this names which application was used to send the tweet (e.g. Tweetdeck, Tweetie, Web)

Some of the data sent in tweets is also nested within different classes. For example inside the 'user' class are namespaces for such pieces of data as:

- screen\_name- this is the username chosen for the Twitter account
- location- this is the geographic location the user has specified for their account
- followers\_count- this namespace contains the value for the number of followers the user account has

It is via this relatively stable set of namespaces that Twitter's associated milieu is maintained and from which the diversity of third-party software is developed.[5]

In a move that, at the time (April 16 2010), was seen as highly significant for the developer community Twitter announced the addition of a new kind of namespace to the Twitter API called Annotations (Molina, 2010).

An annotation was not the addition of another strictly defined namespace, like those described above, to the fixed anatomy of all tweets. Rather, annotations would give developers the ability to create and name their own new namespaces which could be added to tweets via their own Twitter client software and which they could also parse and publish within that same software.

What this meant was that Twitter, in the spirit of openness, was enabling developers to define new kinds of parsable information that could be contained inside a tweet alongside the usual namespaces. This development would enable developers to create their own unique services on top of the established Twitter platform.

Not only would annotations be a significant widening of the kind of social and cultural information that would constitute the Twitter milieu but it would also facilitate the development of specialized Twitter clients that could attract sub-groups of Twitter users based around the content contained in the new namespaces.

The example Molina gives of the kind of XML code that an annotation might produce is of adding book information in additional namespaces, which would then display in a users client if it were programmed to parse that namespace, and thus save the valuable 140 characters of the main tweet for comment.[6] One could then imagine a Twitter client could be developed just for discussing books where each tweet would carry information about the book being discussed.

As Molina states in his announcement the possibilities for the utilization of annotations was very broad:

*Annotations are a blank slate that lend themselves to myriad divergent use cases. We want to provide open-ended utility for all the developers to innovate on top of . . . Certain annotations will become standards democratically because everyone agrees. Some might have diverging opinions. It's something that we hope will grow organically and be driven by sociological and cultural forces. (Molina, 2010)*

Although online discussion regarding the potential utilisation of annotations in Twitter didn't progress beyond commercial application there is no doubt that such an opening up of the Twitter API could also have social and political uses as well as enabling an even more defined analytics. [7]

From the Simondonian perspective such a broadening of the Twitter associated milieu can be understood as an increase of indeterminacy in the system which in turn enables the possibility for further concretization.

So, for example, the individuation of smaller and more nuanced psycho-social groupings around niche collections of annotations augmenting the standard Twitter milieu and accessed via a range of independently developed Twitter clients could be envisaged.

However, at the time of writing this potential line of progression in the Twitter API seems to have been dealt a fatal blow. On March 11 2011 Twitter changed its API Terms of Service (Twitter, 2011) and contacted independent developers to warn them to stop developing Twitter clients. In this message to the community Twitter's platform/API leader Ryan Sarver (2011) bluntly stated:

*More specifically, developers ask us if they should build client apps that mimic or reproduce the mainstream Twitter consumer client experience. The answer is no. [8]*

The reasons given for this move was that Twitter claimed that they wanted their users to 'experience a unified Twitter experience', that is they felt the ability to access the Twitter milieu via different clients might confuse users. Additionally there were also some privacy concerns with allowing access to Twitter's API via clients they could not control. These reasons were generally met with scepticism and surprise by the developer community. As if to compound this move of stifling further client development Twitter also acquired Tweetdeck, the one remaining widely used third-party Twitter client they didn't already own.

Although the Annotations project was already on hold this announcement and simultaneous change to the Twitter API Terms of Service seems to have killed off this line of development altogether as well as any supplementary lines of development which might have concretised around it. The barring of developers from building clients which can accept information outside the main timeline (which is essentially what annotations do) prevents the utilization of annotations at all.

This move has effectively closed the development of the Architecture of Participation and associated regime of functioning of Twitter to third-party developers and locked it down in a way similar to the Foreign Exchange Market discussed earlier. This means that outside the proprietary Twitter development team the opportunity for invention proper has been ended,

as there is no opportunity to increase the operational indeterminacy from which fresh inventive leaps can emerge. [9]

It should now be clear that unlike Simondon's purified version, a mechanology of social software must include social and cultural aspects in the concretization process. As a result, despite Simondon's dismissal of adornment in relation to mechanical technology, for social software cultural phenomena are not an obstacle to, but an additional opportunity for, technical development. As such it's possible to suggest that there is a co-constitution of the technical with the social at a new level.

Yet the point is that such utilizations of Simondon's operational theorizing of technology in no ways go against his core description of a mechanology. As we saw earlier Simondon describes the development of an associated milieu as being 'the mediator of the relationship between manufactured technical elements and natural elements' and that for him nature includes the psycho-social. What we argue, however, is that Simondon's reluctance to allow social aspects into his theory of concretization cannot be sustained when considering contemporary networked media technologies, other than at the cost of their being denied technological status.

A rejoinder could be made that the milieus created for the operation of these technologies are not strictly psycho-social as they tend to consist of recorded interactions which are therefore now physical artefacts within a system. Although this is strictly true it is still necessary that the interactions (which are cultural in nature) occur in the first instance. Moreover, the milieus under discussion require that interactions are ongoing. This permanent transformative nature of the milieu not only describes one way technology supports the creation of the transindividual but that the transindividual reciprocally feeds back into the ongoing maintenance of the milieu. What Simondon says of the Guimbal turbine applies just as well to a social technology such as Twitter or the technology on which stock markets run: 'Technical objects which in their liaison with the natural world put into play what is essentially a recurrent causality must be invented rather than developed in stages, because such objects are the cause of their own condition of functioning' (Simondon, 1980: 61).

This also introduces a different way to theorize the distinctiveness of such techno-social networks; that is as technologies whose associated milieus are, at least partially but emphatically, constituted by recurrent causality with the regime of the psycho-social.

The change in the nature of this recurrent causality has ethical consequences in that it engenders the possibility for the production of new technological lineages that have the potential to support different forms of culture and society.

The example of Twitter annotations illustrates that the corporate ownership of associated milieus of psycho-social activity necessarily leads to a closing down not only of technical invention but also of the mediated psycho-social. Following Simondon's analysis of informational technology as being regulative in the same way that culture is, then concern at the corporate control of social software is surely justified.

Recent developments regarding the expansion of the attention economy (Beller, 2006), new forms of labour (Scholz, 2008), the focus on data-mining (O'Reilly & Battelle, 2009), the competition to collect the social graph of network participants, and fears over copyright, control and surveillance are just some examples of the ethical (in the sense of the possibilities for affecting and being affected) implications of social software and its control.

The plasticity of software (encapsulated in the notion of the API) which organizes such relationships also presents new ethical challenges as the 'rhythm and relaxation' of development of such technology occurs at increasing speed.

