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Listening to the Tube Map:

Rhythm and the Historiography of Urban Map Use

Abstract

This paper is in two parts. In the first half, I consider the challenge posed by the recent performative turn in critical cartography to the urban historical geographer. If maps come into being only within the diverse moments of their use, then how can we compensate for the absence of such events within the historical archive? Building on Tim Ingold's work, I suggest that one approach is to make an analogy between printed maps and musical scores, as decentred technologies whose instructions for performance are always mediated by environmental contingencies and the historical particularities of their performers. Returning a map to its original setting and 'listening' to the rhythms inscribed within it might enable us to uncover the specific spatial practices it once sought to produce. I then consolidate this approach via a study of Harry Beck's 1933 map of the London Underground. By locating it within the rhythmic dynamics of interwar London, I uncover the Tube Map's covert cybernetic impulse; in gesturing towards its own redundancy, it proffered a mode of cartographic practice that might impel the user toward an environmental docility that accorded with the dynamics of monopoly capitalism. Beck's map thus stands revealed as a watershed technology within attempts to orchestrate twentieth-century urban life.

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In recent years, there has been an emphatic shift within cartographic criticism. Brian Harley's (1988; 1989) foundational work on the discursive construction of modern cartography has been overshadowed by a surge of interest in how maps operate as active technologies amidst the messy contingencies of everyday life. For Harley, the governmental or colonial map's strategic efficacy lay in its schematic iconography and in the common interpretative framework, shared by both its producers and its users, which secured its status as an objective piece of knowledge. Recent critiques, however, argue that this approach obscures the less determinate ways in which maps take effect within the variable and grounded situations of their use (Del Casino and Hanna, 2006; Kitchin and Dodge, 2007; Laurier and Brown, 2005, 2008; Pickles, 2004). The ongoing critical inquiry into cartography's representational content has thus become supplemented by a heightened attention to performances of map use, or the multifarious ways that such devices are taken up, utilised, negotiated, or subverted within a diverse range of navigational events.

Reflecting this shift, Del Casino and Hanna (2006) and Kitchin and Dodge (2007) have both called for a categorical revision of our ontological understanding of what a map is. For Kitchin and Dodge, it is both mistaken and restrictive to privilege a map as a stable ontic entity. Instead, maps should be viewed as fundamentally ontogenetic, always in a state of perpetual becoming and constantly remade via a dispersed set of encounters between the printed artefact, the particular user, and the material configuration of their navigational context. Similarly, for Del Casino and Hanna, maps are primarily 'mobile subjects' (36) that operate inextricably as both

representations and technologies, and which are mediated once again by both the orientations of their users and the material environments that they help to re-produce. According to these revisions, maps have no significant existence beyond the aggregate of negotiations within which they are engaged. A configuration of lines on a page only becomes a map through its grounded recognition as such, taken up by particular individuals as a tool for solving specific spatial problems. Such deployments are always highly scripted, but this never sufficiently determines how the map will coalesce in any concrete situation, to re-form the space around it whilst also remoulding the perceptions and practices of its interlocutors. The analytical imperative of critical cartography thus undergoes a shift. It is no longer sufficient to 'deconstruct' a map as a representation of space, or to trace the politico-epistemological machinations that produced it on the page. Instead, researchers should focus their attention on those unstable moments when a map comes into being, that 'mix[ture] of creative, reflexive, playful, affective and habitual practices' (Kitchin and Dodge, 2007: 341) through which it comes to fruition as an actor in the world.

For anyone interested in the history of urban cartography, reframing the map through what Kitchin and Dodge term 'emergent cartography' (342), or Del Casino and Hanna call 'map spaces' (35), is both tantalising and frustrating. For as Chris Perkins notes:

> The difficulty for historians of cartography concerned with practice is of course that maps as artefacts have tended to be preserved and institutionalised, whereas evidence of mapping practices is less likely to have survived, or is harder to establish (2004: 386).

Indeed, the archival record of past mapping practices overwhelmingly documents the processes, decisions, and administrative strategies that produced the

maps of the modern era, rather than the more dispersed and multifarious events of their subsequent use. The more ordinary and unremarkable an urban map was - the less moored to a specific strategy of military action, civic governance, or wilful resistance - the less likely it is that instances of its usage will have entered the public archive. The history of urban cartography thus remains dominated by studies that reaffirm the ontic security of the artefactual map (Gilbert, 2002; Nead, 2000; Pickles, 2004), fully able to chart the representational and political structures through which its image took form, but inevitably silent about the diverse ways in which it subsequently coalesced across the various terrains of its ordinary deployment.

Aside from a few serendipitous moments, it seems likely that this archival deficit will continue to challenge the historical urban geographer. However, there are other, more tangential forms of historical knowledge that could perhaps be mobilised by way of critical compensation. Firstly, if maps only come into being at points of negotiation between object, user and terrain, then we might attend to the dynamic environments to which a map originally addressed itself. This would require a sensitivity not only to the layouts, architectures, and traffic flows of historic cities, but also to the kinds of navigational problems for which the map was likely to have been deployed. We might also reflect on those historic subjects most likely to have mobilised the map, attending to any differentials of class, gender, and ethnicity that might have governed either access to it or to the kind of navigational tasks that it once anticipated. On a more profound level, this would also require a consideration of how those users might have experienced the built environment, the perceptual structures through which space was understood, and the somatic configurations of past automotive bodies.

If, as recent commentators propose, the cartographic object, the individual wayfinder, and the specific situation of the map's deployment all reproduce each other (and are likewise reproduced) within a distributed set of contingent encounters, then a historical inquiry into all three of these components might indicate a deeper history of urban map use. The quandary remains, however, of how to bring these elements together and collide these ineffable contextual knowledges against the tangible archival object. If earlier map use has left few concrete traces, then how can we see beyond the map's ontic security and reconstruct a now unknowable set of historic ontogenetic becomings?

