

Urban Discourses and Neural Networks: The Relevance of Deleuzian Characteristics of Group for Neurons/Brains and Bodies/Cities

INTRODUCTION

This article arises from an interdisciplinary conversation between an architect and a psychiatrist on the different ways groups function at macro and micro levels; specifically, groups of bodies in cities and groups of neurons in brains. Traditional paradigms of both cities and brains describe the relationships between the groups that comprise them in terms of hierarchies and structure: brains are often described as having regions that dominate in one particular area, say language reception, while cities are often described in terms of sociopolitical power structures. Gilles Deleuze and Félix Guattari describe these characteristics as “arborescent.”¹ New understandings for both, however, reveal patterns of interaction within each that Deleuze and Guattari would call “rhizomatic”: networks of interaction that proceed horizontally, unpredictably and often in ways that contradict hierarchical organising principles.² While certain hierarchies will always be evident (and sometimes beneficial), both brains and cities are also multiplicitous assemblages that are in a constant state of becoming.³ Elizabeth Grosz goes further and argues that bodies and cities are mutually defining assemblages that cease to be distinct from one another. This article will offer evidence from cognitive neuroscience and epigenetics that supports her argument that the relationship between gene and environment is mutually defining and non-hierarchical. The article will also offer examples from a recent “critical spatial practice,” a collaborative urban installation, that arises out of the discursive space between groups of bodies and their urban environment that similarly show the capacity of the marginal to deterritorialise hierarchical urban systems.⁴ The article will conclude with observations about the interface between the morphology of a part of a group and the group itself, on the micro level of deoxyribonucleic acid (DNA) and the macro level of bodies and cities.

The article is not offered as a resolved argument, but as a curious association. We attempt what Brian Massumi describes as a “dynamic holding together of disparate elements.”⁵ One

is to the left (of the page) and one is to the right, although occasionally the text will blur to both margins as the discourses converge, the form mirroring the substance.

It will become more apparent at the conclusion what this “curious association” might be. But, at the outset let us say that while groups of bodies and groups of neurons appear distinct from one another and diverse in form, substance and organisation, like different “strata ... on the Body of the earth,”⁶ we observe that the lines that define their difference can also spill from one stratum to the other, as lines of deterritorialisation. For as groups of bodies relate interpersonally in the urban realm, the environment they co-create has the capacity to shape the very architecture of the groups of neurons in their brains. And likewise, the capacity of individual brains to tolerate change, problem-solve, and regulate mood and arousal affects their capacity to participate in a group and operate in the urban realm.

MULTIPLICITIES: NOMAD, NOT MONAD

“Multiplicities,” as Deleuze and Guattari define them, have no essential unity around which they pivot. They cannot be described in terms of subject or object, only magnitudes and vectors, structured as changeable, heterogeneous “assemblages” at any particular point in time and/or space.⁷ Multiplicities grow, like rhizomes, horizontal roots that bud in any direction underground, as distinct from trees with a single trunk supporting an overarching canopy and supported by a centralised root system. For Deleuze and Guattari, multiplicities describe a way of thinking and writing that is liberated from the linearity of argument that is the traditional basis of philosophy and, indeed, all scholarly enterprise. It describes the creative, often intuitive, leap sideways between “plateaus”⁸ or disciplines; thought that grows in unpredictable and uncontained directions. One of the many metaphors they use to distinguish these two ways of thinking from each other is that of the nomad: the free wanderer that knows no bounds, is not contained by an interiority, and finds its identity in difference; versus the monad (a neat shift in consonants): a Leibnizian term to describe an indivisible, indestructible unit. One is free, the other contained. While we, the authors of this paper, do not advocate the primacy of the rhizomatic over the arborescent (this merely inverts and affirms the same system of privileging that Deleuze and Guattari seek to deconstruct), we do see praxic value in the rhizomatic as a model for interdisciplinary cross-fertilisation as well as a means of critically re-thinking ways of understanding different types of groups that are the subjects and objects of our different fields of investigation.