It is the ability to track the operational implications of such changes that makes Simondon's ontology so valuable. A unique aspect of Simondon's analysis is that entities, or individuals as they are conventionally thought of, are never complete. That is their process of individuation does not result in a stable individual we can call finished. It is this quality that enables them to provide the pre-individual milieus for further concretizations. This contrasts with the link-node analysis of relations we find in much network theory which focuses on how fully formed (saturated), autonomous and fully-present objects come into relation with one another. This often leads to analysis of these networks as ones that are static or rely for change on power differentials between node objects.[10] Simondon's notion of concretization, on the other hand, does not neglect the role of power in relations but rethinks what a relation actually is, so that it is re-theorized as a constructive operation and not a reification of a relationship. In network theory the relation itself becomes as object-like as the terms it brings into relation, resulting in the problem of accounting for the recursive relations between three objects. For example, although we can map the financial market or Twitter as a network of people, devices, software etc this does not capture the reality of the ongoing operation of all these things. This is something a Simondonian analysis gets us closer to.

Broadening Simondon's theory of technical genesis, so that it goes beyond the development of a double relationship with the regime of physical individuation to include the psycho-social, demonstrates the relevance of his theory to contemporary networked media.

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## Biographical Note

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## Notes

[1] Simondon's wider project involves providing an account of nature as the progressive development of the individuation process which constitutes three regimes (physical, biological and psycho-collective) all of which ultimately develop from a metastable, pre-individual being. Simondon develops the idea of the pre-individual from a range of sources including thermodynamics (especially potential energy) and Anaximander's apeiron. The pre-individual is not a substantial ground which subtends all individuation but must be regarded as the metastable condition of being, that is 'a being that is more than unity and more than identity, and that has not yet dephased itself into multiple dimensions (Simondon, 2009: 11).'

Furthermore, in his work Simondon gives an account of the immanent operation of the individuation of being (transduction) which underpins his delineation of the various regimes of nature as well as the development of technological objects as outlined in this essay. The transductive operation is both a dephasing and structuring operation which Simondon develops from both thermodynamics and cybernetics and which ontologically prioritizes the



process of individuation over any purported individual

[2] Simondon's claim for the need for the development of a technological culture needs to be understood in relation to his understanding of alienation, which differs to that developed by Marx. For Simondon contemporary culture is out of phase with the technical reality within which we live (because it is based on ancient culture which was developed in relation to tools and not machines) for it neither understands or takes into account that technical individuals are 'the end-product of an evolution' (mechanology) rather than mere utensils. To create a productive resonance between culture and technology the behaviours that govern development in both (concretization/saturation) need to be understood and taken into account so man is not alienated from the technical aspects of the reality that surround him.

[3] The system is still being improved, for example, in 2006 the Philadelphia Stock Exchange relocated most of its trading engines '80 miles — and three milliseconds — from Philadelphia, and into NJ2, where . . . the time to communicate between servers is down to a millionth of a second' (Vanderbilt, 2009). These types of improvement are not concretizations however as they do not lead to further qualitative developments of the system.

[4] The development of applications for mobile devices, especially phones, may be the exception here as they do constitute a real development of the system's relation to its operational environment in both the physical and psycho-social sense with the enabling of more widespread user interactions as well as the development of a location based dimension via GPS. The latter especially can be seen as a further concretization between software and environment.

[5] For a full list of the namespaces contained in a tweet see Raffi Krikorian's Map of a Twitter status object: <http://mehack.com/map-of-a-twitter-status-object>.

[6] From Molina's (2010) XML example it is easy to discern how the annotations tags contains the new developer created namespaces in a traditional nested format.

```
<annotations>
<annotation>
<namespace>iso</namespace>
<key>isbn</key>
```

```
<value>030759243X</value>
</annotation>
<annotation>
<namespace>amazon</namespace>
<key>url</key>
<value>
http://www.amazon.com/Although-Course-You-Becoming-Yourself/dp/030759...
</value>
</annotation>
</annotations>
```

[7] An analysis of blog posts by developers just after the announcement shows a concentration of thinking around annotations as providing potential for either commercial or fairly straightforward cultural use.

For example Mal Curtis (2010) suggests annotations could be used to append links to other media files, translations of the tweet in other languages or even software code to tweets. Additionally he also sees such further applications as “the weather, your location, currently listening music / watching tv / film and your Facebook / social media profile information. Or advertising.”

[8] The extent of the changes to the API Terms of Service can be seen in the comparison document produced by Somerville (2011). Section 1.5 in particular applies to legally enforcing the request made by Twitter to developers to restrict development of clients.

[9] Zittrain’s (2008) argument regarding generative development expresses a similar notion to Simondon’s affirmation of the importance of indeterminacy for further invention. For Zittrain a platform is non-generative when it is so locked down that it prevents innovation by its users because they are required to use it in one specific way. Conversely a generative platform allows users to ‘tinker’ and explore freely and thus uncover potential lines of development on that platform.

[10] This portrayal of Network Theory is based on Graham Harman’s metaphysical exposition of Bruno Latour’s work in *Prince of Networks* (Harman, 2009). The author is aware that this is just one version of Network Theory but the clarity with which the Ontology is developed in this work helps sharpen the general comparison to Simondon.

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## FCJ-128 A Programmable Platform? Drupal, Modularity, and the Future of the Web

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I found Drupal in the summer heat of the riverside town of Rosario, Argentina during an internship with a women's rights organisation in the city. The Canadian government funded me to help the organisation with their information technology, part of a program to promote Canada's reputation as a leader in technology sector. Cynical of my government's motives, but committed to the politics of free or open source software (FOSS), I helped the administrator migrate from proprietary software to free software alternatives. Their website relied on an aging copy of Macromedia Dreamweaver, a foreign application for most of the staff. I wanted in Rosario to create the ideal website for the NGO, but I did not have the ability to program such customised software. After some extensive searching, I happened upon the Drupal content management system (CMS) as a replacement. Drupal describes itself as 'a sort of 'builder's kit' made up of pre-designed components that can be used as-is or be extensively reconfigured to suit your needs. Its intent is to provide incredible flexibility while still allowing people who aren't programmers to make powerful websites'. [1] Though at times I regretted my decision as I struggled to learn how to configure it, its code adapted to my goals. Drupal adapted because its code is comprised of many components—known as modules—that I could add and remove to compose a customised web platform. The case of Drupal explicates how a platform may be programmable, in its case through a modular design that puts users in contact with its running code.

How can the programmability of Drupal be understood? How would this lead to a general study of the programmability of platforms? Programmable means to be 'capable of being programmed' (2008: 224). My arrival story offers a window into Drupal, which exemplifies an intensely programmable platform: a platform whose very being resonates with a user.[2]

While, as Dodge and Kitchin (2005) suggest, I can program a clock's time (174-154), its programmability is highly limited because it only alters the time function of its more malleable electric circuits.