The map as a musical score

One way forward has perhaps been suggested by Tim Ingold's (2000) critique of the 'mental map' paradigm, a model of wayfinding that was previously dominant within cognitive psychology and certain schools of geographical thought. Theorists such as Alfred Gell (1985) supposed that our ability to navigate across familiar terrain depends upon a retained system of knowledge about how various locations are related to each other in space. Crucially for Gell, this abstract knowledge remains stable and consistent irrespective of our actual situation on the ground; it is, to use his term, 'non-token-indexical' (279). Thus when we transverse a customary environment, we use this anterior mental map to forge expectations about what images are soon to confront us. If our subsequent perceptual input matches our predictions, then we know we are going the right way. Gell's underlying argument, then, is that habitual ambulation is identically structured to proper cartographic navigation. Both operations

involve the same basic processes of referencing, inference and confirmation; the artefactual map only makes explicit what is otherwise a largely subliminal procedure.

For Ingold, however, this assertion of equivalence categorically misrecognises what really happens when people undertake a customary journey, an activity he variously terms ‘wayfinding’ (2000) or ‘wayfaring’ (2007). Unlike the stranger navigating with her map, the local wayfinder perceives her environment not in relation to some fixed configuration of abstract spatial knowledge, but within what Ingold calls ‘a matrix of movement’ (2000: 219). Places become meaningful because of the sequences within which they are experienced, tied together within a hermeneutic arc that casts a familiar journey as an ambulatory retelling of a well-known story. We understand our trajectories, Ingold argues, not because we cross-reference them to some quasi-cartographic image filed within our heads, but because we are accustomed to how these landscapes habitually unfold. And such spatial knowledge is not a cognitive resource banked within our minds, but an embodied attunement to the spatial terrain, an accumulation of hitherto experiences in playful negotiation with the surroundings through which we move.

Yet whilst Ingold’s critique of the mental map paradigm is insightful, it doesn’t go far enough, since its rhetorical force requires him to maintain a questionable opposition between the celebrated hermeneutics of quotidian wayfinding and the reified practices of proper cartographic navigation. For Ingold - as much as for Gell - to consult an artefactual map is still to engage in a cognitive exercise, to alienate oneself from one’s immediate environment and plot out a set of spatial manoeuvres to later be executed on the ground. He articulates the contrast thus:

> Ordinary movement in a familiar environment lacks the stop-go character of [cartographic] navigation, in which every physical or

> bodily manoeuvre (displacement in space) is preceded by a mental and calculative one (fixing the course) (2000: 239).

Recent empirical studies, however, cast doubt on this description of everyday map use. Laurier and Brown (2008), for instance, have studied a group of four tourists in Edinburgh city centre attempting to use the street plan in their guidebook to find their way to an historic house. They describe in detail how members of the party repeatedly rotated both the map and their own bodies, constructing and exploring different alignments with the street. Individuals often separated themselves out from the huddle, to open up new sightlines or rehearse the first steps of a tentative new route. Fingers traced out lines across the printed page; others indicated potentially significant details within the landscape. Appeals were made to the local knowledge of passers-by (who offered a further set of understandings through which the map was brought into meaning), whilst suggestions and counter-argument circulated freely. As Laurier and Brown conclude, this cartographic engagement was a shared and socially organised form of practical reasoning, an embodied encounter with the contingent environment that radically exceeded simple cognition.

Although their focus is on a group of 'lost' tourists, Laurier and Brown's argument seems equally applicable to less crisis-ridden forms of urban navigation. In much ordinary usage, a portable street map may be consulted sporadically over the course of a journey, less to solve the problem of where one 'is' than to monitor and moderate one's already-located progress. Equally, it is as likely to be negotiated whilst the user is in motion as to cause the navigator to pause or stop. Hence the map might provoke no sudden withdrawal into a cognitive space of calculation or sensorial disengagement from the immediate environment. Instead, it is often experienced as a dynamic and multisensory object, already interwoven into the fabric of the city and

ranged over by a dispersed and peripatetic attention - much like the information displayed on a road sign or the heightened traffic noise that indicates a proximate main road. Clearly the map's representational content alters our orientation to our urban surroundings, just as it impacts our developing trajectory, but our dynamic experience of the unfolding terrain equally structures how we put the map to work. In effect, then, to posit a binary opposition between the situated nature of familiar wayfinding and the cognitive abstractions of cartographic navigation has an unhelpfully regressive effect. It restores to the map its counterfeit sovereignty, framing it once again as a stable ontic entity and the sole determinant of all instances of its use.

By asserting this contrast, Ingold is able to privilege his preferred forms of indigenous local mapping over the tyrannical abstractions of modern cartography. Yet in his rush to critique such institutional epistemologies, he credits these maps with too comprehensive a strategic power and risks occluding their more pluralistic effects within decentred events of quotidian navigation. For instance, he writes:

> when navigating in a strange country by means of a topographic map, the relation between one's position on the ground and one's location in space, as defined by particular map coordinates, is *strictly synchronic*, and *divorced from any narrative context*. It is possible to specify where one is – one's current location – without regard to where one has been, or where one is going (2000: 237; my emphasis).

This is, of course, one possible way that we might use a map, which highlights its potential as an instrument of spatial alienation. But this description seems importantly to miss what often takes place within cartographic wayfinding. Coming to fruition only at certain contingent moments within an ongoing journey, most maps are

bound up less with specifying where one is (as an isolated synchronic event) than with confirming one's ambulatory location within an overall narrative arc (the story of one's progress to here, and the shadowy projection of one's future trajectory). Indeed, one's present position can hardly be understood outside of this narrative, for where one has been and where one is going are hermeneutic constants that frame the entire navigational project, and thus each pragmatic recourse to the map. In most ordinary usage, therefore, maps coalesce within profoundly *diachronic* performances.

