

Off the Grid: Infrastructure and transformational space

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Concepts of space underlie and structure design practices involved in the production of human environments, such as architecture, landscape design, urban planning, industrial design and civil engineering, for example. The implicit nature of concepts of space, and their close link to interpretations of self and world make them appropriate candidates in the pedagogy of these fields for a discussion of "threshold concepts" as proposed by Meyer and Land (2006).

This paper contrasts the dialectical concept of space as a container and the non-dialectical concept of networked space, conceptualised here as *threshold* space and *transformational* space. It asks how the latter could shift understandings of a complex interdisciplinary spatial design problem, namely infrastructure, the physical systems of mobility, communication, and environmental control that underpin human environments (Bélanger, 2008; Varnelis, 2009). To address this non-dialectical concept, it examines firstly the nature of infrastructures, arguing, as proposed by Varnelis (2009), that they are "networked ecologies" or "hyperobjects" according to Morton (2011): open networks of effect rather than closed collections of equipment or fixed territories. Secondly, it considers the implications of this model for what is depicted as a world-view, adducing Morton's rejection of the idea of Nature (2007), and Harman's interpretation of Heidegger's analysis of tools (Heidegger, 1962; Harman, 2006). It concludes by advocating that a critical position termed here as *being off the grid*—encountering secondary or what Harman terms "withdrawn" (2006) aspects of infrastructural systems—should be sought as a transformative position in the education of designers, planners, and policy-makers.

Introduction

In J.G. Ballard's novella *Concrete Island* (1974), architect Robert Maitland crashes his Jaguar over a motorway embankment onto a traffic island, a thin triangle of waste ground two hundred metres long. Here, in a parody of Robinson Crusoe, he finds himself marooned. As Ballard writes:

His jacket and trousers were stained with sweat, mud and engine grease—few drivers, even if they did notice him, would be eager to give him a lift. Besides, it would be almost impossible to slow down here and stop. The pressure of the following traffic, free at last from the long tail-backs that always blocked the Westway interchange during the rush hour, forced them on relentlessly (Ballard, 1974: 17)

The fast-flowing arms of the motorway continue to operate perfectly, ensuring the rapid movement of bodies and objects; but their operation is inaccessible to Maitland. Immobilised by the infrastructure of mobility, he has not simply *exited* urban life, he has slipped *off the grid* while remaining firmly within its network of effects. This paper presents an argument for the importance to design pedagogy and practice of a spatial model that can account for conditions such as those experienced by Maitland.

Space is a structuring concept, a model that underlies human activity and material production. The Cartesian belief that space was a transcendental absolute is now widely rejected. Lefebvre, for example, argued that space is a multifarious social praxis before being a mathematical construct (Lefebvre, 1991), while De Landa points out that even from a mathematical perspective there are many possible spatialities, including topological, Gaussian, Euclidean, and affine spaces (De Landa, 2002). As a result, no single concept of space underlies all the various design practices involved in the material production of human (and non-human) environments, such as architecture, landscape, urban planning, interiors, industrial design, and civil engineering. The fact that such concepts are not fully shared and are often implicit can make communication between these practices, and education in them, frustrating.

Alternative spatial models can act as “threshold concepts” (Meyer & Land, 2006), potentially effecting major shifts in the way the existence and nature of spatial relationships are understood by learners in this field. This transformation of perspective also entails a potential reconstruction of subjective identity, as the subject's own spatial relationships and capacities come into question. As Meyer and Land point out, threshold concepts are often troublesome: in the case of spatial models, this can be because of the potential scale of these transformations of self and world; and because concepts of space are commonly tacit—assumed rather than articulated (Meyer & Land, 2006: 12).

Infrastructure—the physical systems of mobility, communication, and environmental control that underpin human environments (Bélanger, 2008; Varnelis, 2009)—presents as an increasingly important and complex design problem. As a determinant of shared environments and public spaces, there are many stakeholders, affected parties, and contributors to such a system. It is my contention that a shift in spatial model has the capacity to be transformative in educating policy-makers, planners and designers for infrastructures as a way of structuring and thinking about the physical world as a networked cultural and environmental system.

I will begin by positing a topological distinction between two types of space: threshold space, and transformational space. I will then consider the currently prevalent forms of infrastructure, arguing that they are hyperobjects: open networks of effect around which no final horizon can be drawn; and move on to discuss ontological and pedagogical implications of this shift.