A programmable platform facilitates adjustments to its very code. How does a platform's interface express its programmability? Considering the characteristic of a platform requires a re-consideration of the act of programming. Typically, programming appears as a written act. Lawrence Lessig (2006), who has had a seminal influence on the study of the Internet and politics, refers to code as the constitution of cyberspace. His definition fits within the etymology of the verb program that stabilised in the 1940s and 1950s as a written act (see Grier, 1996). Programming came to be seen as an act in language comparable to other human languages (see Cramer, 2008). However, earlier usage of the verb 'to program' by mathematician John von Neumann considered 'the word to mean "to assemble" or "to organize"' (Grier, 1996: 52). His earlier usage does not include the linguistic foreclosures of programming; instead, his usage opens up reconsidering programming as an act of composition. Thus, programming is not only an act of writing, but can also include the mouse clicks made on the computer screen. Importantly, written code is executed—it usually runs to create an interface with the user. This moment of interface offers another juncture to consider the act of programming. The interface, far from the static result of code, is a moment of resonance between the becoming of a user and the running code.

The work of Gilbert Simondon on information and ontogenesis offers a way to understand the resonance between user and code at the moment of the interface. I rely on his concept of transduction (Mackenzie, 2002; Massumi, 2002) to express how platforms may be transductions, part of an individuation occurring through the chemistry between users and code. Programming is the individuation of a software's running code occurring through the resonance of its users and by its code. A transductive approach opens up the window for the reconsideration of the interface of the platform as a moment of individuation, rather than a given form. In the case of Drupal, its modular code—code assembled into discrete, exchange parts—facilitates its programmability. Modularity is the variety of programmability by which Drupal enables users to alter its running code. Explaining Drupal and its modularity through the work of Simondon facilitates a consideration of a programmable platform and also provides an opportunity to question the benefits and limits of modularity. The approach and its engagement with the concept of transduction of programmability and modularity offer a novel line of criticism in the emerging field of platform studies.

## Literature Review

The concept of the platform has proven a useful means to study and critique software and the web.[3] In computing, a platform means, 'a standard system architecture; a (type of) machine and/or operating system, regarded as the base on which software applications are run' (Oxford University Press, 1989). Both Microsoft Windows as software and a personal computer as hardware function as platforms that support other applications. The term acquires critical cache as its technical usage (development platforms) chaff with its political semantics (political platforms) (see Gillespie, 2010); provoking questions of who has access to a platform and what does the platform afford or enable. Lash argues platforms are lifted-out spaces that admit actors to 'participate in various forms of technological life' (2002: 24). Lifting out is a form of networking as it defines a common language or protocol (see Galloway, 2004) identifiably separate from the digital noise. A platform's standards, especially digital ones, create networks of commonality that allow software, routines, and functions to circulate among its nodes. Admission and, by extension, exclusion to platforms constitute a 'new type of social stratification, in which social classes depend on relations to intellectual property and rights of access' (Lash, 2002: 24). His concept and its ramifications also apply to social media. If social media sites provide the technical means for forms of participatory cultural production (Benkler, 2006; Jenkins, 2006), then they also act as the gatekeepers of participatory culture—the means to exist online and create existences online. Critiques of web platforms not only question its boundaries, but also 'the substantial role a site's interface plays in manoeuvring individual users and communities' (van Dijck, 2009: 45). Given the breadth of the term and explosion of social media platforms, a variety of theories have developed to explore their boundaries and affordances of platforms drawing upon political economy, cultural studies, and anthropology.

Cultural studies and anthropology contribute a sense of the platform and its role in community development, cultural production and social intersection. The platform is defined as a site of community and culture enabled through the specific social networking functions (Boyd and Ellison, 2007; Burgess and Green, 2009; Lange, 2007). Lange, for instance, studies the communities of self-identified 'YouTubers' and video-bloggers who form a small community on YouTube through sharing video, responses, and comments. Platforms act as digital intermediaries (van Dijck, 2009; van Dijck and Nieborg, 2009; Gillespie, 2010) that mediate between 'amateurs and professionals, volunteers and employees, anonymous users and stars' (van Dijck, 2009: 53). The environments afford a cultural and technical context for the production and reception of digital objects (Benkler, 2006). While the literature helps explain the affordance of platform, the emphasis often overlooks the conditions of entry, namely what users might disclose in exchange for so-called free services. Political economy and critical studies of the Internet have stepped in to rectify this gap.



While much of the literature on the political economic structures of the Internet predates Web 2.0, its insights on code as a form of structuration continue to resonate with platform studies (Dahlberg, 2005; Dyer-Witheford, 1999; Terranova, 2004). Approaches to structurations of the web question how commercial websites channel user activity into circuits of consumption, harness user labour as free labour, and monitor browsing habits to produce cybernetic commodities. Platforms, in sum, create processes of subjectivication perpetuating regimes of neoliberalism and discipline (Cote and Pybus, 2007; Langlois, McKelvey, Elmer, and Werbin, 2009). The approach adds a more nuanced view of how code mediates access and usage of platforms. Code, however, is a very different structure to those built of brick. If code has a 'variable ontology', as Mackenzie suggests (2006), then how does the code or programming of a platform change?

The programmability of the platform is an emerging line of research. Programming has gradually moved from being dependent on hardware platforms to software platforms. Montfort and Bogost (2009) studied the programmability of the Atari 2600 to describe how programming or software production occurs with certain conditions of the platform. Atari programmers wrote within the confines of 4 kilobytes of computer memory. The primitive gaming platform required programmers to write code for every aspect of the hardware from controlling input from the joystick to drawing lines on the television screen. Modern platforms mediate the developer away from such low-level hardware functions. The case of the JAVA platform, for example, demonstrates how a software platform mediates hardware all together. As Adrian Mackenzie (2006) explains, JAVA sought, and ultimately failed, to create a universal platform that allowed one code to run on any operating system and hardware. The components of the JAVA virtual machine handled the low-level functions allowing programmers to focus on actually creating a program that utilises the platform. The JAVA platform is a zone of programmability that functions to mediate the software from the varying hardware. The Java virtual platform, while a failed experiment, foreshadows the web as a platform. As browsers and server languages become more sophisticated, websites become software, software that depends on the web as a platform (McKelvey, 2008). Software, rather than hardware, came to define the programmability of a platform. If the programmability of the platform has lifted-up, past hardware, then, how does software express its own programmability?

