

Another Form: From the 'Informational' to the 'Infrastructural' City

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The Bifurcated City

How do we characterise the form of the contemporary city? Towns and cities used to be delimited by walls and centred on cathedrals or citadels or plazas. They were a sort of meta-architecture, centring the power of a ruler or church, or sheltering a market or a public place with its politics of exchange, appearance or talk.¹ They commanded a region of smaller towns or a rural extension that filled the space to the next town or city.² The legibilities of citadels, spires and boundaries still inform more recent images of a world of compact cities with CBDs neatly bordered by belts of neighbourhoods interspersed with industry and surrounded by open space. In this image that still sits so powerfully in our expectations, urban systems consist of hierarchies of villages, towns and cities, each with dominion over successively larger territories.

This comforting image is shattered today however as new movement and communications infrastructures cut through neatly spaced territories, undermining hierarchical orders and bringing incompatible urban elements into incongruous relations with one another. Today, communications and social and economic organisation shift into cyberspace in a logic of hypertext as people break free from the constraints of place, to work and make community in networks across regional and even global dimensions. The internal orderings of cities seem to have become irrelevant, and the city has responded apparently by scattering. The rural peace is shattered as urban people spread into the

countryside, to be followed by the rest of the city including its most central components. A new amorphous city of fragments has invaded everywhere, creating sprawls of low intensity urbanisation served by ribbons of traffic-clogged infrastructure. Without having explicitly intended to do so, we seem to have created a new regional urbanism without community, public space or centrality, without *places* in the way we are used to understanding them.

This loss of place has been signalled for a long time: Melvin Webber proposed already in the 1960s that we were beginning to conduct our lives in 'non-place urban realms' engaging in 'communities without propinquity' over different ranges by means of new travel and communications opportunities.³ He proposed however that our loss of places was not simply a loss of order or a failure of planning, but something positively brought into being as we made new forms of communication, social organisation and exchange possible. Marc Auge pointed to the downside, and bemoaned the loss of an organic social life in a supermodernity that has separated itself from the rest of the world in a self-contained space of long-distance connectivity.⁴ These twin themes have remained with us: of on the one hand the integration of new placeless forms of society by technological means, and on the other of the consequent fragmentation of social worlds as previously organic societies are divided by being included in or excluded from the new mobile, globally integrated world.

Much commentary today understands a new social order emerging in a more virtual, less real, space and sphere.⁵ This space is high-tech, with high-tech networks and media and mobile personal devices facilitating new virtual forms of social and economic life free from the gross reality of life at street level. This new space allows some to inhabit not so much a global village as 'a global network of individual cottages'.⁶ It understands a world divided between an 'organised core of professionals and managers and a disorganised periphery' occupying respectively 'the nodal segments of the space of globally interconnected flows and the fragmented and powerless locales of social communities'.⁷

A Material-Communicative Form?

I will argue here that this view undertheorises the network organisation in the physical places of cities. I will extend the role of communications or relations to things and the low-tech as well as to the high-tech and people, to the materiality of places as well as to cyberspace. In doing so I will argue that action at all levels, rather than just the high-tech level is made coherent by and integrated in technical systems which create bounded 'technological paradigms'⁸ of objects, subjects and practices. In a contextual world, things and ways of doing things are given in their combinations with other things and ways of doing things, so that they can only be what they are and make the sense they do in drawing their significance from what is around them. Things come in whole arrangements in other words, and these arrangements need to be assembled and maintained in order that meanings come to be and remain stable. Peter Taylor has asserted that cities come in packs⁹; I am saying that *all* urban entities, cities, neighbourhoods, buildings, street furniture or big-box out of town stores, are organised in networks of related entities. We only recognise them for what they are in their relations or networks and would feel them out of place outside of them.

The question of how things remain together in

arrangements is of course a crucial one, but one that is simple to answer. There is a material basis to the meaning and significance of urban entities in being with other entities, and in order to be durably what they are, they need to be held in place in synthetic and *realised* arrangements, in what I will call 'infrastructures'.