Thresholds of containment and transformational space

A curve drawn on a piece of paper can be either open or closed depending on the coinciding of its beginning and end. A closed curve contains an interior space and indicates an exterior one. An open curve may create zones of partial closure, administer

relations of proximity, or mark changes of state, but it does not establish a dialectic of absolute interiority and exteriority. This distinction indicates two possible types of space: the dialectical space of the closed curve, fundamentally split by thresholds of closure and containment, and the multiplicitous space of open passage, connection, and transformation. Adopting the terms thematised by this issue of ACCESS, I am reserving the term *threshold space* for the former, and offering the term *transformational space* for the latter.¹

The proposed distinction is between the idea of space as a container, and the idea of space as connection. In a threshold space, things, effects, and events are contained or exteriorised; in a transformational space they are transmitted. Harry Beck's seminal map of the London Underground (1931) locates stations according to their topological relationship and their connections to one other, not their geographical position. For someone traversing the network, it is more important to know which connections are available at any given point and where transfers need to be made, than to know distances travelled or which stretches of track are underground and which are in the open air. Containment is secondary to connection. To pass *outside* in threshold space is to cross a line demarcating an interior, whether by choice, accident, or involuntary ejection. In transformational space, however, there is no strict exterior, only degrees of connection. Charing Cross, on Beck's map, differs from Edgware not because it is a more capacious station, with better amenities and more platforms, but because it has greater connectivity.

Similarly, urban motorway networks can be usefully understood in this sense. The motorway folds the city, creating points of accelerated connection and compressing distance. The motorway cuts through the city like a street, but unlike a street, access can only be gained at certain strategic points where there are on-ramps. These short-circuits modify the connectivity of the street-grid. In doing so, they modify the ability of certain types of effect to propagate through the city. An accident at one point of the network can create congestion at another point. A business might choose to locate itself close to an on-ramp in order to facilitate rapid transmission of its goods. From the perspective of an urban inhabitant, the motorway is normally considered as a space of pure connection,

barring an accident such as Maitland's. In the spatial operation of the motorway, the question of interiority is secondary, even problematic, compared to questions of access and the types of effect that thereby propagate.

Another way of analysing infrastructure as a cultural system of threshold space is to consider the cellphone network. The city is blanketed by cell-phone coverage. So long as I am carrying a working phone, I have access to this network, and can have remote effects through it. If my phone stops working, however, being 'within' the area of coverage is of no use to me. Without access, I am off the grid. From the point of view of a threshold spatiality, I could be said to be *in* the network, but without a connection or the capacity to have effects on other elements of the network, this would be a hollow claim. The dialectic of exteriority / interiority can have little to say about my situation (even if we were to redefine 'in' as meaning membership or participation: a possibility I will consider below when I address the edges of the network).

In the twentieth century, infrastructures such as these previously discussed became one of the key determinants of urban form, and consequently of spatial experience and politics.² In directing design attention to this cultural condition an understanding of the nondialectical and transformational space of networks is necessary.

Network culture

Kazys Varnelis (2008) introduces his discussion of what he calls "the networking of public space" with a description of the commonplace experience of sitting in a café where individuals are paying little attention to one another; instead talking on the phone, emailing, download, reading, and listening to music on headphones. Wryly, Varnelis suggests that the café provides little more than a site where these individuals can "establish an ambient visual experience of bodies in near proximity... a calculated copresence" as they engage in their solitary pursuits (Varnelis, 2008: 17). But it would not be correct to see only disconnection. While they share an ambient local presence, these individuals are also present in other spaces and participating in other communities. The *flâneur* of the early twentieth century, at home in the streets and arcades of the city,

has been replaced by the network-connected individual of the twenty-first, whose most important human interactions can be pursued remotely. Varnelis points to five conditions of contemporary spatial experience as characteristic of this new spatiality: "the everyday superimposition of real and virtual spaces, the development of a mobile sense of place, the emergence of popular virtual worlds, the rise of the network as a socio-spatial model, and the growing use of mapping and tracking technologies." (Varnelis, 2008: 15).

In referring to the idea that the network is a "socio-spatial model", not just a technological innovation, Varnelis follows Manuel Castells, who contended that we now participate in an increasingly global culture dominated by networks. As Castells wrote, "Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power, and culture" (Castells, 2010: 469). In their most abstract form, networks are comprised of nodes and connections; and although they can take on hierarchical forms, they are not constrained to hierarchy. Social practices and structures are refracted by this new globalised condition. Work, for example, becomes fragmented and individualised:

[L]abor is disaggregated in its performance, and reintegrated in its outcome through a multiplicity of interconnected tasks in different sites, ushering in a new division of labor based on the attributes / capacities of each worker rather than on the organization of the task ... Who are the owners, who the producers, who the managers, and who the servants, becomes increasingly blurred in a production system of variable geometry, of teamwork, of networking, outsourcing, and subcontracting (Castells, 2010: 471-75).