Linux, the famous operating system, is the best known case of a software platform with a particular politics of its programmability. Free software, according to Lessig, is 'code (both software and hardware) whose functionality is transparent at least to one knowledgeable about the technology' (2006: 139). The source code of Linux is open for all to see, and to program as part of the development of the kernel or as a way to customise an installation. (Porting Linux to any hardware has become a bit of a hack, a mark of skill). The openness of the code permits greater entry into programming its source code. Richard Stallman (1985), whose original GNU Public License (GPL) proved a catalyst for FOSS development, argues

in his manifesto that 'copying all or parts of a program is as natural to a programmer as breathing, and as productive. It ought to be free'. Drupal is one thousands of projects that have adopted the GPL as an act of making their programming more open. These efforts mark a clear and vital counterforce to commercial software development using closed proprietary code (Dyer-Witheford, 2002; Milberry and S. Anderson, 2009). However, its open programmability is still a written act, difficult to those who do not speak its technical programming language. If we consider the interface and running code, what other forms of programmability might be possible?

## Programmability at the Interface: An Analytic Framework

The following section takes up the question of the interface to describe programmability and the fluidity of running code. By considering programming as assembling, I sought to open a space to consider the graphical user interface as a potential moment of programming. The interface is 'the threshold between the underlying structure of the program and the user. As a threshold it contains elements of both' (Fuller, 2003: 149). Users directly interact with code often through the click of their computer mouse. The mouse, as described by Sean Cubitt is a 'nomadic and schizophrenic prosthesis' (1998: 88) that points 'to the modular space of infinite text' (1998: 90) and 'governs insert point' (1998: 91). Mouse clicks shape our desktop by dragging, dropping, selecting, and deleting discrete elements. These clicks feed into a loop informing program and user. The question of the interface opens up a consideration of the program as one of forming. If the user possesses a role in the operation of code, does the written code contain the entire program? The following section introduces the concept of transduction to consider the forming of the program.

The work of Gilbert Simondon has aided me in a thinking of programs as in-formation. His work encourages beginning with forming and working backward to formations. Simondon provided one of the first critiques of the now seminal cybernetic information theory. During his engagement with cybernetics, he rejects its definition of information as a static unit of data, and argues it is a process of becoming, a process of in-formation (Toscano, 2009: 384-386). His version of information brings machines, networks, and other technical beings into the fold of his general question of, as Adrian Mackenzie states, 'ontogenesis (that is, how something comes to be) rather than ontology (that is, on what something is)' (2002: 17). Ontogenesis questions 'the becoming of being' and this coming into being is a process of individuation, a term that 'corresponds to the appearance of phases in being that are the phases of being' (Simondon, 2009b: 5-6). If, as Simondon suggests, the individual is always already in a process of individuation, then I have come to think of the program as always already a process of programming. The question turns to understanding the motion and direction of

this programming so that I might re-situate myself in programming Drupal.

In-formation occurs when processes come into contact with each other, contaminating each other (Toscano, 2006: 152-153). Contamination abounds in Simondon because he considers processes to have a metastability which concerns 'the notions of order, potential energy in a system, and the notion of an increase in entropy' (2009b: 6). Simondon introduces the concept to discuss the potentialities driving the processes of in-formation and to contest models of individuation based on 'stable equilibrium'. As Gilles Deleuze writes on his short commentary on Simondon, 'a metastable system thus implies a fundamental difference, like a state of dissymmetry. It is nonetheless a system insofar as the difference therein is like potential energy, like a difference of potential distributed within certain limits' (2004: 87). Metastability in software involves the potentials coursing through electric circuits and user input—the potential of the user moving the mouse across the screen. The computer electrifies with the currents of human and software processes.

When processes of a metastable system contaminate one another, the system changes. These phases are called by Simondon a transduction, which Garelli describes as 'a phenomenon of resonance to a metastable system, which radiates on the basis of a preindividual potential that dephases itself at the same time that it takes hold in individualized form' (quoted in Toscano, 2006: 143). Thinking transductively pushes toward considering the program, and also the user, as changing or individuating from their resonance with each other. Simondon uses the example of a crystal to clarify his concept of transduction:

*The simplest image of the transductive process is furnished if one thinks of a crystal, beginning as a tiny seed, which grows and extends itself in all directions in its mother-water. Each layer of molecules that has already been constituted serves as the structuring basis for the layer that is being formed next, and the result is an amplifying reticular structure. (Simondon, 1992: 313)*

The crystal grows on a cave wall even though it appears static and rock-like. The motion and stabilisation of atoms grow crystals. The growth of the crystal originates from its metastability.

Mackenzie utilises the concept of transduction to envisage the relation between various human and software processes. He emphasises Simondon's transductive approach to information as a way to understand the forming of software. Mackenzie states,

*Simondon's notion of information acts as a countermeasure to the tendency of recent cybernetic and biotechnological understandings of information to collapse living and non-living processes together. It takes the specificity of machines and life seriously. Machines are in the process of in-formation. They are open to information to the extent that they can maintain a margin of indeterminacy, or a capacity to be in-formed (2002: 52).*

The indeterminacy allows for many instances, configurations, crashes, errors, and versions of software. Thinking transductively destabilises the finality of code and emphasising the executing and running of code—its ontogenesis. A transductive view of the platform then, offers a way to envision it as in-formation. The source code does not contain the finality of the platform; rather the informing of a Drupal site modulates through the interactions of users and code. Software is always forming, and this forming also includes a moment of programmability. As form become motion, programs become programming, and Drupal becomes Drupalling.

Here begins a transductive critique of Web 2.0 platforms. As Mackenzie states, 'transductive processes occur at the interface between technical and non-technical, human and non-human, living and non-living' (2002: 52). An interface visualises the running code to the user, while the process of interfacing is a potential phase of transduction. The moment of the interface has significance in the ontogenesis of the platform. Mackenzie writes, 'a machine works within a certain margin of indeterminacy maintained at its interfaces' (2002: 53). Indeterminacy, in my case, refers to how an interface becomes a relation between a user and running code (Toscano, 2006: 140). Since platforms have different interfaces, the line of critique allows for the comparison of how platforms facilitate programmability.[4] The programmability of a platform depends, in part, on the resonance between user and code.

The work of Sherry Turkle (1997) on the difference between users of Microsoft DOS and Apple Macintosh proves instructive to compare different transductions. The DOS interface provides only a blinking prompt, waiting for a command. No clues exist to what the commands might be. They rest in the complex documentation in a manual that its users must memorise to know its cryptic commands. Despite the complexity, its users enjoy their close connection to the computer. The blinking command line connects a user directly to the software processes running. A user can accidentally erase their hard drive or tweak its boot processes without warnings from the interface (Cramer and Fuller, 2008: 150). The Apple interface, on the other hand, provides a graphic user interface to allow users to see their computer in action, at the cost of being increasingly distanced from its actual operation. Users had less ability to modify their computer's running code because the interface guards the running code from the user. Users had far less capacity to program their machines, since most of the configuration elements lay outside of their view on screen. In short,

users enjoy the platform's ease of use, but lack access to the most of the underlying code (Turkle, 1997). DOS and Apple interfaces illustrate how the interface acts as point of resonance between human and software processes. Not only does an interface relate a user to a running code, but it also changes how a user understands and feels capable of interacting with the computer. In the individuation of software, interfacing is a vital process for study. The question of the interface now turns to Drupal. How does it interface humans and code together? How does this interfacing enable its programmability?