MULTIPLICITIES IN NEURAL NETWORKS

Deleuze and Guattari’s model of multiplicities is relevant for recent insights into the development of neural networks that have arisen from the cognitive neuroscience discourse. These insights present a profound challenge for earlier hierarchical models of brain function that privilege the frontal lobes over other brain regions with an executive role.

Previously, the frontal lobes of the human brain were conceptualised as “fixed” centres that initiated and controlled the planning, organising and prioritising cognitive functions of the mind.⁹ They were the “subject” dictating the function of

the two other main association and integration regions for the five senses – the temporal and parietal lobes. In turn, it was thought that the temporal lobes were primarily concerned with memory and language functions, while the parietal lobes subserved time and spatial perception.¹⁰

Recent structural and functional neuroimaging studies suggest a radically different, alternative understanding: neural networks may indeed involve the frontal, temporal and parietal lobes to support a given higher-order cognitive function, for example working memory.¹¹ However, each frontal-temporal-parietal neural network has a functional integrity as an extant network with each of its component brain regions equally important.¹² If either the frontal region, and/or the temporal region, and/or the parietal region is/are impaired in its function then the whole network becomes dysfunctional, manifesting a corresponding diminished working memory ability. There is no unique, fixed, subject role for any of these brain regions in the neural network: dysfunction in any of these brain regions leads to a decreased working memory performance. Such neural networks are comprised of equal, inter-dependent, “assembled” entities with no subject and no object: in this way they can be conceptualised as multiplicities.

CITIES AND THEIR ENVIRONMENT

While most would regard cities as groups of complex systems, only recently have scientific paradigms been developed to understand the way cities function that resist simple hierarchical thinking. In the early 1970s, the science of studying the impact of cities on the environment used a simple linear equation:

$$I(\text{impact})=P(\text{population})\times A(\text{affluence})\times T(\text{technology})^{13}$$

It was recognised that population and affluence increased the impact on the environment, but technology to improve efficiencies could diminish their negative effects. More recently, models have been developed that recognise that many other factors affect the environmental impact of cities, including organisation, lifestyle and the types of materials and energy that flow into and out of the city. Current models treat the city as a metabolising organism and use Material Flux Analysis to investigate the complex relationship between stocks and flows of a city.¹⁴ In these investigations it is the vectors of movement through a city that are critical: energy, water, air, biotic and abiotic raw material. While the group of subjects who occupy it, the populace, are still important, as are the groups of material objects (the built form), it is the multiplicitous fluid trajectories in and out that are critical in determining a city’s ecological footprint. Deleuze and Guattari suggest that it is these circulations or flows – in particular, networks of passage – that characterise a town or city and diminish the potential for hierarchical power relations to assert themselves.¹⁵

INTERPERSONAL RELATIONSHIPS WITHIN CITIES

If one looks at group power relationships within cities, it appears that arborescent structures predominate: the law, the government, commerce wield a strong, hierarchical organising force. Those that own land, money or have institutional power are the ones who shape the urban fabric. However, even the marginalised have the capacity to deterritorialise the structures that seek to define them, through rhizomatic movement. The “tactics” of movement and timing enable the apparently powerless to usurp power from the powerful.¹⁶ We see evidence of this in the temporary appropriation of public space for private occupation by the city’s homeless: in the stealth of groups of graffiti artists who appropriate public and private walls; and in groups of skateboarders who transform a handrail for the infirm into a stunt track. The city’s group power relationships are played out through vectors of movement as much as they are through the building of edifices and law enforcement.