All this has significant implications for how we understand the quotidian urban map, particularly in relation to such important dynamics as performance, narrative, and time. For if, as Ingold suggests, the narrative arc of familiar wayfinding makes it 'more akin to playing music or story telling than to reading a map' (2000: 238), then quotidian map use might also withstand such strong analytical comparisons. As he elaborates:

> [In wayfinding] one remembers the route as a succession of vistas connected by transitions, rather as one might remember a piece of music as a series of thematic sections linked by bridge passages. Just as with musical performance, wayfinding has an essentially temporal character: the path, like the musical melody, unfolds over time rather than across space (2000: 238).

For Ingold, this comparison is sustained by the processual essence of wayfinding itself. Like a melodic phrase, the wayfinder's journey is continually unfolding; it can never be reduced to a sequence of discrete locations, just as a flowing melody is always more than the sum of its component notes. Yet if cartographic navigation is something other than a disjointed set of cognitive episodes severed from the corporeal motions they allegedly precede, then the path one forges

might also be framed through this evocative musical metaphor. Here, however, the familiar tune unthinkingly performed by the habitual wayfinder becomes a faltering and unaccustomed melody, tentatively picked out by the map user as she makes her way through the unknown urban landscape. Endowed with particular navigational skills and impelled by her need to traverse the city, her performance can be cast as a structured improvisation, as she sporadically draws instructions from her map whilst adapting these to her own unique playing style and the responsive demands of the immediate terrain. My basic suggestion, then, is that ordinary urban maps might function in a similar fashion to printed musical scores, and that such an analogy potentially unlocks new ways of thinking about the relationship between cartography, history, performance and power.

I should make it clear that my present interest is specifically in exploring the performative dynamics of cartographic wayfinding, rather than in understanding how maps work to transmit more basic geographical knowledge. Matthew Sparke has previously described the *Historical Atlas of Canada* as a 'cartographic "musical score"' (1998: 468), but he deploys this metaphor to shed very different light on the political mechanics of institutional mapping. Sparke's analogy is rooted in Edward Said's (1993) notion of a 'contrapuntal' reading, a postcolonial strategy for bringing to attention a tacit set of counterhegemonic meanings that already lie dormant within an imperialistic text. As Sparke ably demonstrates, the *Historical Atlas*'s representational schemata can be used to articulate a counter-narrative about the history of colonial oppression, which is radically in tension with its dominant account of an organic Canadian nation. His analysis, however, privileges the *Atlas* as something to be read, a visual statement of geographical knowledge designed to be safely pored over in the schoolroom or the library. My concern, here, is with a very different mode of

cartographic engagement – the situated deployment of maps to get across the city – and, as such, highlights an alternate set of correlations between the published map and the musical score.

To explore this further, it is useful to invoke the philosopher Nelson Goodman (1976) and his essential designation of scored music as both a two-stage and an allographic art form. Unlike a one-stage art form such as painting, Goodman proposes, a composer's score never constitutes the actual artwork; instead, the work always exists at a secondary level, when a musician chooses to articulate the notes on the page and transform them into sound. Furthermore, unlike an autographic painting, a piece of music has no authentic original; rather, the work consists of all those performances that properly comply with the score's instructions, irrespective of any variable aesthetic merit. Goodman's analysis is useful here because he fixes the score's essence as a technology of instruction, whilst also noting its internal contradiction, since it can only command certain facets of its subsequent performance. The pitch, duration, and octave of the notes might be clearly specified on the page, but important elements such as expression, timbre, phrasing, and attack have to be left to the player's discretion and the unique conditions of each recital. Even terms used to regulate the tempo of the piece, such as '*allegro*' or '*andante*', are too vague and imprecise for Goodman to accept them as properly part of the score.

Already, then, a set of parallels emerge between cartographic navigation and musical recital, for wayfinding - like playing music - is an allographic, two-stage practice. The printed text again has less ontological significance than the set of performances it initiates, dispersed as they are across space and time. In addition, whilst the map provides some broad criteria by which the 'correctness' of those navigations can be judged, it must also encounter its own limitations as an

instructional technology. As Ingold notes about musical scores, maps are always read 'outwardly' in performance (2007: 16); they demand from the user an accumulated set of both mental and motor-sensory competencies, whose variability will always affect the texture of the practiced outcome. External factors will also intrude; traffic flows, other interlocutors, and even the state of the weather will consistently shape cartographic performance, just as the construction of an instrument or the acoustics of a recital room invariably influences the resultant sound. Musical scores and printed maps, then, are both fully ontogenetic technologies, whose eventual becomings cannot be disassociated from the contingent circumstance of each and every material performance.

In sum, framing the map as a musical score allows us to explore both its instructional dynamics and the ways in which its performative prescriptions are constantly destabilised as events unfold on the ground. Furthermore, it invites us to reconsider the historical role that urban cartography might have played within modern formations of social governance. As Max Weber (1958) notes, the historical emergence of the musical score in the West was inextricable from broader processes of musical rationalisation. The development of polyvocality within monastic chant ushered in staff lines and other early schemata that helped stabilise each note's pitch and fix the overall measure of the song. Soon a song was able to be sung solely from written notations, enabling groups of singers to achieve heightened levels of complex coordination (Chanan, 1994; Ingold, 2007). Over successive centuries, courtly musicians would pursue increasingly elaborate compositional structures, which in turn spurred the development of more complicated notational systems. As Weber makes clear, this spiralling process eventually led to the complete segregation of composition from subsequent acts of performance. By the end of the seventeenth century, aided by

both the wider division of labour and the emergence of the published score as a viable commodity form, composers had become institutionally distanced, both spatially and temporally, from the actual production of their works (Chanan, 1994; Goehr, 1992). In the words of Andy Hamilton, the composer was now ‘a desk-worker rather than a performer’ (2007: 35), presenting a definitive set of printed instructions for musicians to follow in their absence.