## The Drupal Interface: The Cut-Up Technique

Drupal began as a project of a student at the University of Antwerp, Dries Buytaert. He sought to share his internet connection in the residence and ended up coding a message board as well. After he graduated, he moved the message board online as a site called 'drop.org' after a fruitful typo. Drupal gets its name from this site as the word is Dutch for 'drop'. To create the message board, he used the popular combination of open-source code, including the PHP scripting language, the Apache web server, and the MySQL database. In 2001, he released the software under the GPL license making it a free software project.[5] Gradually the platform acquired users and developers. Before the launch of Drupal 5, the number of developers had grown from 45 in mid-2003 to 555 in late 2006 on the Drupal.org site. [6] The site also acts as a repository of Drupal-related projects; they grew from 67 projects in late 2003 to 1,124 projects in late 2006. [7]

Drupal, like most FOSS content management systems, breaks itself down into a series of modules. A module is a snippet of code that modifies the Drupal source code. Appendix I lists the core modules of Drupal and the other modules included by default. Manovich lists modularity as one of his five principles of new media. He defines it as occurring when 'media elements, be they images, sounds, shapes, or behaviours, are represented as collections of discrete samples' (Manovich, 2002: 30). Modularity, in his definition, not only refers to the granularity of computing components, but also their capacity to relate. The concept of modular design began in computer hardware as IBM streamlined its bloated product line by creating a modular product line consisting of relatable hardware and software components (Campbell-Kelly and Aspray, 2004: 117-137). IBM's innovations, as Andrew Russell (2008) points out in his history of modularity, spread across the computer industry and inspired the current modular design of desktop computers. The computer is an assemblage of standardised components, such as the CPU and the hard drive (Grove, 1996). As websites transitioned from simple text files to complex software, developers translated the concept of modularity from computer programs. Many popular FOSS platforms, such as Drupal, Joomla, and WordPress, use modules in their development.

Modularity is a standard form of programming that divides an application into the sum of many independent and linked components (Manovich, 2002). The concept is highly prevalent in FOSS projects. Modularity eases participation in development in their distributed operations. Contributors only need to specialise in certain parts of the code to make a contribution to the project, allowing 'different individuals to contribute vastly different levels of efforts commensurate with their ability, motivation, and availability' (Benkler, 2006: 103). The resulting modular code is 'a highly distributed object' comprised of 'a loose corpus of source code' consisting 'of several thousand files organized in an intricate tree-like hierarchy' that 'provisionally stabilizes' in the form of a 'release' and, at the same time, under 'constant modification' by 'patches' that modifies the source code' (Mackenzie, 2006: 70). Modularity and open source creates an 'open' object, constantly evolving.

Modularity also allows its developers to extend the program without the input or approval of the core by creating new, optional modules. So long as the module's code speaks the same language as the platform, such as both using the standards of Drupal version 5, then development occurs without the consent or involvement of core development. By installing and running Linux, its users enrol in this a networked platform of module creation and distribution. Thus, the programming of Linux includes both a programming community expanding and honing the code base and an end user conjuring their own kernel, and in doing so, expressing their vision of the platform based on the available modules. Web modules further accelerate the spread and impact of modularity because their programming languages do not need to be compiled so the central core of the platform does not need to be recompiled to add or change modules.

Where modularity has commonly been understood as a form of software production, modularity also alters the resonance between the end user (or, as Mackenzie puts it, the code subject) and the platform (the code object) (Mackenzie, 2006: 70). Linux famously allows users to compile their own kernel, a badge of honour among technical gurus. Various interfaces allow users to include, exclude, and modularise parts of the kernel. An instance of Linux includes an open platform, a developer community, and an end user creating their own version of the object. They too become part of this networked object, watching and benefitting from the modules uploaded. Various interfaces have adopted modularity as part of programming (Myers, 1998). One of the first popular programs to adopt a modular interface was MAX/MSP, a popular music composition software for the early Apple computer (Déchelle et al., 1999). Users composed music by connecting modules to create and modify sounds.