Connection between tasks is decreasingly reliant on co-presence in a contained site of labour. The Marxist division of labour facilitates geographic dispersal. But this networking does not constitute a net dematerialisation, only a redistribution of materials and a prioritising of infrastructure. Castells remarks that:

instead of the end of cities, predicted by futurologists under the conditions of advanced telecommunications that would make spatial concentration of people and activities unnecessary, we find ourselves in the largest wave of urbanization in the history of humankind (2010: xxxii)

While “all that is solid melts into air” (Marx, 1998: 38) it also recondenses in new ways. Although small local bookstores might be closing in the face of competition from online bookstores, for instance, ever-larger warehouses and distribution networks must be built to service those online vendors. Similarly, the decreasing significance of physical branches for banks is matched by an increase in need for server farms, ATMs, and EFTPOS machines. As network space prioritises connection over containment; topology over topography, it still relies on physical infrastructure. Facing the numerous grids and infrastructures underpinning credit, mobility, energy, social services, food, water, information, and voice, the question of *access* becomes central. Varnelis writes:

Far from the mythical distributed ideal that ideologists of technology claim it to be, the network has its own physicality, its own material presence. Networks rely on relatively few high-bandwidth transcontinental and transoceanic fiber-optic lines, on even fewer Tier-1 carriers that sell space on these lines, and on still fewer mobile-phone operators and last-mile connection (DSL or cable broadband service) providers that allow the end user to access bandwidth (Varnelis, 2008: 28).

In spite of the apparently egalitarian logic of the network, there is still an intricate play of power-relations pertaining to its controls. The term ‘access’ suggests once again a dialectic of interiority, when what matters is actually the capacity to have effects in the network, and the uneven distribution of these capacities.

As Castells and Varnelis indicate, contemporary spatial production and daily experience are characterised by the morphology of networks. Under these conditions, social structures and practices like work take on new forms, becoming dispersed and redistributed in a way that prioritises connection over co-presence. However, the

consequent agnosticism about distance does not result in a net dematerialisation, but a redistribution of material in a way that foregrounds the role of infrastructure, and the question of access to it.

Networked ecologies and the non-existent edges of the network

What is outside the network? Although I have argued that the question of access should be redrafted as a question of capacities for effect, does the network, considered as a whole, form an interiorised space? To address this question, it will be useful to consider *networked ecologies*, which Varnelis argues are the contemporary form of infrastructure.

In the grand projects of modernist urban designers, infrastructure was a means of providing civic form. As Varnelis puts it, "Modernists believed in the virtues of the plan, the capacity of a clear idea to bring order to the chaos of the metropolis" (Varnelis, 2009: 8). Modernist infrastructures were imagined to be optimisations of urban complexity, allowing the city to operate as a gigantic machine. Le Corbusier described his *Ville Contemporaine* (1922) like this:

these skyscrapers will contain the city's brains, the brains of the whole nation. They stand for all the careful working-out and organisation on which the general activity is based. Everything is concentrated in them: apparatus for abolishing time and space, telephones, cables and wireless; the banks, business affairs and the control of industry; finance, commerce, specialisation. The station is in the midst of the skyscrapers, the tubes run below them, and the tracks for fast traffic are at their base (Banham, 1960: 254).

In reality, such masterplans proved far messier than their idealised presentation would suggest. Reyner Banham, writing in 1971, following the adoption of scepticism regarding such mechanistic views, celebrated the "nonplan" of Los Angeles:

Conventional standards of planning do not work in Los Angeles. It feels more natural (I put it no stronger than that) to leave the effective planning of the area to

mechanisms that have already given the city its present character: the infrastructure to giant agencies like the Division of Highways and the Metropolitan Water District and their like; the intermediate levels of management to the subdivision and zoning ordinances; the details decisions to local and private initiative; with ad-hoc interventions by city, State and pressure-groups formed to agitate over matters of clear and present need (Banham, 2009: 121).