Ingold (2007) has already compared the lines of the stave to the geographical markers of longitude and latitude - the two sets of guidelines that enabled the modern reification of music and topography, respectively. But the historical confluence of the score and the map might run deeper through the fabric of urban modernity. It seems telling, for instance, that the proliferation of ichnographic street maps should occur during an era marked by the ascendency of the classical orchestra, for the two share important formal similarities. At the historical zenith of musical rationalisation, the orchestral score worked to individuate a vast number of musicians, arranging each one within their own apportioned space (according to instrument and rank), and marshalling their performances through the coordinated distribution of printed instructions (Turley, 2001). The popular street plans of the mid-nineteenth century made the same kind of bureaucratic gesture. Spatially disseminated amongst a mass of individuals, they raised at least the spectre of a more orchestrated metropolitan mobility. This comparison should not be pushed too far; not only are cartographic notations less linear in their commands than notes on a stave, but the diverse situations in which it is taken up makes the map highly unstable as an administrative device. Yet such street plans still point towards an authorised set of spatial behaviours or promote certain modes of mobile orientation to the dynamic built environment. To use a map in an orthodox manner is still to concede, in some ill-defined way, to a

form of cartographic management. On these terms, the traffic policeman even takes the role of an orchestral conductor, whose body communicates certain codified instructions to supplement the incomplete coordinations of the page.

Of course, this account clearly exaggerates the administrative impulse within ordinary urban maps. One could equally write a second musical history – perhaps linking the Baroque *basso continuo* to the post-modernism of John Cage – that shows composers exploiting the score's internal limitations to augment the possibilities for virtuoso performance. In works like *49 Waltzes for the Five Boroughs* (1977) and *A Dip in the Lake – Ten Quick Steps, Sixty-one Waltzes and Fifty-six Marches for Chicago and Vicinity* (1978), Cage even explored this idea by constructing compositions out of popular city street plans. Using chance operations, he picked multiple coordinates and arranged them in clusters of two, three or four. He then plotted these points on top of the map and joined them via networks of ruled straight lines (Gena, 1982) - a waltz, for instance, consisted of three plotted coordinates connected by two sides of a scalene triangle. Musicians were asked to visit each location in turn, there to produce, record or simply listen to the sounds around them for however long they wished. A diligent performer would thus be propelled into a lengthy and complex encounter with the city, as she oscillated between loosely-structured stretches of journey-making and rooted engagements with diverse local soundscapes. In constructing these works, Cage not only revealed the formals connections between maps and musical scores, but dramatised the essential improvisation within all acts of cartographic wayfinding, in play from the moment that the performer takes up the map and begins to follow its ambiguous instructions.

Yet whatever tone of critical account it leads us to produce, this underlying analogy provides a mechanism to begin investigating the erstwhile dynamics of now-

forgotten map use. Our critical project might undergo a shift, from decoding the graphic notations on the page, to tracing how they once sought to choreograph diffuse urban mobilities. In what ways, we might ask, did the map embed itself within the melodic, harmonic or rhythmic structures of the terrain that it depicts, and what were likely to have been the results? Our task, in short, is to develop a form of cartographic musicology, a tentative form of critical synaesthesia that moves beyond examining what a particular map *looks* like, to exploring how it might once have *sounded* as it came to be played out across the surface of the city.

Locating the various tools we might use to pursue this venture lies beyond the scope of this essay, but Henri Lefebvre's (2004) method of rhythmanalysis is surely a productive starting point. Lefebvre's principal insight was that everyday life perpetually coalesces through the interplay of different rhythmic forces, particularly those of the human body as it encounters the more abstract measures of production, transportation and industrial leisure. As the body's exertive, affective and perceptual rhythms slowly become refashioned, they exert a set of reciprocal resistances that produce shifting patterns of synchronicity and arrhythmia. Rhythm is thus a key modality through which we can scrutinise the dialectical re-production of the individual and the social, or the 'natural' and the cultural, and the power relationships that these forces put in play (Edensor, 2010). More specifically, it provides a site of audible contestation between the dynamic structures of the historic city, the corporeal configurations of those who moved through it, and the latent prescriptions embedded in the map. By listening to how these rhythms came together at a particular historic moment, therefore, we might understand more about how our map engaged with its environment, the type of spatial practices it once sought to solicit, and the various kinds of outcomes that this was likely to have produced. Without firm archival

evidence of actual navigations, this inquiry must remain only a tentative act of historical reconstruction – an exploration of how our map *asked to be* used, rather than of how it actually *was* used; yet, it still might facilitate a greater critical insight into the structural configurations of past cartographic performance.

The Rhythmic Orchestrations of the Tube Map

In the remainder of this paper, I aim to consolidate this approach via one particular case study: an analysis of Harry Beck's design for the map of the London Underground, first published in January 1933 (Figure 1). The Tube Map, as it is more generally known, is one of the most familiar images of modern urban cartography, often cited as the template for subsequent transit maps (Ovenden, 2003) and the recent object of much critical and historical study (Ashford, 2011; Forty, 1986; Garland, 1994; Hadlaw, 2003; Pike, 2002; Turnbull, 2006; Vertesi, 2008). I consider it here because such work has revealed an important structural paradox within Beck's design, with significant implications for how we might conceptualise the performative dynamics of cartographic navigation.

On the one hand, Beck's map is frequently presented as a watershed event of spatial reification. David Pike (2002), for instance, locates it as the culmination of a modernist representational tradition that mobilised the logics of rational geometry to address the threatening disorder of everyday urban life. For Pike, Beck's vision of London directly reprised the network of coloured boulevards that Napoleon III drew over the map of Paris he famously handed to Baron Haussmann in 1853. Similarly, his placing of London's railway lines within a sterile abstract void echoed Le Corbusier's proposal to obliterate part of that same city - the premise for a brave new

landscape of geometric highways and uniform apartment blocks in his *Plan Voisin* of 1925. This trio of cartographic visions, argues Pike, were united by their common desire to erase the city's untidy inheritance and replace it with a unitary, organised and (above all) controllable metropolis.