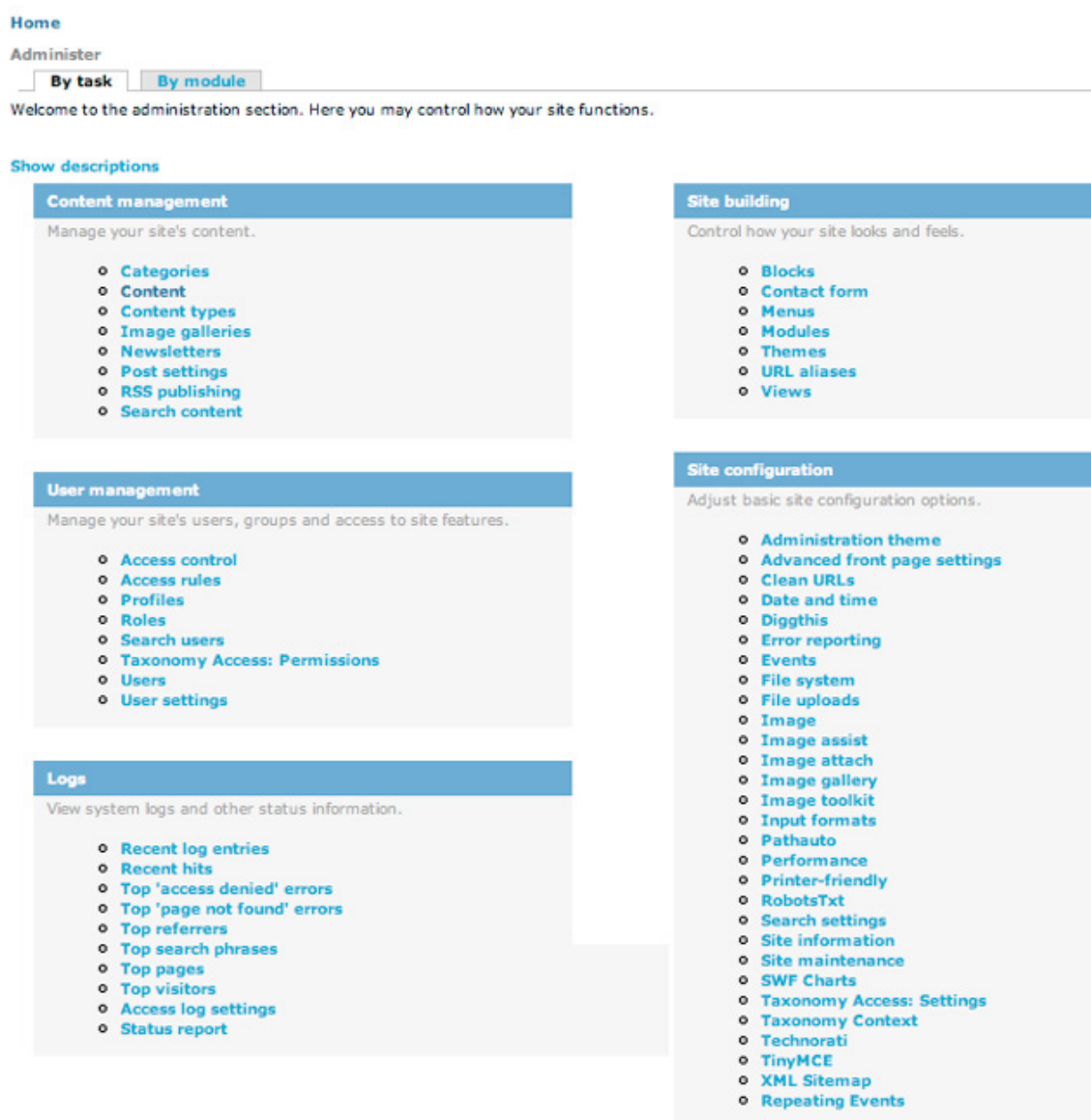


Figure 1. The Drupal interface and modules

Modularity at the interface helps because it divides code into discrete functions that are easily signified. Simply put, modules break complex code down into digestible bites. I depended on these little hints when I configured my first Drupal site in Argentina. Logging in as the site administrator gives a user access to add and remove modules. The Drupal interface, depicted in Figure 1, provides a simple menu to enable and configure modules. It allows users to exclude and include modules on their site. To use a module in Drupal, a user downloads and installs modules from Drupal.org onto their version of Drupal. The list of modules shows their names and a brief description that explains what they do. Modules feature their own configuration menus allowing users to tweak their functions. Through these menus and modules, a user begins a process of individuation with their local installation. The platform individuates through the enabling and disabling of different modules together in a particular configurations, what Simondon would call a phase.



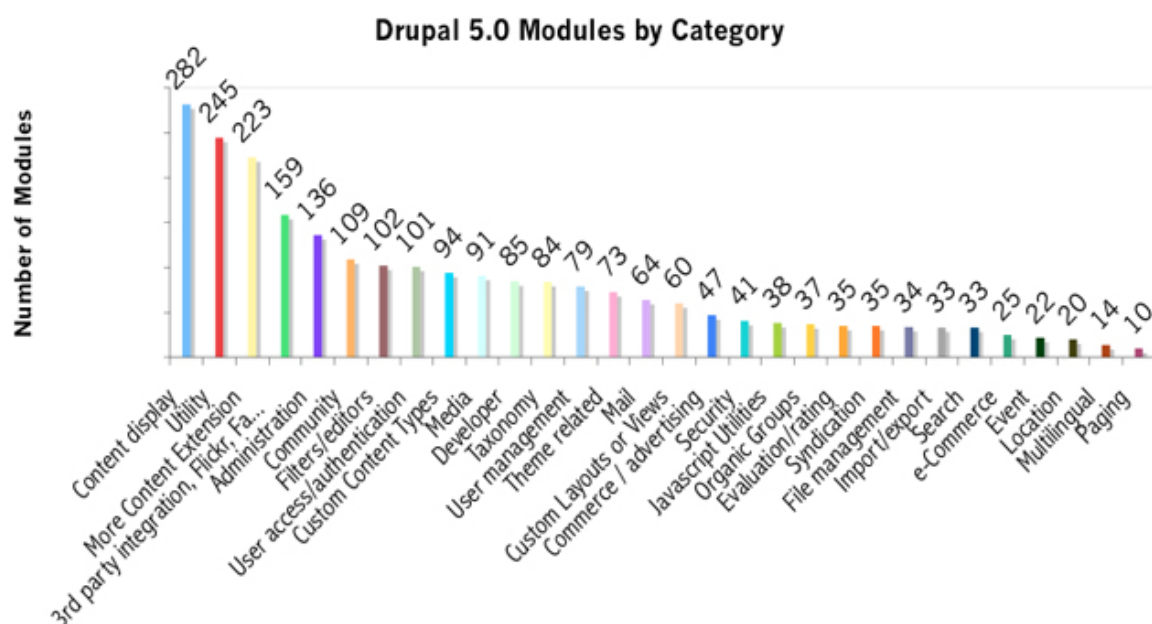


Figure 2. Modules available for Drupal

Modules connect the individuation of a local Drupal site by connecting the user to the wider open source development community. The developing community alters a local installation by generating new modules, versions of modules, and eventually new versions of the core. Drupal features a highly diverse range of modules. Figure 2 depicts the diversity of modules available for Drupal 5. At the time of my study, Drupal had 2,411 modules that Drupal.org divided into 30 categories. The average category has 80 modules. Each module extends and modifies the capacities of Drupal, from common tasks, like improving the software's search engine or the type of media it can handle, to the obscure, such as allowing Drupal to become a bibliographic tool. If the possibilities of a Drupal site depend on the range of modules available, then the growing community continually expands and mutates the relationship between user and running code.

Where the act of writing once described the act of programming, the cut-up technique (Burroughs and Gysin, 1978) provides a better description of modular programmability. William S. Burroughs popularised the technique of cutting up texts into short sentences or words and then re-assembling these cut-ups into new works (Hansen, 2001). Modules are like cut-ups—snippets of code assembled together by the author. Katherine Hayles notices a similar pattern in her description of new media. 'Fragmentation and recombination,' she mentions, 'are intrinsic to the medium' (Hayles, 2004: 76). She compares these characteristics to writing techniques similar to the cut-up, through the following helpful example—

*... Raymond Queneau's Cent mille milliards de poèmes (1961), a book in which each page may be cut into several strips corresponding to the lines of a poem. By juxtaposing the cut strip on one page with strips from other pages, large numbers of combinations are possible, as indicated by Queneau's title. (Hayles, 2004: 76-77)*

The pre-cut lines resemble the thousands of Drupal modules that users can include or omit. The Drupal.org website becomes its own book of poems, comprised of the 2,411 modules. Once written, modules become potential cut-ups for users to program at the Drupal interface. Like the reader or editor of Queneau's book of poems, users arrange modules in various ways to program the platforms. This form of programming resembles John von Neumann's definition of programming as assembling. The cut-up captures a type of programming as act of assembling snippets into new formations. The cut-up technique appears in Drupal as user piece together modules. Modules function as signs that 'not only point to—or signify—other documents and resources, they enable material effects, for example, taking us to other signs, or in the case of web browser cookies, storing a remote ID file on our own PC hard drives' (Elmer, 2006: 16). When a user enables a module in the interface, it injects a bit of code during various events of the Drupal process. The injection of code is a transduction that changes the form of the Drupal site. A user creates an event when they click a hyperlink. Drupal itself also creates an event when it runs a script automatically (through Linux's job scheduler cron). Events trigger functions in the Drupal code. These two examples illustrate how both users and code trigger software functions. Developers refer to events and their resulting functions—'the things Drupal does'—as actions. [8] Modules hook into actions. Drupal actually uses the term hook to designate how 'modules interact with the Drupal core'. [9] Each module defines a list of hooks to alter actions. VanDyk and Westgate (2007) give the following example of how hooks allow modules to alter the Drupal process,