Banham was hopeful for this ad-hoc evolution of cities in response to hundreds of partial plans, pressures, and responsibilities; but Varnelis observes that his nonplanned city was as utopian as was the modernist masterplanning. The freeways he was so enamoured of were at the time fresh and flowing, not decaying and clogged, and he did not foresee the stagnation that would result from a morass of competing authorities and interests:

Left unfettered, the competing interests of individuals, government bureaucracies, and private corporations have led to a vicious stalemate, an urban trench warfare that effectively undoes the city's ability to fix its problems (Varnelis, 2009: 13).

In his own analysis of Los Angeles, Varnelis coins the term “networked ecology” for “a series of codependent systems of environmental mitigation, land-use organization, communication, and service delivery” (Varnelis, 2009: 15).³ These networked ecologies are infrastructures, but they are not singular or optimised like the ideal infrastructures envisaged by Le Corbusier:

Rather than being executed in conformance with the outline of a plan, they are networked, hypercomplex systems produced by technology, laws, political pressures, disciplinary desires, environmental constraints and a myriad other pressures, tied together with feedback mechanisms (Varnelis, 2009: 15).

One of his examples is the oil-drilling infrastructure that taps the reserves of Los Angeles City Oilfield that underlie the urban area. No single company owns this infrastructure; the rules that govern it are spread across local, state, and national authorities. Its sites are

distributed: there are subterranean pipelines, downtown oil-rigs camouflaged as generic office buildings and offshore drilling platforms masquerading as palmy islands. This disparate conglomeration of facilities does not form a machinic unity, but something more akin to an ecology: an interconnected web of pumps, pipes, trucks, land, investments, drilling rights, and lobby-groups—each with dependencies and effects.

Networked ecologies include specialised and esoteric infrastructures like that of prop-houses: huge warehouses stocked with the miscellaneous props required at short notice for filming TV shows, music videos, and movies. These logistic centres concentrate the needs of the film industry alleviating the need to gather props and materials from widely distributed sites. No single prop-house serves as a central hub—rather, a network of specialised prop-houses "offer highly specialized and themed fragmentary utopias" (Varnelis, 2009: 222). Prop-houses gather and circulate the heterogenous objects upon which the fantasy sites of television and movies are built; and upon which a multi-billion dollar economy rides.

These disaggregated and multiplicitous infrastructures (to borrow Castells's terms) are constellations of elements operating with varying degrees of cohesion. They are not closed systems, which one can occupy or exit. Rather, they are overlapping and interwoven meshworks with a vast number of secondary and tertiary effects.

Hyperobjects

Infrastructures, particularly when they take on the character of networked ecologies, are not closed systems with interiors and exteriors. To claim that something is *outside* a networked ecology is to posit the possibility of drawing a horizon beyond which its effects cannot propagate; or else to discriminate against weak or remote effects. Ecologist Timothy Morton describes a class of objects he calls *hyper-objects*, "objects massively distributed in time and space that make us redefine what an object is" (Morton, 2011: 5). Climate, for example, is more than just the weather. At any given point in time I can look at the sky and comment on the weather, but I can only detect and describe climate instrumentally, by marshalling armies of sensors, recording devices, and visualisation

machines, over a long period of time. Climate exceeds my local observations (just because it is snowing where I am doesn't mean that the climate isn't getting warmer). There is no total viewpoint available to me.⁴

Infrastructures are hyperobjects, operating on scales of time and size that make any total viewpoint impossible (Bélanger, 2008). Outside of Twizel, a town in the central plains of New Zealand's South Island, resides a security-hardened control facility administering nine of Meridian Energy's hydro-electric power stations. From there, technicians, by watching camera feeds and monitoring telemetry, are able to raise or lower the level of entire lakes, and even reverse the flow of the Waiau River. Although this control room provides a privileged view of the energy-generating network, it does not provide anything like a complete or full view. Cameras and sensors monitor a handful of key control-points, but there are kilometres of unwatched canals, high-tension cables, and access roads. The network is affected by rainfall, local politicians, and power consumption habits, and in return has effects on lake and river shorelines, longfin eels, tourist ventures, the location of power-hungry industries, and an infinite number of other participants. The network is bigger and fuzzier than the neat organisation of the control-room, and it connects into a myriad of other systems and grids. No total viewpoint of this networked ecology is possible, and all encounters with it are partial. Hyperobjects cannot be summoned to appear within a horizon of human experience, as they recede over the horizon of every particular encounter.