Many have argued that technology and relationality have played a central role in forming our subjectivities and making us who we are. Here I will suggest that also the *objectivity* of the city is constituted in limited technical systems or infrastructures comprising complexes of arranged things. I have covered some of this ground in a previous paper where I explored the relationality in Heidegger's thinking. I proposed that in reading Heidegger we have to move beyond considerations of technology as something to be simply used or read and as exterior to human life. We need instead to consider it as implicated in perception and practice and central to the way objects and subjects are disclosed.¹⁰ The so-called perception-practice paradigm, understands that facts and things have a genesis and develop, rather than being simply there and discovered. They are 'inseparably connected with ... techniques ... interpretations and ... conventions' and dependent 'on "conjunctures" ...'.¹¹ Facts, things and ideas belong together, are produced, and co-constitute one another in 'paradigms'.¹² In such a view the emphasis is on context, co-production and 'thick description',¹³ to reveal processes of disclosure, rather than on straightforward definitions and descriptions of facts.

Infrastructures, as I will use the word here, are technical networks arranging and especially *distributing* things and practices that have and draw their significance in relation to one another. But infrastructures are more than handy resources held in convenient relations with other things, because the things they contain are not predefined but become defined and come to make the sense they do in relation to whole

arrangements of subjects, objects and practices that work together to construct larger entities - like the neighbourhood or the modern city or the metropolitan city or the globe for that matter. Infrastructures are also arrangements constructed and realised in specific historical times and conditions and to the social-organisational and technological state of the art of their times and places. They establish practical and of-their-times ways of knowing and doing things between and in the presence of other things. In this way I want to foreground the role of technological materiality in the production of urban things while conceiving subjectivity as a form of practical engagement with that materiality.

I will look at the way infrastructures of contextual entities and practices are established and will cover a few examples, starting with a new virtual global informational network and practice, and then moving on to the less topical but just as significant real historical example of the modern city. The metropolitan post-modern city will be by then rather simple to describe. I will suggest that in a relational perspective all our infrastructures, and the subjects, objects and practices that attach to them, are both real in that they do something and virtual in that they are synthetic and potential, requiring active engagement before they manifest themselves. I am interested here in exploring how this point of view might change the way we look at and think about the urban periphery and the contemporary diffuse city. While a different way of seeing things may not solve problems we see emerging with new urban forms, a conceptualisation that finds order in the phenomenon we are looking at may offer at least some clarity about what it is we are dealing with.

By in a sense virtualising urban materiality I will suggest that we may be able to reunify an urban space bifurcated between the virtual and the real and make places and flows commensurable. I will also suggest that in making real and virtual (low and high-tech) networks commensurable we can start to move beyond categorical dualisms like real and

virtual or mind and material and as designers and planners begin dealing with the city directly in terms of the material technological paradigms of infrastructures. We live not in a bifurcated space but in a 'dappled world'¹⁴ of our own making and replete with boundaries and cross-paradigm articulations. In the view I will outline our post-modern city is in principle no more or less ordered and coherent than any of the others, but what I will suggest is that in order to tackle problems of change and transition we need conceptualisations which enable us to see the boundaries and articulations clearly.

The Informational City

But first I will look at a form of contemporary social and urban organisation in the terms in which it is normally discussed, questioning the notions of information and subjectivity used. I will oppose this 'informational city' to the idea of the 'infrastructural city' and suggest that the first misses the role of a communicative materiality in the order and production of cities.

According to a well-known informational view of the social-organisational form of our world, urban space has shifted away from being a social text,¹⁵ in a serial sequential time, to being a hypertext of simultaneous, technologically enabled, social-organisational linkages. Manuel Castells has claimed that the new microelectronic communication media constitute a radically new 'technological paradigm', and that the new 'informational city' is a product of this new technology and the organisational structures it enables.¹⁶ The power of networks today has become such, according to this view, that it is possible for the first time to coordinate and facilitate networked, decentralised organisation and action and maintain synchrony in networks.¹⁷

This new society is of a communicative order that emphasises the individual and his or her relations with widely distributed people in sparsely connected 'network communities' of family, friends, workmates

and business contacts. Each person constructs his or her own community to orders relevant to that individual, and the internet becomes the pre-eminent infrastructure for a 'networked individualism'.¹⁸ We begin to conduct large parts of our lives in a pervasive connectivity of diverse network systems, and in a culture of 'real virtuality'.¹⁹ Castells claims that this translates as a transformation of the material conditions of our lives, through the institution of a 'space of flows' and 'timeless time'. The space of flows refers to the technological and organisational possibility of effective social practices without geographical contiguity; timeless time refers to the use of new technologies 'in a relentless effort to annihilate time'.²⁰