Suppose a user logs into your Drupal web site. At the time the user logs in, Drupal fires the user hook. That means that any function named according to the convention module name plus hook name will be called. For example, `comment_user()` in the comment module, `locale_user()` in the locale module, `node_user()` in the node module, and any other similarly named functions will be called. If you were to write a custom module called `spammy.module` and include a function called `spammy_user()` that sent an e-mail to the user, your function would be called too, and the hapless user would receive an unsolicited e-mail at every login. (2007: 4-5)

The example details the event (logging in), Drupal's response (the hook announcement), and the capacity of the module to intervene (its hook function). By enabling a module, the user spawns a process that interjects new code when executing Drupal core code. The resonance between user and modules creates transductions that alter the Drupal installation, creating new phases of its individuation as Drupal. Through its modularity, Drupal remains in-forma-

tion—always with a potential for the platform to change even when installed and running. Modularity, in short, enables a particular form of programmability; however, the limits of Drupal too must be considered if this line of critique proves to be productive for future developments on the web. Modularity, as argued, is the specific transduction of Drupal, but what are the ramifications of modularity and the cut-up technique?

## Plug and Play? Questioning Modularity

The open development process leads to a highly divergent and complex code base for Drupal. Problems arise since Drupal 5.0 assumes the compatibility of modules. Inevitably, conflicts arise between modules operating together. The risk arises from the disjuncture between code and its representation at the interface. Bad interactions can occur between code that the interface cannot represent, except as an error. The user does not have the luxury of a pharmacist to advise against taking two modules at the same time. The metastability of the Drupal platform does not preclude crisis and failure. Modules may break, stopping the individuation of a site. A quick search on the Drupal websites for ‘module conflict’ returns 394 different mentions in the forum. An exemplary post writes,

*Seems as though I have lost all administrative privileges to my site during development. I think their might be a code conflict between this module and another one.*  
[10]

The opacity of code returns; a conflict exists deep within the processes of Drupal as two modules and their function collide. The resonance between code and humans at the interface ruptures, separating the two processes.

How does the modularity guide our own thinking about software development? A critique of modularity must also consider how its social dimensions affect its programmability. Modularity can be both social and technical. Russell (2008) utilises the same case of IBM and streamlining its product line I used above to illustrate not only technical design, but the social changes in IBM. Modularity, he suggest, also became a form of organisation where the firm consolidated systems engineering among elites who schematised the modules. Indeed, modularity has also become a concept to understand the spread of ideas and tactics in collective action. Benedict Anderson first introduced modularity when he suggested the rise of nationalism corresponded with its cultural underpinnings becoming modular, that is, ‘capable of being transplanted’ (1991: 5). Nationalism, in short, spreads through modular cultural

artefacts. The concept of modularity as a social phenomenon was elaborated by Sidney Tarrow in his study of social movements. He defines modularity as 'the capacity of a form of collective action to be utilized by a variety of social actors, against a variety of targets, either alone, or in combination with other forms' (1994: 33). The petitions and the boycott, for instance, both circulated as modular tactics during the American Revolution.

Technical compatibility of modularity obfuscates its social formations. What are the implications of disconnecting certain cultural practices from a specific context? Modularity depends on reducing complex social practices into simple pieces of code. The instrumental logic of modular compatibility seems to exclude the complexity of cultural artefacts. What are the conditions of circulating cultural practices embedded in technical modules? How do cultures become reified within modules? The process of modularity then encourages the circulation of socio-technical practices as fixed and unquestioned. The Drupal project itself suffers from a lineage of open source development with a male-dominated hacker culture (Jordan and Taylor, 2004; Mackenzie, 2006; Ross, 1991). An internal Drupal project has sprung up to attempt to address its lack of gender diversity.<sup>[11]</sup> This questioning is critical to reveal the cultural tendencies circulating with modules. Modules inscribe limits on the programmability of the platform because they transplant practices that have been encoded in a specific, perhaps problematic, way. Downloading and installing a module transplants code without much consideration of its specific politics. A module for voting on stories, for example, might deploy a binary 'yes/no' poll appropriate for its development context, but inappropriate for other sites. The technical compatibility ignores social incompatibilities.

## Modular Resonance

The concern that modularity might obfuscate social processes stresses the need for greater engagement with the development of modules. The individuation of my various Drupal sites has also involved my own individuation. The Infoscape Research Lab, where I work as a research associate, has run Drupal on its website since 2006. I applied my skills learned in Argentina to build the lab's site. Over the years, the lab has built up a small eco-system of users and modules. (Not all the build-up is useful I learnt from administering the site). Adding module injects new processes into this ecosystem without requiring the migration of users or re-formatting our content. Even though we use modules to provide functions we never imagined when the site was first constructed, Drupal allows the programming of its core code to enable precisely this task. The site is never done, for better or worse. Its individuation continues.

I have also come to see modularity as a concept of importance for digital methods.[12] The Lab has begun to develop its research tools as Drupal modules. The Blogpulse, for instance, pulls data from our sample of Canadian partisan bloggers, renders a timeline of blog posts year by year on the site, and allows site contributors to annotate the timeline. By developing tools as Drupal modules, we skipped having to develop a system for logging in users, a web interface, and avoided challenges of linking databases. The module is also distributed under the GPL license for other research projects to use. In benefiting from the modularity of Drupal, the system has opportunities for research. Could Drupal be a platform for research modules? How could the university create platforms, like Drupal, for developing methods and creating research projects? While this possibility must be left for another paper, my last anecdote emphasises a need to remain aware of how the ontogenesis of software, its programming, and how this ontogenesis includes our individuation. As software studies and digital methods evolve, how might our understandings of computers inform new methods and approaches?

## Conclusion

What does Drupal tell us about the future of the web? To be sure, Drupal is not the only type of programmable platform. Examples proliferate on the web, such as Yahoo Pipes, OpenKaspow, and Dapper (now defunct). The platforms allow users to create mash-ups by mixing information flows and injecting a number of modular filters. These programming interfaces, in short, make small machines—simple programs. Drupal, on the other hand, facilitates the repurposing of its highly complex program. In this sense, Drupal exemplifies a growing number of open source projects such as Ruby on Rails, and Django for Python. These platforms allow users to program aspects of their code, while also leaving some components untouched. They allow for selective programming—connecting amateur web developer with the mature code of open source programmers.