Hyperobjects can be partially mapped or traced out as networks of effects—as transformational spaces. The relationship between horizons and the transformational space of hyperobjects is neatly articulated by Gregory Bateson, who gives the example of a blind man making prosthetic use of a cane:

Where do *I* start? Is my mental system bounded at the handle of the stick? Is it bounded by my skin? Does it start halfway up the stick? But these are nonsense questions. The stick is a pathway along which the transforms of difference are being transmitted. The way to delineate the system is to draw the limiting line in

such a way that you do not leave things inexplicable. If what you are trying to explain is a given piece of behaviour, such as the locomotion of the blind man, then, for this purpose, you will need the street, the stick, the man; the street, the stick, and so on, round and round. But when the blind man sits down to eat his lunch, his stick and its messages will no longer be relevant—if it is his eating that you want to understand." (Bateson, 2000: 465).

The network of transformations is continuous, and in the drawing of a horizon a “limiting line” is necessarily a severing of some connections. Horizons are provisional, belonging to a particular encounter with a network of transformations. There is no ultimate horizon, because there is no end to the effects and transformations that could be included in the network. Infrastructures are best understood as spaces in which many horizons are possible and none are complete, not spaces in which horizons are posited from the outset. To this extent infrastructures operate as *transformational* systems.

The fallacy of the outside

Meyer and Land suggest one of the characteristics of a threshold concept is that it may entail ontological shifts, changes in world-view; as well as shifts in subjective identity (Meyer & Land, 2006: xiv). A transformational concept of space such as the one I have outlined does not remain strictly bounded to a particular practical application. It carries ontological implications. The design of infrastructure, as conceived from a transformational perspective, blends with the question of world-building. An inversion occurs from “the world of design” to “the design of the world” (Mau, 2004: 11). In considering this proposition I turn now to transformations of the concept of world that are entailed by the spatial model in question.

Pollution and the finitude of resources have been a growing part of public comprehension. The secondary effects of industrial processes and consumer habits are well-known. Waste cannot be simply ejected because it must always go somewhere, perhaps to return in an unexpected way; and no process can rely on endless reserves. Of this awareness, Bruno Latour writes:

[T]he notion of ‘environment’ began to occupy public consciousness precisely when it was realized that no human action could count on an outside environment any more: There is no reserve outside which the unwanted consequences of our collective actions could be allowed to linger and disappear from view. Literally there is no outside, no *décharge* where we could discharge the refuse of our activity... No outside is left ... It is not only Magellan's ship [that circles the planet] but also our refuse, our toxic wastes and toxic loans, after several turns (Latour, 2009: 144).

The concept of an outside falters when faced with the persistent return of the excluded. Where once waste could be thrown away, it is now evident, according to Latour, that away is always a specific location, and that it is not as distant or disconnected as might be hoped. The outside is a fallacy—local and remote are interlinked in a single system of effects and transformations. Oil seeping to the surface as a result of urban drilling in Los Angeles, or pollutants entering the atmosphere from oil-burning vehicles should not be seen as passing *outside* the infrastructure in question, but as aspects of it.

Morton calls this insight “the ecological thought” (Morton, 2010: 1), and claims it is a principle with wider pertinence than practical environmentalism. One of the effects of Morton’s ecological thought is the obsolescence of the concept of Nature.⁵ He critiques Nature as relying on a dialectic of exterior and interior, and the possibility of an absolute horizon, writing:

Ecology can do without a concept of a something, a thing of some kind, 'over yonder,' called Nature. Yet thinking, including ecological thinking, has set up 'Nature' as a reified thing in the distance, under the sidewalk, on the other side where the grass is always greener, preferably in the mountains, in the wild (Morton, 2010: 3).

Nature is always projected at a distance, contends Morton, imagined to be a pure exterior.

Any thought or practice that develops from the idea of Nature begins by carving out such a conceptual exterior, and distorted by the reflections introduced at the horizon.⁶ Nature is detrimental to any possibility of ecological thought, because it blinds us to connections and the transmission of effects with a fantasy of disconnection.⁷ In the same vein, Graham Harman argues:

[T]here is no such thing as a 'horizon' but only a system of exchange between beings and their being. This system is known as 'world', a colossal infrastructure of humans, plants, sea mammals, gasoline, perfumes, rivers, pirate colonies, and opium (Harman, 2006: 155).

Harman does not mean to indicate that there are no horizons of any kind, but that no pure horizons can exist without severing at least some lines of effect and transformation (as Bateson indicated above). In agreement with the cited views of Morton and Latour, Harman envisions "world" as "a colossal infrastructure", an inescapable totality without an outside. Infrastructures are difficult to handle because they are hyperobjects that extend over the horizon of any individual encounter, interlinking seamlessly with this totality.