BODIES-CITIES: A MODEL OF CO-CREATION

While science addresses a city’s relationship to the broader environment and discourses of power relations address interpersonal relationships within the city, philosopher Grosz turns her gaze (again through the spectacles of power relations) to the relationship between groups of bodies and the city’s material fabric. In her chapter “Bodies-Cities”¹⁷ she argues that two previous paradigms have dominated the understanding of this relationship. The first is causal: bodies create cities out of a need. The second is representational: bodies and cities have an isomorphic relationship (that is, exhibit the same organisational structure as each other) that develops in parallel: the king is a city’s head, the law is its nerves, the military is its arms and commerce is its belly, etc. She suggests that this is a misreading of the relationship. Cities and bodies are isomorphic, but not as mirrors of each other: rather, she writes, “there is a two way linkage that could be defined as an *interface*, perhaps even a co-building.”¹⁸ Grosz offers evidence of this from the biological sciences: for instance, the subject’s form is shaped by its physical context where musculature and posture change in response to vertical living and sitting at desks. She also notes that interpersonal relationships between bodies are shaped by the divisions evident within homes. This can be readily extrapolated to cities: quarters defined by ethnicity, wealth or specific professions often create an atmosphere of exclusion for those outside the group. Finally, the inscriptions of bodies on the fabric of the city in the form of advertising create norms, shape habits and facilitate desires that are involved in the creation and/or destruction of a person’s self-image.¹⁹

INTERFACE BETWEEN REGIONS OF THE BRAIN: THE BRAIN AS CO-CREATING ORGANISM

Contemporary models of neural network development identify a similar pattern of growth that suggests a flexible interface between different parts of the brain. It appears now that each neural network – for example, a frontal-temporal-parietal neural network subserving working memory – does not have a rigid, immutable and inflexible structure. Rather, potentially many different neurons in frontal, temporal and parietal brain regions may be recruited to form a particular frontal-temporal-parietal neural network at a given point in time.²⁰ This is most apparent during three key developmental phases: the first five years of life, peri-puberty and in late adolescence, and continues until middle adult life. Neural network development has usually reached its zenith by the mid-40s.²¹ Hence, a given neural network, such as a frontal-temporal-parietal neural network subserving working memory, operates more like a vector than a fixed structure; again, like a Deleuzian multiplicity.

Also, like a multiplicity, such a neural network is changed in its nature if a further brain region becomes involved. For example, the striatal region of the basal ganglia has a key role in the coordination and integration of movement, emotion and thought. If the striatal region becomes involved in a frontal-temporal-parietal neural network, multiple new potential neural networks are possible. These include frontal-striatal-parietal neural networks, known to subserve the “holding on line” or capacitance function of working memory, while frontal-striatal-temporal neural networks play a key role in short-term memory acquisition.²²

Further, these different brain regions have specialised functions that they are innately best at compared to other brain regions, but each has the capacity to appropriate the specialised function of other brain regions if needed. For example, if an acquired brain injury (for example, a brain tumour) leads to dysfunction of the temporal lobe region before speech is developed, children can still acquire speech through adjacent frontal and/or parietal brain regions. In this way, while a certain functional hierarchy is evident, the brain comprises multiplicitous assemblages in a constant state of becoming.

RHIZOMATIC GROWTH IN GROUPS

As groups of bodies “morph” like rhizomes into the city that surrounds them, and vice versa, what is their destination? Grosz speculates that it is unclear. Will the interface between body and city ultimately be through the machine of the computer? And if so, will the machine usurp the role of the body’s limbs (as happens already in the use of prostheses and robotics in factories) or will the machine take on artificial intelligence?

All of these discourses about bodies and cities, “plateaus,” if you like, have influenced a number of architectural practices to move beyond the traditional conceptualisation of architecture as the design of physical buildings on fixed sites in the urban realm and into what Jane Rendell calls “critical spatial practices.”²³ These are creative works, often collaborations, that explore multiplicities, vectors of movement, and

rhizomatic development to reflect the complexity of the city's relationship to the environment, the diverse ways that the city structures interpersonal relationships and the potential for the non-human aspects of the city and the bodies that reside within it to co-create one another.