Thus framed, the Tube Map exemplifies what Ingold has called the 'transport' paradigm of traversing urban space, a highly controlled mode of rationalised journey-making that has become endemic within modern metropolitan life. Route maps like these, Ingold argues, present the city as an 'array of interconnected destinations' (2007: 73). Abstracted from all topographical or historical associations, and locked within a stable synchronic structure, they are designed to be comprehensible at a single glance. Meaningful places are reduced on paper to a series of isolated dots, linked together via an 'assembly of point-to-point connectors' (2007: 74-5) that effectively defines their only function. Transit maps thus participate in modernity's wider transition from an authentic and engaged form of journey-making to an alienated mode of passified travel. Availing themselves only to the calculation of the best and most efficient route to take, such maps frame the subsequent experience as one of environmental disconnection, invested only in the final destination that provides its sole point of meaningful reference.

The regular geometries and equidistant station names that characterised Beck's map make it clearly consonant with this reified form of mechanised mobility. Yet, paradoxically, its graphic innovations also brought it back towards the archaic type of wayfinding that Ingold cites as the very antithesis of modern transportation. In one important passage, he notes how the Tube Map resists the tyrannical convention of asserting an equivalence between the surface of the page and the surface of the Earth that it purports to describe. In fact, since the Tube Map derives its meaning from a

network of lines rather than from the blank space surrounding it, a version made ‘out of stiff wire, soldered at the intersections…would serve just as well’ (2000: 241). By curious implication, then, Beck’s map comes to mimic those indigenous mappings which similarly render the landscape as a meshwork of lines whilst asserting no imperial jurisdiction over the territory through which they run. The emphatic royal blue border that surrounded Beck’s diagram upon its initial publication in 1933 - much like the stylised Thames that bisected its lower half - is revealed to have been a striking anomaly, a concession to an outmoded cartographic trope that his innovative renderings had already superseded.

Indeed, the Tube Map comes even closer to such forms of indigenous mapping if we consider its basic navigational mechanic. As Ingold notes (2007), many native peoples understand a well-travelled pathway not as a set of abstract spatial relationships, but as a succession of familiar place names that are brought together within a meaningful narrative arc. Yet because of its dissociation from all surface topography, a Tube journey can be figured as little other than a litany of station names - of places to pass through, or at which to alight and change trains. Thus, whilst Beck's map initially provokes an act of cognitive calculation – here fixing the course does indeed precede any displacement in space – the projected route is invariably transposed into a surprisingly narrative form. Furthermore, if a first-time traveller is to successfully enact this itinerary, she must remain highly attentive to her subterranean surroundings - scanning for station names on intermediate platforms, sensing when the train slows into a station, aligning herself with the correct flow of passengers, and sporadically glancing at the repeated issues of the map encountered on her journey. This active and multisensory engagement with the passing environment appears to

bring the Underground navigator much closer to the indigenous wayfinder than to the transported person's disconnected docility.

Beck's Tube Map can thus be framed equally as the exemplification of an alienating transit map or as a return to an archaic form of narrational mapping, a confusing ambiguity that potentially runs though the plethora of route maps that have followed in its wake. For this reason, I want to reconsider the historical origins of Beck's design and unpick the performative work that it sought to achieve in the tunnels beneath interwar London. By inserting it back into that city's shifting polyrhythmia - trying to hear it, in effect, as a musical score with some instructional intent - I hope to probe deeper into this apparent contradiction, and to speculate about the wider role that such route plans have played within the spatial orchestration of modern urban life.

During the interwar decades, London became the site for some important negotiations around the rhythms of everyday mobility. As it unevenly embraced the forces of mass production, corporate management and organised consumption, the city's physical transformation produced specific contradictions around Underground travel, in particular. London's surface area doubled between the wars (White, 2001), fuelled by great swathes of owner-occupied housing built on its northern and western fringes, which served to stabilise the identities of its expanding clerical and supervisory classes whilst providing the key locus for much of the consumption on which this transformation depended (Oliver et al, 1981; Weightman and Humphries, 1984). On one level, Beck's map was an obvious product of this rapid suburban expansion. Before 1933, depictions of the system had usually been printed on top of ordinary street plans; but this had produced a representational crisis as the Underground extended outwards. Soon either the outlying stations had to be left off

the map, or else the scale had to be reduced in such a way that threatened the legibility of the dense metropolitan centre (Leboff and Demuth, 1999). Beck's famous resolution was to fix the network within a convex image, which reduced the greater distances between suburban stations and forced its twisted railway lines into a regular geometry (Garland, 1994).

This tale of simple causality, however, masks the deeper significance of Beck's design and its complicit endorsement of how monopoly capitalism was restructuring the experience of metropolitan mobility. The London Underground network had initially developed as a fragmented collection of disconnected routes, built by rival speculative companies who were more interested in their own profitability than in meeting the city's wider transport needs (Day and Reed, 2001). At the turn of the twentieth century, these uncoordinated endeavours had produced an inefficient system ridden with points of congestion and of under- or over-provision, which had left many of its component companies teetering on the brink of economic collapse. By 1902, however, the Underground Electric Railways Company of London Limited (UERL or 'Underground Group') had begun to buy up these struggling concerns, binding them together within a common management structure that fostered much greater levels of mutual cooperation (Barker and Robbins, 1974). Finally, in July 1933 - six months after the launch of Beck's new Tube Map – the government converted the UERL into London Transport, a public corporation with monopoly rights over the city's entire passenger transport provision. Whilst remaining the property of its stockholders, London Transport was made fully accountable through its publically appointed executive, the London Passenger Transport Board (LTPB).