Failure and withdrawal

Pierre Bélanger suggests that infrastructure "remains largely invisible until the precise moment at which it breaks down or fails" (Bélanger, 2008). This paper began with a moment of infrastructural failure: Maitland's Jaguar crashing through a barrier, and Maitland falling off the grid. He suddenly experiences the motorway as an explicit object whereas previously it had functioned transparently.

Turning to the German philosopher, Martin Heidegger, we find an attribution of existential significance to the interchange between the visible and invisible aspects of an entity foregrounded by failure. He posits the way a tool withdraws into invisibility through use, but erupts into consciousness once it fails (Heidegger, 1962: 95-102). A hammer in use is not a subject of explicit awareness, but is simply relied upon for some

end: perhaps building a boat or re-attaching the legs of a stool. As the hammer disappears into its operation, it becomes more fully itself:

[T]he less we just stare at the hammer-Thing, and the more we seize hold of it and use it, the more primordial does our relationship to it become, and the more unveiledly is it encountered as that which it is—as equipment (Heidegger, 1962: 98).

The being of the tool is disclosed most fully not through analysis or study, but through its performance. In this situation, Heidegger says the hammer is “ready-at-hand”. When the hammer breaks, however, and the carpenter is left staring blankly at the now-ineffective implement, the hammer erupts suddenly into awareness in the mode of “presence-to-hand”. Readiness-at-hand and presence-to-hand are not separate kinds of object, but as Boedeker puts it, “two modes of the *how-being* of intraworldly entities” (Dreyfus & Wrathall, 2005: 159). In use, the tool *refers on* to the task at hand, and when its use is interrupted, this reference is disturbed (Heidegger, 1962: 105; Harman, 2006: 24-35).

Harman argues controversially that Heidegger’s insight is not limited to human encounters with objects—even if Heidegger himself believed this to be the case (Harman, 2006). He believes that withdrawal through reference and presence-to-hand through encounter is part of the structure of all entities.⁸ Paper, for example, encounters the knife *as* knife in some sense at least, even given the obvious fact that the paper does not have consciousness of the knife, because it clearly does not encounter it as a pebble or dropsaw. Each particular encounter is a moment of presence-to-hand, behind which both the thing encountered and the encounterer withdraw into the execution of their own being as part of the total in its “equipmental totality” (Heidegger, 1962: 136) or “referential contexture” (Harman, 2006: 22).

As revealed in Maitland’s encounter, the motorway as a seamless cultural system is broken and there is exposure of “a vast environmental backdrop supporting the thin and volatile layer of our explicit activities” (Harman, 2006: 18). But the motorway exceeds

this encounter: other road-users successfully navigate its lanes, and homeless people sleep under its bridges. If we follow Harman's expansion of the scope of Heidegger's terms to encompass non-human encounters, we could also count the rain running off it, birds perching on its lighting masts, and carbon monoxide being released into the atmosphere. Maitland's experience is one moment of presence-to-hand, but in each of these encounters there is a form of presence-to-hand, and behind them all is a withdrawal into the performative being of readiness-at-hand. Withdrawal could be seen as the hyperobjectivity of all objects: the movement by which they exceed any single encounter and remain always open to others. Presence-to-hand is bounded by the horizon of a particular encounter, but withdrawing beyond this horizon is an infinitely-connected equipmental totality.

Off the grid

When Maitland falls off the grid, he does not fall *outside*. Ballard calls into question the applicability of a threshold spatiality to the network by placing Maitland in an ambiguous position: simultaneously outside and pocketed. The bursting of a tyre triggers a reconfiguration of a network of elements in which Maitland finds himself even more deeply enmeshed. As the narrative unfolds it becomes evident that Maitland's alienation is not strictly an incarceration or exile, but a failure to connect: there is a phone, but he cannot get to it; a car stops for him, but he waves it on aggressively.

Following this argument, *outside* pertains to threshold space, but *off the grid* pertains to transformational space. When we fall off the grid, we do not escape it by exiting across any absolute horizon or threshold. We remain engaged in the grid's network of effects, even if those effects are indirect, remote, or weak. Off the grid is a position that exposes or engages these secondary effects that are masked by the horizons of specific encounters. As Maitland speeds along the motorway, his encounter is specific and bounded. Withdrawn over the horizons of this encounter, however, are a vast network of referrals—things operating or performing relations—that are exposed at the moment of his stranding. In siting ourselves off the grid, we encounter hitherto withdrawn aspects of the grid, but not from the perspective of a disengaged observer. Off the grid describes this

state of being alongside, encountering obliquely something that had been operating previously in a transparent way. This perspective reveals potentially the ontological shifts implicit in a transformational concept of space. From off the grid, I encounter my own connections in ways I had previously been unaware. My shift in perspective unveils the world as a referential contexture.