Paul Carter, in his writings on creative collaborations, says of the collaborative process: "In contrast with the solo artist, producing another Grecian urn image of Being, artistic collaborators plunge into the realm of Becoming."²⁴ It is through the uncomfortable collisions of difference that new inventions arise. And the outcome of such collaborative processes? "It is a mistake to regard the outcome as simply another provisional insight by a group of artists," he writes. The most important outcome is a reinvention of social relations.²⁵

URBAN THREADS, A COLLABORATIVE INSTALLATION: BODIES-CITIES CO-CREATING

By way of example, I will offer a collaboration of my own with a group of homeless women that explored the ways they stake out public place in the private realm and the reciprocal performances of the city to both welcome and reject them.²⁶ Together we created an installation of domestic "rooms" in hidden and disused spaces in the city. The project evolved over a period of months in the context of a number of discursive encounters (flights of words, hands and feet) – meeting, storytelling, seeking approval from landowners and authorities, fabricating, locating and walking – and was installed in the city of Melbourne for two weeks in 2004. The "rooms" included Bedrooms and WAR(d)robes, and signposted an existing Living Room (the name of the Primary Health Service that supported them) and Dining Room (a café that offered free lunches), see figures 1-3 below.



Figure 1: *Bedroom 3* jostling with the rubbish (courtesy of photographer Tim Herbert).

Figure 2: Fabrication of the WAR(d)robes (courtesy of photographer Janet McGaw).

Figure 3: The response of the city to *Bedroom 3* (courtesy of photographer Janet McGaw).

The installation was made from reclaimed rubbish, a material flow that normally exits the city for disposal elsewhere. The “objects” that we created documented the interpersonal encounters that the “subjects” experienced in the city. Further, they invited ongoing discourse. The city responded to the installation in multiplicitous ways. Some of the obvious wielders of institutional power supported our project by offering the use of their land for free. Others sought to stymie our progress through legalistic prohibitions. Once in place, passers-by used their tactical power to both engage with the work and destroy it. A sticker appeared: “vote 1 for artists.” A chrysalis made by one of my collaborators as a “bedroom” was mysteriously relocated to another’s enclosure after a storm damaged hers. One was slashed with a knife. It was also damaged by a daily encounter with a “wheelie” (rubbish) bin. As curator, I recorded the encounters on the installations with spray-painted graffiti. The installation remained in a constant state of “becoming,” even as it disintegrated.

Many of the garments and chrysalises my collaborators made were evidence that the city creates them as much as my collaborators’ presence in the city shapes the urban fabric. The WAR(d)robes were a reflection of their daily experiences, such as feelings of being judged by the clothes they wear, feeling intimidated by uniforms of office and feeling the need to choose clothes that carve out a protective zone of space around themselves. The Bedrooms were the most minimal of enclosures: barely there. They had no sense of entitlement to the city. And the Path of Most Resistance (and Least Distance) that we marked to connect each site was a vector in space that recorded two of my collaborators’ experiences of taking the shortcut through private property: the atrium of a multinational accounting firm and an élite shopping precinct where security guards would regularly ask them to move on. On good days, one of them confided, she would take this route, but on days when she “felt bad about herself” she would take the longer path through less visible streets.

THE FOLD: THE MORPHOLOGY OF MULTIPLICITIES

When working as an architect, even on such ephemeral projects that seem in many ways form-less and barely spatial, it is still illuminating to reflect on the forms that my collaborators made to be housed in our metaphorical rooms. Deleuze, via Leibniz, argues that the fold is the form that a multiplicity takes. Architects and architectural theorists, such as Bernard Cache,²⁷ John Rajchman,²⁸ and many others in recent years have often taken this literally as a cue to use the act of folding to create the structure and skin of buildings and urban spaces. While it is not within the scope of this paper to speculate on whether one ought to take such a sequential leap, we will offer two observations on the effect of morphology on the interface between the individual and the group.