Almost from its inception, the corporate viability of the UERL was heavily bound up with the expansion of its railway lines into the presently undeveloped

environs of London. Seeking to secure a more stable source of revenue, the group pursued a number of interwar extension programmes: the Hampstead tube to Edgware in 1924, the City & South London Railway to Morden in 1926, and the Piccadilly Line to both the north and the west in 1933 (Day and Reed, 2001). Thus the first issue of Beck's map already proclaimed the latter line's imminent extension to its terminus at Cockfosters - then only a tiny hamlet, five miles beyond the edge of the built-up area. Within three years of its opening, and further encouraged by London Transport's careful provision of connecting bus routes, speculative building firms had erected vast housing estates around each of the new stations that promised to supply the infant corporation with a stable and reliable passenger base (Carpenter, 1992).

Importantly, Beck's new design was always more than a skilful visualisation of these extensions, for its representational schemata were deeply sympathetic to the UERL's underlying project. As Adrian Forty (1986) has noted, the map functioned as a corporate fetish that successfully refigured London's mess of haphazard railway lines into a bright, clean and integrated system. By concealing the larger distances between suburban stations, it made them appear both closer to the centre and an organic part of the greater metropolis. For Janin Hadlaw (2003), Beck's map went even further by articulating the very logics through which time, space, and everyday movement were becoming restructured by the forces of monopoly capitalism. Its cartographic abstractions, she argues, clearly stressed that traditional, more grounded experiences of place and duration were now less significant than the circulation of passengers through the system - an address seemingly understood by the workers and consumers who routinely journeyed between the suburbs and the centre. That Beck's map should have enjoyed such immediate popularity is testament, for Hadlaw, to just

how prevalent this 'common sensibility' (26) had become amongst ordinary Londoners.

Hadlaw's analysis is useful because it identifies how London's interwar modernisation was underscored by the dominant measure of the twice-daily commute. Since its expanded suburbs were overwhelmingly residential, their inhabitants depended upon the metropolitan centre for most of their employment, retail and recreational needs (Edwards, 2003). Yet, whilst this enhanced the UERL's financial security (and later, that of London Transport), it created a fraught set of rhythmic tensions around the practice of commuting, in particular. Hadlaw has explored the striking mismatch between the experienced duration of commuters' journeys and the condensed distances displayed on Beck's map. Since time spent commuting is without economic value, she argues, 'not recognizing its duration in representation is entirely logical' (2003: 34). Yet the asynchronicity that Hadlaw notes must be heard alongside another, more intricate set of rhythmic negotiations then taking place around the Underground commuter's body.

Whilst the corporation itself was heavily reliant on the planned extension of its Tube lines, Frank Pick (Commercial Manager at the UERL from 1928 and London Transport's first Chief Executive) was adamant that commuters would tolerate no longer than a forty-five-minute train journey between home and workplace in either direction (Barman, 1979). The corporation thus set out to bring London's transport services into a tighter and ever more efficient eurhythmia that would maximise the distance that could be covered in this time. Pick and his agents accordingly pursued a range of reforms, including improvements to signalling, reducing platform waiting time, and eliminating all superfluous stoppages on route, all of which served to increase the average speed of trains across the network.

This coordinated efficiency drive also involved a sustained attention to mobile flows of passengers through the system. Beginning with the stations he designed for the Morden extension in 1923, Charles Holden's architecture worked hard to expedite the individual's passage from the street onto the trains. He deployed and then refined a series of innovations, such as larger station entrances, separate lanes for season-ticket holders, and push-button printing machines that allowed clerks (and later passengers) to issue tickets in a fraction of the time that it had previously taken (Barman, 1979). The key component within these technical assemblages was the automatic escalator, systematically brought in to replace station lifts from 1924 and progressively improved throughout the 1930s (Orton, 2000). Located at both the spatial and symbolic centres of Holden's stations, it reworked the logics of the factory assembly line by stabilising the flow of moving objects whilst disciplining the exertions of the bodies it encountered. Unlike the staircase (whose motion was held hostage to the corporeal irregularities of specific individuals) or the electric lift (which produced dysfunctional moments of stasis and congestion), the escalator served to isolate each passenger as a generic entity, immobilising them within a predicable flow of regular mechanical motion.

Additional strategies of corporeal management were deployed deep within the tunnels. From 1923, and in clear anticipation of its later line extensions, the UERL began to replace its existing Tube trains with those built to a new specification, known as Standard Stock. Edwardian Tube cars had been accessed via two narrow doors at opposite ends of the carriage, a set up that required passengers joining the train to wait for the debarking file to cease before they could proceed. In contrast, the new designs of the 1920s were fitted with two sets of double doors spaced evenly towards the centre of the car. Not only were these roughly equidistant from anywhere

within the saloon, but opposing streams of passengers could now embark and alight simultaneously. Their state-of-the-art pneumatic mechanisms also meant that guards no longer had to open and close each door manually (Barman, 1979; Moss, 2000), decreasing the length of time that the train was held at the station. At the same time, a range of innovations inside the cars - from upholstered arm rests, to line diagrams posted within the sightline of seated passengers – worked to position each traveller's body whilst lessening the anticipated need for any pause or hesitation.

In 1927, a poster by the illustrator Lunt Roberts appeared inside ticket halls that clearly set out these systemic imperatives (Figure 2). Between bookended drawings of a jovial commuter entering and exiting from two of Holden's stations, his daily journey was sequentially broken down into seventeen habitual actions - a list that included both automatic movements (standing on the right of the escalator, stepping off with the right foot) and directed modes of attention and response (bewaring of pickpockets, allowing other passengers off the car first). This litany reveals how the Underground assemblage was becoming enmeshed with a set of corporeal and perceptual alignments, solicited by its component architectures and various mechanical technologies. At the end of the list came some ironic self-depreciation:

> Why? [the commuter asks, rhetorically]
>
> Because I do it every day.
>
> Why?
>
> Because I'm, unfortunately, that sort of chap.