This paper has argued for the way that an alternative spatial model—that of transformative space—opens up a "new and previously inaccessible" (Meyer & Land, 2006: xv) world-view. This has particular implications not only for thinking about subjective conditions of living in urban environments, but also for educating policy-makers, planners and designers working on the spatial organisation of the human environment. Schools of architecture and spatial design are accustomed to making space an explicit theme, but such conceptual thematics are perhaps less familiar in the pedagogies of urban planning, engineering and industrial design. The conceptual position of transformation as discussed here is offered as a way of extending the physicality of design to an ontological space of production, a structuring concept or model that underlies human activity.

Being “off the grid” is thus a critical and transformative position to be advocated in the education of designers, planners, and policy-makers. I propose three benefits that could arise from the conscious application of a transformational model and an ‘off-the-grid’ perspective in these diverse fields of design education. They are:

1. Reducing fragmentation of design problems by disciplinary boundaries, for example, or according to the geographical division of the urban landscape by property boundaries. The ecological principle of interconnection, which a transformational model supports, transforms all design tasks to aspects of collaborative world-building.
2. Emphasising consideration of effects beyond phenomenal effects or effects on selected humans: Non-human elements such as the atmosphere, soil, materials, and other organisms can be considered as receivers and producers of effects; as

can humans who might otherwise be excluded. Thus a potential exists for going beyond thresholds into transformative spatial configurations.

3. Encouraging inventive opportunism: Working with what already exists, exploiting what is available, and re-using what is at hand as ways of working that are valued more than novel but disengaged additions to the context.⁹

These three pedagogical aspects are benefits that would be felt most keenly in the design of infrastructures and in learning about infrastructural issues and problems—seen as open networks of effect and transformation rather than closed collections of equipment, fixed domains or territories.

I have proposed a distinction between threshold space and transformational space as necessary for understanding the spatiality of infrastructure and of learning. While threshold space proceeds from a fundamental assumption of containment, transformational space prioritises connections between things, and the transformations that take place across those connections.

Morton, Latour, and Harman have provided a theoretical framework for thinking the condition of total interconnection indicating that the concept of an outside is based on drawing a horizon as a provisional artefact of a particular encounter, always severing at least some lines of connection and effect. Thus questions of interiority and the outside are not in any sense obsolete or irrelevant, but they must be allied to a robust theoretical model of transformational space if they are not to obscure the operation of spatial systems in matters of infrastructure as in learning. When things fall off the grid, they encounter remote, hidden, or overlooked parts of the grid's network of effects.

References

- Ballard, J. G. (1974). *Concrete Island*. London: Jonathan Cape.
- Banham, R. (1960). *Theory and Design in the First Machine Age*. London: Butterworth & Co.
- Banham, R. (2009). *Los Angeles. The architecture of four ecologies*. Berkeley, CA: University of California Press. [1st ed. 1971].
- Bateson, G. (2000). *Steps to an Ecology of Mind*. Chicago: University of Chicago Press. [1st ed. 1972].
- Bélanger, P. (2008). *Landscape Infrastructure. Emerging practices, paradigms & technologies reshaping the contemporary urban landscape*. [DVD]. Toronto: University of Toronto.
- Castells, M. (2010). *Rise of the Network Society, 2nd ed.* Oxford: Blackwell. [1st ed. 1996].
- De Landa, M. (2002). *Intensive Science and Virtual Philosophy*. London: Continuum.
- Dreyfus, H. & M. Wrathall (2005). *A companion to Heidegger*. Malden, MA: Blackwell.
- Frampton, K. (1992). *Modern Architecture. A critical history, 3rd ed.* London: Thames & Hudson.
- Giedion, S. (1954). *Space, Time and Architecture, 3rd ed.* Cambridge, MA: Harvard University Press. [1st ed. 1941].
- Harman, G. (2006). *Tool-being*. Chicago: Open Court.
- Heidegger, M. (1962). *Being and Time* (J. Macquarrie & E. Robinson, Trans.). Malden, MA: Blackwell.
- Latour, B. (1993). *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.
- Latour, B. (2009). Spheres and Networks. Two ways to reinterpret globalization. *Harvard Design Magazine*, 30, Spring/Summer, 138-44.
- Lefebvre, H. (1991). *The Production of Space* (D. Nicholson-Smith, Trans.). Oxford: Blackwell.
- Marx, K. & Engels, F. (1998). *The Communist Manifesto. A modern edition*. London: Verso. [1st English ed. 1888].
- Mau, B. (2004). *Massive Change*. London: Phaidon.