What other forms of programmability can be imagined? Matthew Fuller's *Webstalker* (Elmer, 2006: 10-12), for instance, imagined a new way to navigate the web as networks of links. Users do not see a website, but a network of connections they can choose to follow. The reimagining of browsing hints towards other ways code, its processes, and its effects could be represented at the interface. Could modules be seen as networks linked to various moments of the running code? Can the future and past produce a live interface where the potential collisions of code might appear? How might cloud computing link independent servers together to share code and innovations? Many questions about programmability and its future remain. The case of Drupal, I hope, pushes toward thinking about a future web, one capable of being further programmed.

Programmability as a trend as I have discussed it here differs sharply from one currently popularised: the proprietary fiefdom of the iPhone (See Drahos and Braithwaite, 2003). Apple's users have a conscribed interaction with its code. Extending the functionality of an iPhone—tailoring it—happens through the Apple's App Store. Access to the store arrives pre-packaged, final, and seamless. The store greets you as one of the default applications on the iPhone's home screen. Pressing the icon connects you to a world of applications extending your iPhone in unimaginable ways. Who knew your phone can simulate a piano or calculate a tip for you? The stability of the iPhone comes at a cost—it becomes a black box. The iPhone, once heralded as the 'portable Internet', has created 'the anti-Internet,' Joshua Errett (2010) writes in his introduction of the App Store as web3.0, 'Unlike the Web, [the App Store] is closed, elitist and heavily and arbitrarily policed.' Users resonate with the potentialities of the iPhone only through the App Store. It adapts the desires of users through millions of applications which extend the device, while simultaneously preventing substantive change. The iPhone is a fixed platform. The code operates, but never changes aside from the occasional update from Apple, a formality automatically installed when syncing the phone. The process of the iPhone, then, is stasis. The result creates 'a curated web' where the possibilities of the platform depend on Apple curators.

The Drupal project takes on critical importance in contrast to the iPhone platform. Not all interfaces prioritise surfacing the variable ontology of code. Platforms involve hierarchies that mediate the resonance between user and code. Social media companies maintain control over proprietary platforms that they circulate as public goods and, when successful, position the public underneath their control. As Dyer-Witheford states,

*... who commands which means of communication is a question in determining what articulations may or may not be made. And in advanced capitalism, the conditions of discourse, both its proliferation and blockages, are deeply set by corporate power.*  
(2007: 196)

Chun (2005) describes how the Windows Media Player communicates with its developer Microsoft to send user preferences. The code supports the Microsoft monopoly by feeding it valuable data about what media users consume. The opacity of the resonance between users and code often feeds into larger processes of monopoly and corporate expansion. Considering the resonance between user and code provides a way to invoke more participatory platforms.

Drupal has political significance then as a programmable platform. Drupal exemplifies how open platforms contribute alternative, and non-commercial means of producing the web. In

comparison to a platform like Linux where a platform really becomes a means of accessing and using your computer, Drupal is a productive and open platform that can be deployed in a variety of contexts and causes. Drupal becomes the ground on which different users and organisations build. Drupal thus aids our productivity. Further, by using Drupal, users enter into a shared space, almost a commons, where they benefit from the circulation of networked common goods. Drupal creates a common space through its standardised platform that, in turn, produces new spaces. Drupal, in this way, becomes almost a tactical database of modules ready to be deployed in the service of any cause. In a time where social media depends predominately on commercial platforms, Drupal demonstrates the existence of alternative platforms that should not be overlooked.

At a time when platforms have become an important part of a participatory culture, their programmability acquires a critical importance. Through the work of Gilbert Simondon, I demonstrated how platforms always are in-formation, whose state might change due to the interactions between the user and its running code. The software interface acquires importance as a critical moment of resonance between user and code to enact programmability. Drupal offers a way to consider programmability through its modular design that includes an interface where users can add and subtract modules. The interface allows users to program the platform through the assembly of modules. While Drupal's modularity does not prove a definitive answer to programmability, a study of its responses to these questions opens up a new line of inquiry into making the web more participatory, not only in content production, but in the programming the code constituting Web 2.0.

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## Notes

[1] This quote comes from The Drupal Overview, see: <http://drupal.org/getting-started/before/overview>.

[2] Arrival stories have been a popular method of virtual ethnography. The device, as used here, describes the ethnographer's way into the object of study, in this case Drupal (See Beaulieu, 2004; Hine, 2000).

[3] The concept of the platform was also the subject of a recent conference. For more details, see: <http://www.networkpolitics.org/content/platform-politics>. The site, incidentally, runs Drupal.

[4] Cramer & Fuller (2008) provide a taxonomy of interface for their contribution in the *Software Studies: A Lexicon*. Also see the book *Interface Criticism: Aesthetics Beyond Buttons* by Andersen & Pold (2011).

[5] From Drupal's own history at: <http://www.drupal.org/node/769>.

[6] I have kept my discussion of Drupal focused on 5; however, the version is long out of date. On 5 January 2011, Drupal released version 7. For more details about the project, and its continued growth visit: <http://www.drupal.org/>.

[7] From statistics posted by joshk on 5 December 2006 on Groups.Drupal.org. See: <http://groups.drupal.org/node/1980/>.

[8] See, <http://drupal.org/node/172152>.

[9] See, <http://api.drupal.org/api/group/hooks>.

[10] See, <http://drupal.org/node/726116>.

[11] The project is an internal Drupal Group called DrupalChix, see: <http://groups.drupal.org/drupalchix>.

[12] The module is viewable here: <http://www.infoscapelab.ca/blogpulse>. Please email me at: [mckelveyf@gmail.com](mailto:mckelveyf@gmail.com) for a copy. Paul Vet, a software developer who contributes to the lab, wrote the BlogPulse and has assisted in developing other software project. See his website: <http://640k.ca/>.

## Appendix I

### Core Modules:

Source: <http://drupal.org/node/27367>

Core – required

Block – Controls the boxes that are displayed around the main content.

Filter – Handles the filtering of content in preparation for display.

Node – Allows content to be submitted to the site and displayed on pages.

System – Handles general site configuration for administrators.

User – Manages the user registration and login system.

Watchdog – Logs and records system events.

Core – optional

Aggregator – Aggregates syndicated content (RSS, RDF, and Atom feeds).

Book – Allows users to collaboratively author a book.

Comment – Allows users to comment on and discuss published content.  
Contact – Enables the use of both personal and site-wide contact forms.  
Drupal – Lets you register your site with a central server and improve ranking of Drupal projects by posting information on your installed modules and themes  
Forum – Enables threaded discussions about general topics.  
Legacy – Provides legacy handlers for upgrades from older Drupal installations.  
Menu – Allows administrators to customize the site navigation menu.  
Path – Allows users to rename URLs.  
Ping – Alerts other sites when your site has been updated.  
Profile – Supports configurable user profiles.  
Search – Enables site-wide keyword searching.  
Taxonomy – Enables the categorization of content.  
Tracker – Enables tracking of recent posts for users.  
Upload – Allows users to upload and attach files to content.

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