This gentle humour, however, could not quite disguise the poster's disciplinary intent. Here inside the ticket hall was a prescription for 'a fair average conduct,' or a generic programme of direct instructions for monitoring, responding to,

and moving through the Underground. The message communicated by Roberts's monotonous column of 'I's – much like the steady pace of the escalator's steps or the apportioning arm rests of the new Standard Stock – was that Tube travel had become predicated upon the complicit behaviour of the generic, self-governed individual.

From January 1933, Beck's Tube Map would align itself with this hegemonic quest for rhythmic orchestration. First published in a portable card folder edition, it was followed two months later by posters displayed on platforms, inside booking halls or on the walls outside stations. Its typographic clarity primarily aimed to reduce the time it took for a traveller to plot their course, whilst its frequent recurrence at points along the journey provided a constant reinforcement of its presently unfolding narrative. The map thus sought to speed the flow of passengers from the streets onto the trains by lessening the need for stoppages en route. Yet, whilst this is important, Beck's design contained a further innovation of much greater significance for critics of urban cartography. For via both its basic imagery and its navigational mechanic, it invited its users to insert themselves into a structure of behavioural response that was carefully articulated to synchronise the rhythms of mobile individuals with the optimum measures demanded by the system.

When his design was first issued to the public, Beck was working on a temporary contract as an electrical draughtsman in the UERL's Establishment Office. He also regularly drew humorous cartoons for the corporation's *Train, Omnibus and Tram Staff Magazine* (Garland, 1994), where, in March 1933, he was responsible for the following article:

> THE NEW UNDERGROUND MAP
>
> Schools of artistic thought are waging wordy warfare over the new Underground folder map which has just been issued. There is much to

> be said on both sides. For years untold our maps have been more or less geographically accurate. There is value in that to the passenger. Yet the diagrammatic map with its straight lines, gives an impression of directness. Which is more useful, and which is the better advertisement?
>
> Needless to say, the Geographists liken it to a radio diagram. They have even troubled to produce an amusing burlesque of it and we reproduce this on the opposite page.

Beck's accompanying cartoon was entitled 'The Underground "Straight Eight" All-Electric Skit-Set Diagram' (Figure 3). Here, he figured his map as a tangle of electric circuitry, its station names and adjacent attractions drolly translated into the language of electrical engineering. (Thus the Holborn Empire becomes 'Holborn Ampère' and there is evidence of 'Great tension' at Bank). This clever self-parody had a robust logic, for since the electrification of its railway lines, the Underground had been, in effect, an ensemble of electrical circuits. In addition, the diagrams used to represent them deployed similarly abstract spatial logics, severing components from their grounded topology in order to articulate the circulation of current. They thus provided a sympathetic model for depicting both a transit system based on organised mobility and the wider city that it had come to sustain.

Yet more interesting still was Beck's presentation of a radio receiver as his initial source of inspiration. To be clear, I am less concerned with whether Beck's map was 'based' on radio diagrams in any causal sense, than with his choice of this analogy to espouse his design to colleagues and corporate peers. At the start of the 1930s, radio receivers had become very particular assemblages. During the second half of the 1920s, electrical engineers had begun to integrate automatic volume

control (AVC) circuits into their devices, soon to become a standard feature within most commercial sets. Before this innovation, the listening volume of a radio receiver had depended on the strength of its incoming signal; if the signal was weak and variable (as was often the case with long distance transmissions), then the volume had a tendency to undulate wildly, and tuning into a station with a much stronger signal would cause the speakers to emit an unpleasantly loud blast (Terman: 1943). AVC circuits were developed to rectify this problem. They monitored fluctuations in the amplitude of incoming radio waves and, via a component called a variable-mu valve, responsively adjusted the incoming voltage to rectify any contingent inconsistencies. The end results were a stable level of output and a more comfortable general listening experience (Wheeler, 1928). (In Beck's cartoon, 'Variable MU' designates Regents Park Station – presumably a reference to the wild cats housed in nearby London Zoo).

After the end of the Second World War, radio AVC circuits would be routinely celebrated as a pioneering instance of a 'cybernetic' system (Sluckin, 1954) - a term used to describe any self-regulating assemblage which deployed an internal feedback loop to respond to its own output and return itself to a homeostatic state of equilibrium (Wiener, 1948). By the turn of the 1950s, self-proclaimed cyberneticists had discerned this structure within a whole range of physiological systems and social formations, and were beginning to posit it as a universal foundation for all forms of organisational stability (Brix, 1967; Sluckin, 1954; Wiener, 1950). In particular, cybernetics seemed to provide a useful model for explaining how both humans and animals came to inhabit their everyday environments, which tallied with contemporary developments in psychological research (Grey Walter, 1953; Sluckin, 1954). Through a process known as 'negative adaptation' or 'habituation', the organism was seen to learn from the results of its previous actions, restructuring its

responsive behaviour as it came to distinguish between those sensory inputs vital to its survival and other, more superfluous environmental stimuli. Through a cycle of self-monitoring and adjustment, the entity became accustomed to its surroundings and achieved a state of perceptual homeostasis fully attuned to its ordinary conditions of existence.

That Beck should present his map as an early example of a cybernetic system suggests, on some level, that his design was invested with similar fantasies of adjustment and alignment. In referencing a radio diagram, he recast the Underground as a self-regulating assemblage that automatically moved back towards a homeostatic state. As a figurative image, then, the map issued an implicit message about the wider stability of the overall system, which accorded with the corporation's larger endeavour to train passengers towards a mode of behavioural compliance.