FOLDING IN EPIGENETICS

Deleuze's concept of the Leibnizian fold can, in part, be described by three constructs. Each construct has numerous resonances with the emerging field of epigenetics in its specific relationship to cognitive neuroscience. Epigenetics²⁹ examines the changes in gene functional activity associated with altered external environments. First, Deleuze defines the fold as anti-extensional, a complex essence that is foundationally qualitative as an extant complex figure. Similarly, the human chromosome is an inherently complex three-dimensional entity that is able to respond in certain genetic regions to the external environment. Recent investigations within the field of molecular genetics have outlined a compelling model of co-creation involving the expression of our DNA and our interpersonal environment. It should be noted that gene structure does not change. Rather, the shape, the folding and the configuration of the chromatin in which the genes are contained alters in response to particular environmental stimuli at particular stages of development.³⁰ There are two main mechanisms by which epigenetic inhibition of gene functional activity occurs: DNA methylation involves the addition of a methyl group to a DNA base pair, and histone acetylation involves the alteration of a histone protein "tail."³¹ Both of these mechanisms affect how loosely or tightly packed the chromatin is which, in turn, affects how easily genes can function through changing their shape, folding and/or configuration. An important and pertinent recent epigenetic example involves the early interpersonal parenting environment affecting a given offspring's ability to manage stress through changes in their DNA methylation of a key nerve growth factor involved in stress regulation: in other words, the early interpersonal environment can influence the morphology, and therefore the functional potential, of certain genes in human beings.³²

Second, the fold is antidialectical in that, as a complex figure, it forms an irreducible foundation and basis for thought, feeling and/or action within/on it. Similarly, chromatin's structure is immutable while its function is subtly variable depending on external stimuli that alter its folding, such as the interpersonal stimuli noted above. Finally, the fold is anti-Cartesian, for it allows and enables knowledge to exist without an object. Similarly, the chromatin's changed folding/form is sufficient to achieve multiple potential biological and psychosocial outcomes without a need for a separate biological "other" such as a synaptic receptor. Further, the chromosome's structural integrity is maintained throughout multiple potential epigenetic foldings, dependent on the external environment; its essence, however, remains unaltered.

Interestingly, Grosz provides many examples of the fluidity of body image from the neurological discipline: the phenomenon of the phantom limb, the capacity of the brain to adjust its image of the body to use prostheses effectively, and the unconscious change to posture and gait that a body exhibits when environmental conditions change, such as the type of clothing one wears.³³ But, now there is evidence from the neurobiological sciences that our early environment can shape the form that our DNA takes. And furthermore, that these changes in morphology affect the capacities we have to engage with our interpersonal environment

in the future. Grosz proposes the Möbius strip as a potential model for understanding the mind/brain connection: a folded form where inside becomes out and outside becomes in.³⁴ But, what model could we use to understand the fluid interface of the body and city that she also describes?

FOLDING IN THE CITY

Rather than attempt to answer that question, at this point I will offer the “chrysalis” that my collaborator “Joan” made for her urban Bedroom as a form for further thought (see figures 4-6). “Joan” described her process of searching for a bed at night in pragmatic terms. She looked for a solid enclosure where footpath folded up to meet wall. She began in daylight and returned to the same place each night until security guards moved her on. The form of the chrysalis she made was expedient and spare: not the laboured silk thread of the worm, but a simple folded cardboard box, wrapped in bubblewrap (a frugal gesture to comfort) and, significantly, with the top flap folded open. What did this fold signify for her? “A way out,” she simply stated. Despite her choice of a simple Cartesian box to represent her experience of staking a claim to the city, she achieves the same effect as a more complex twisted form. At the extension of the flap, she is neither inside nor out; she maintains an avenue of connection with the city and indicates that she refuses to be eternally contained by her current predicament. The fold is the point where individual subject becomes part of the group, the point of a “new relation between the one and the multiple,” where there is already multiplicity in “the one” (she is a nomad).³⁵



Figure 4: Joan’s *Chrysalis for Bedroom 1* (courtesy of photographer Janet McGaw).

Figure 5: Hanging Joan’s *Chrysalis* (courtesy of photographer Janet McGaw).

Figure 6: *Bedroom 1* (courtesy of photographer Janet McGaw).

CONCLUSION

Recent developments in cognitive neuroscience and parallel deconstructions of our understandings of the city from philosophy reveal that relationships within and between groups of neurons within the brain and groups of bodies within the city are fluid and mutually defining, not contained by the hierarchical structures that historically have prescribed our way of seeing these different domains or “strata.”