- Meillassoux, Q. (2008). *After Finitude. An essay on the necessity of contingency* (R. Brassier, Trans.). London: Continuum.
- Meyer, J. & Land, R., Eds. (2006). *Overcoming Barriers to Student Understanding. Threshold concepts and troublesome knowledge*. London: Routledge.
- Morton, T. (2007). *Ecology without Nature*. Cambridge, MA: Harvard University Press.
- Morton, T. (2010). *The Ecological Thought*. Cambridge, MA: Harvard University Press.
- Morton, T. (2011). *Hyperobjects and the End of Common Sense*. Retrieved March 6, 2011, from <http://contemporarycondition.blogspot.com/2010/03/hyperobjects-and-end-of-common-sense.html>
- Varnelis, K. (2008). *Networked Publics*. Cambridge, MA: MIT Press.
- Varnelis, K. (2009). *The Infrastructural city. Networked ecologies in Los Angeles*. Barcelona: ACTAR.

Notes

1. These two modes of space are by no means exclusive or binary. In fact, it is possible to see threshold space as a special case of transformational space, much as closed curves are a subset of curves in general. This argument would be akin to Manuel De Landa's argument that continuous spaces give rise to discontinuous ones according to a process of "symmetry-breaking" (De Landa, 2002: 22-24).

2. The vast urban works of Baron von Haussmann in Paris triggered an attempt by Camillo Sitte to avoid infrastructural dominance by emphasising urban 'rooms,' which he saw as offering a more humane spatial experience. Modernist historian Siegfried Giedion wrote that Sitte "was a kind of troubadour, ineffectually pitting his medieval songs against the din of modern industry" (Giedion, 1954: 683-84). From the opposite direction, Le Corbusier's urban proposals for Rio de Janeiro, Algiers, and Zlín attempted to assimilate the role of infrastructural engineer and urban planner to the architect. This would prove overly ambitious (Frampton, 1992: 180-82).

3. Banham had described four 'ecologies' in 1960s Los Angeles: "Surfurbia", "the Foothills", "the Plains of Id", and "Autopia". Each designated an urban region, except for Autopia, which was what he designated the interconnecting freeway system (Banham, 2009). Varnelis's networked ecologies are overlaid rather than constituting regions.

4. Morton argues that hyperobjects are not circumscribed by their relation to humans at all. They form the basis of a critique of anthropocentric thinking that proceeds in much the same way that Quentin Meillassoux critiques anthropocentric "correlationism" with reference to "arche-fossils", objects that are claimed to precede the possibility of human intentionality (Meillassoux, 2008).

5. Morton capitalises the term to draw attention to its historically situated status as a proper name, and "highlight its 'unnatural' qualities" (Morton, 2010: 3).

6. "In the idea of pristine wilderness, we can make out the mirror image of private

property: Keep of the Grass, Do Not Touch, Not for Sale. Nature was a special kind of private property, without an owner, exhibited in a specially constructed art gallery” (Morton, 2010, 6).

7. Latour argues that the outside was only ever an effect of a conceptual manoeuvre that carved out an interior, the domain of human concerns and productions, and an exterior, the domain of nature. In *We Have Never Been Modern* (1993), he claims that such a distinction is in fact the foundational act of modernity; and since such a distinction has never actually been successfully maintained between these two leaky domains, we have consequently never been modern at all.

8. In this, he explicitly runs against mainstream phenomenological interpreters of Heidegger such as Boedeker, who writes: “Presence-to-hand is neither a super-property nor a formal structure common to everything existent. Instead, it is one of several ways in which we can encounter entities” (Dreyfus & Wrathall, 2005: 159). Harman rejects the premising of human encounter, claiming, “Heidegger chooses to embezzle from the realm of common sense the ontic *assumption* that humans are very different from knives and paper” (Harman, 2006: 30)—an assumption he asserts that Heidegger never sufficiently argues.

9. Varnelis proposes a new kind of urbanist, who “might very well resemble a hacker, in the best sense, re-imagining how to appropriate the codes, rules, and systems that make up the contemporary city and manipulate them so as to create not a plan but a new kind of urban intervention” (Varnelis, 2009: 16).