Yet, as a crucial component within the Underground assemblage, the Tube Map not only announced this representational fantasy, but addressed its users via a technical structure that pursued the same process of environmental habituation. Earlier Tube maps, printed over the top of ordinary street plans, had been haunted by a vague and intractable navigational excess, an infinite set of street-level journeys that might stir the user's memory or energise imaginings of expeditions yet to take. Beck's abstractions tried to remove this semantic surplus, as far as was pragmatically possible. In eschewing both street-level topography and any attempt at geographical scale, the map sought to eliminate all semantic noise that threatened to compromise the clarity of its signal. Thus, whilst presenting itself as an indispensible tool to enable novice travellers to plot out their trajectories, it claimed little utility beyond this and its subsequent repetitions all along the route were cast merely as so many reminders. In structuring this process of simple reinforcement, the map projected the conditions

of its own incremental redundancy. Users, it hoped, would internalise its instructions and have no further reason to pay it any attention. Its economy of design, therefore, endeavoured to interpolate navigators into a cycle of negative adaptation.

In short, Beck's new Tube Map sought to become superfluous - a familiar object that any practiced traveller would soon screen out as an unnecessary visual stimulus. In so doing, it envisioned a state of receptive habituation which both embodied and exemplified the wider modes of self-governed response then being solicited across the entire network. Its innovative abstractions not only communicated the lack of value in time spent travelling between the suburbs and the centre, but they offered an important technical lesson in how to monitor one's environment and respond to it accordingly. Framed by measures of repetition and routine, but encountered in quick succession all along the route, the map asked Londoners to progressively ignore it; and, in so doing, it conjured for its users a type of responsive behaviour that might cope with the contingencies of everyday journey-making and adjust itself back towards a predictable spatial outcome. As the witty 'specification' on his cartoon made clear, Beck's network was designed to be characterised by 'minimum or no Resistance'.

Conclusion

If, as Ingold (2007) claims, modern transit maps work to reify quotidian travel by alienating passengers from the passing terrain and deferring all meaning until the point of arrival, then they seem to function at a more insidious level than merely that of representational content. The case of the Tube Map suggests that such devices were implicated within monopoly capitalism's larger drive to remould the behaviour and

perceptual apparatuses of mobile urban individuals. As instructional devices within spaces of routine, their typographic purity sought to solicit a more favourable mode of responsive habituation, or a cybernetic state of automotive self-governance that might – in its most realised form – react to the disruptions of everyday travel by returning the system to its homeostatic stability.

Indeed, whilst it is tempting to view Beck's Tube Map as what Lefebvre (1991) once termed a 'representation of space' (a reified image that produces abstract knowledge about the territory it claims to depict), to do so would ignore the productive dialectic already embedded within its navigational mechanic. Only to the novice did it present its network as a total synchronic structure, awaiting the narration of an efficient projected route. Attached to cycles of quotidian travel, such calculations already pursued their own transmutation into a complicit mode of habituated wayfinding, a somatic state of self-governed docility much closer to Lefebvre's alternate category of 'spatial practice'. In a discussion about learning to play a musical instrument, Walter Ong notes that a musician 'has to have interiorized the technology, made the tool or machine a second nature, a psychological part of himself or herself' (2002: 82). Beck's Tube Map invited its users to pursue a similar process of incorporation, to internalise its basic instructions for practice until they coalesced into a residual pattern of unthinking response.

Beck's design is most usefully understood as a teleological fantasy, a wishful image of a self-regulating system that could never come to pass in the disordered real world. Thus, whilst novels and films from the interwar period express clear anxieties about the Underground as an agent of mechanical dehumanisation, they also describe a wealth of experiences, less amenable to its underlying administrative logics - from the loitering of petty criminals, to young women's exhilaration at their access to the

city, to bourgeois distaste at the closeness of working-class bodies (Ashford, 2011; Welsh, 2010). Sadly for us, the new Tube Map appears not to have registered within this body of work. Yet, the economic forces behind London's modernisation must equally have disrupted its hegemonic project. For example, both the UERL and the LPTB endorsed a much slower cadence of travel by advertising its outlying stations as portals for pleasant weekend daytrips. Whilst these journeys might have been happily eurhythmic with the faster tempos of weekday commuting, their lack of familiarity must have returned passengers to an active and percipient engagement with those spaces they were moving through, unsettling the terms of more habituated travel.

Indeed, more recent engagements with Beck's map have emphasised its amenity to subversive contrapuntal readings. For instance, David Pike (2002) finds its underlying rationalism to be compromised by the joyous utopianism of its brightly coloured lines. These, he argues, often lead the viewer into an aesthetic reverie that threatens to undermine the map's strident functionalism. In addition, artistic reworkings such as Simon Patterson's print *The Great Bear* (1992) and Neil Gaiman's novel *Neverwhere* (1996) continue to exploit the mysteries generated when archaic place names are transposed into Edward Johnston's austere corporate typeface.

Despite its necessary failings as an administrative device, however, the Tube Map remains an important historical response to a structural shift within interwar capitalism and the contradictions this produced around metropolitan mobility. By projecting the idealised conditions of its own becomings, it sought to revise how individual passengers responded to the corporate built environment, so that they might learn to align their behaviour with the spatial requirements of the dynamic system. The ticket halls and platforms of London's Underground were surely filled with all

manner of unforeseen navigational improvisations, as travellers deployed the map in unexpected ways or merely struggled to meet its authorised prescriptions, but such events might forever remain lost to the metropolitan historian. In their continued absence, trying to hear the map once more within the historic spaces that it previously sought to orchestrate can still expand our critical understanding of this icon of modern cartography. What (and how much) this method might tell us about other maps within the urban archive very much remains to be seen.

Illustrations:

Figure 1. Map of the London Underground, designed by Harry Beck. Published in a pocket-folder edition, January 1933.

Figure 2. Poster by Lunt Roberts, displayed inside Underground stations in 1927.

Figure 3. Cartoon by Harry Beck, published in *Train, Omnibus and Tram Staff Magazine*, March 1933, 76.

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