While we acknowledge that arborescent systems do operate in both cities and brains (and they can be benevolent as well as “apparatuses of capture”), we suggest that rhizomatic interactions within and between groups are a way to bypass the negative forces of hierarchical power. In the instance of the city, a diagonal trajectory that pedestrians chart across a road subverts the power of the striations of the city to contain them, just as the appropriation of a footpath in a lane as a bed for the evening subverts the power of commerce to dictate land use in the city. In the brain, the issue of arborescence versus rhizomatic is not so much about power as functionality. While we still acknowledge that the brain has regions that dominate in certain functions (frontal lobe – planning, organising and strategising; temporal lobe – receptive language and memory; and parietal lobe – time and spatial perception), it is now apparent that many potential neural networks involving other brain regions subsume these functions in unpredictable ways.

Interestingly, it appears that morphology has a role in mediating these relationships: early interpersonal environments can shape the folding of the chromatin that in turn affects its capacity to interact with later environments; a body’s morphology can be shaped by the physical and interpersonal environment of the city and, in turn, has a role in shaping the city’s response to it. This article thus refutes the notion of distinction between such groups, arguing that the interface between them is fluid: a site of co-creation and “becoming.”

IMPLICATIONS

So what are the implications of this specific interdisciplinary discussion? What kind of “machinic processes” do we adopt here? Following Deleuze and Guattari, we suggest that this article functions as an “abstract machine” deterritorialising the boundaries of both our disciplines.³⁶ While we resist resolution to this discourse, we offer the following questions to conclude.

If our interpersonal environments have the capacity to shape the way individual brains develop, what does this mean for architects caught up in a striated system of relationships operating in a striated physical environment? How do we “smooth” the city? What kinds of spaces are conducive for rhizomatic operations by marginal players? Can we be better at deterritorialising the public realm? Should we accept the visual and textual content placed on the surfaces of our cities by advertisers who seek to commodify the body? What role do these representations have in creating self-perceptions in the bodies that inhabit the city, particularly those outside the norms they project? And, finally, if our cities are in a state of “becoming” through a process of co-creation with our bodies, what is their evolutionary path – prostheses that improve the functional capacities of our bodies or the fictional cyborg that turns on its creators and destroys them?

- 1 G Deleuze and F Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987), 3-25.
- 2 Ibid.
- 3 Ibid.
- 4 Architect and theorist Jane Rendell coins the phrase to describe practices “between” art and architecture that engage with the social, aesthetic, the private and the public. See J Rendell, *Art and Architecture: A Place Between* (London: IB Tauris, 2006), 6.
- 5 B Massumi, “Translator’s Foreword: Pleasures of Philosophy,” in Deleuze and Guattari, *A Thousand Plateaus*, xiv.
- 6 Deleuze and Guattari, *A Thousand Plateaus*, 502.
- 7 Deleuze and Guattari, *A Thousand Plateaus*, 3-25.
- 8 Massumi, “Translator’s Foreword,” xiv.
- 9 M M Mesulam, “Spatial Attention and Neglect: Frontal, Parietal and Cingulate Contributions to the Mental Representation and Attentional Targeting of Salient Extrapersonal Events,” *Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences*, 354 (1999), 1325-46.
- 10 E R Kandel, J H Schwartz, and T M Jessell, *Principles of Neural Science*, 4th ed., (New York: McGraw-Hill, 2000), 9-18.
- 11 A Vance, T Silk, M Casey, N Rinehart, J Bradshaw, M Bellgrove and R Cunnington, “Right Parietal Dysfunction in Children with Attention Deficit Hyperactivity Disorder, Combined Type: A Functional MRI Study,” *Molecular Psychiatry*, 12 (2007), 826-32.
- 12 MI Posner and MK Rothbart, “Research on Attention Networks as a Model for the Integration of Psychological Science,” *Annual Review of Psychology*, 58 (2007), 1-23.
- 13 D Yencken and D Wilkinson, *Resetting the Compass: Australia’s Journey Towards Sustainability* (Collingwood, Vic: CSIRO Publishing, 2000), 31.
- 14 Ibid., 100.
- 15 Deleuze and Guattari, *A Thousand Plateaus*, 432.
- 16 Michel de Certeau, another French theorist writing in the 1980s about power relations (developing Foucault’s line of thought), made similar observations. He defined “tactics” and “strategies” as two different types of power played out in the urban environment. Strategies are those things that own place and can define an interiority around themselves, while tactics are those things that own nothing but usurp the power of a strategy through movement and timing. His insights into these processes are useful here. Both he and Deleuze and Guattari seek to critique understandings of social formations in terms of modes of production: D&G argue that social formations are “machinic processes” upon which production depends. De Certeau argues that there is no hierarchy of production over consumption – consumers are in fact silent producers. See M de Certeau, *The Practice of Everyday Life* (Berkeley, CA.: University of California Press, 1984), xix.
- 17 E Grosz, “Bodies-Cities,” in *Sexuality and Space*, ed. Beatriz Colomina (New York: Princeton Architectural Press, 1992), 249.
- 18 Ibid., 248.
- 19 Ibid.
- 20 I Bystron, C Blakemore and P Rakic, “Development of the Human Cerebral Cortex: Boulder Committee Revisited,” *Nature Reviews Neuroscience*, 9 (2008), 110-22.
- 21 G Bartzokis, M Beckson, PH Lu, KH Neuchterlein, N Edwards, and J Mintz, “Age-Related Changes in Frontal and Temporal Lobe Volumes in Men: A Magnetic Resonance Imaging Study,” *Archives of General Psychiatry*, 58 (2001), 461-65.
- 22 A Vance, N Hall, M Casey, F Karsz and M Bellgrove, “Visuospatial Memory Deficits in Adolescent-onset Schizophrenia,” *Schizophrenia Research*, 93 (2007), 345-49.

- 23 Rendell, *Art and Architecture*.
- 24 P Carter, *Material Thinking* (Melbourne: Melbourne University Press, 2004), 11.
- 25 Ibid., 10.
- 26 J McGaw and J May, "Urban Threads", *The Journal of Architectural Education*, 2006, 59: 12-18.
- 27 B Cache, *Earth Moves: The Furnishing of Territories* (Cambridge, Mass.: MIT Press, 1995).
- 28 J Rajchman, *Constructions* (Cambridge, Mass.: MIT Press, 1998), 11-36.
- 29 C Bock and T Lengauer, "Computational Epigenetics," *Bioinformatics*, 24 (2008), 1-10.
- 30 R Holliday, "Epigenetics: An Historical Overview," *Epigenetics*, 1 (2006), 76-80.
- 31 Ibid.
- 32 M Szyf, P McGowan and MJ Meaney, "The Social Environment and the Epigenome," *Environmental and Molecular Mutagenesis* (19 December 2007), (EPub).
- 33 E Grosz, *Volatile Bodies* (Crows Nest, NSW: Allen and Unwin, 1994), 70-80.
- 34 Ibid., 208-10.
- 35 A Badiou, "Gilles Deleuze, *The Fold: Leibniz and the Baroque*," trans. Thelma Sowley, in *Deleuze and the Theatre of Philosophy*, ed. Constantin V Boundas and Dorothea Olkowski (New York: Routledge, 1994), 51-69, at 54.
- 36 Deleuze and Guattari, *A Thousand Plateaus*, 512.

Janet McGaw is a practising architect and an academic interested in the ethics and poetics of public place-making. Recent work includes a collaborative installation with homeless women in Melbourne.

Alasdair Vance leads the Academic Child Psychiatry Unit team at the Department of Paediatrics, University of Melbourne. The Unit is recognised internationally for its innovative work on clinical phenotyping and the careful delineation of the neural mechanisms underlying human visuospatial memory and working memory.