But is this vision of a free-forming networked individualism weightlessly inhabiting a global space too simple? What kinds of people and things are involved in his vision? Castells has a Weberian conception of power as a violence someone does to someone else, defining power as 'the action of humans on other humans to impose their will on others, by the use, potential or actual, of symbolic or physical violence'.²¹ He sees power as being played out today less through physical and more and more through symbolic violence - through media and communications - and he sees the subject emerging in this struggle, which is a struggle in his terms literally for minds.²² Communications technologies and media are the most important parts of our lives today because 'they build our imaginary'.²³ While acknowledging that the power of global media today is unprecedented and may be radically and violently transformative of power relations, I want to note that Castells's conception of the subject and his or her constitution is importantly different to more embodied versions of the constitution of subjectivity, and some of this is precisely in the emphasis on minds.

Although he notes Foucault's emphasis on the bodily microphysics of power, Castells stays with his macrophysics of networks of globally connected

minds and globally diffusing ideas. Foucault argued how, in relations of power, human subjects are moved to behave in certain ways without being forced: 'The exercise of power consists in guiding the possibility of conduct and putting in order the possible outcome. Basically power is less a confrontation between two adversaries or the linking of one to the other than a question of government'.²⁴ He taught us that we are shaped in situations that shape our conduct: being a crew member on a ship or a member of a household fundamentally affects the ways we are and what we do. We are all subject to an invisible governance of rationalised schemes, institutionalised programmes, techniques and material apparatus that shape conduct to particular ends.²⁵ These technical-organisational 'devices' diffuse more slowly than ideas, are integral with, and often only make sense in the context of, the practices they support and enable, and are not at all easily thrown off or replaced.

With Foucault we shift the locus of subjectivity and action from the agent to the agent-environment relationship. What acts is not simply the agent with his or her stock of ideas, but the agent integrated with the technical and organisational systems that enable the action and make it coherent. What we end up dealing with is not pure ideas or information but dense networks of diverse but interrelated people and material embodying practical knowledges and supporting practices embedded in place.

Networks of Knowledge

Ole Hanseth points out that even if we could regard knowledge as composed of pure information we would still have to contend with the systematicity of knowledge itself - the fact that bits of information may only make sense in a very restricted number of combinations with other information bits. The idea therefore that knowledge is decomposable into facts or information-bits that are unproblematically recomposable in different combinations becomes questionable. Knowledge itself needs to

be constructed into whole sense-making combinations, and paradigms are the guiding framework of starting assumptions and taken-for-granted for such work. The construction of a new paradigm is as much about constructing the framework as about constructing knowledge as such, and the interrelatedness and systemic character of the knowledge makes changes from old to new very challenging.²⁶

Then paradigms don't simply exist as pure knowledge, they rely on an interconnected apparatus of texts, institutions, writing and publishing practices and so on. All of this needs to be installed, fine-tuned and maintained, with all the work and expense that entails. Hanseth explores the idea of knowledge as a network further by considering the internet. The first thing he notes is that in practice, knowledge in networks is dependent on high degrees of technical standardisation. Standardisation also means that network externalities apply: a particular standard connection protocol may confer increasing value on the network and information as more and more connections with the same technical standard are made. Historical or path-dependent processes then kick in, with an increasing systematisation of information and increasing lock-in of people already committed to the system. A technically or operationally better standard will have to overcome these network externalities, and objectively superior standards may be locked out.²⁷

New standards do make the leap however and one of the ways they do this is by being compatible backwardly with old standards. New information is assembled or constructed in the new standard so that it is compatible (or at least translatable) in the old standard. This mode of piggy-backing on old technical standards while allowing access to the new is one of the ways that technical advance happens today and we see all sorts of technologies from information exchange protocols to computer operating systems, software and hardware, designed to new standards while being backwardly compatible

with the old.²⁸

Knowledges are embedded in historically elaborated and refined paradigms involving investment in work already done, procedures in place, and systems already made, and these simply cannot stop suddenly and shift to new paradigms. Networks of knowledge become, according to Hanseth, more like *infrastructures* of knowledge as all the structure and then all the associated apparatus, practices and organisation is factored in. Infrastructures in our common understanding tend to be large and heavy and hard to change. Knowledge has similar features: it is 'big, heavy and rigid - and not light and flexible'.²⁹

Castells's new paradigm is explicitly technological - he conceives of it as constituted around a complex of microelectronics-based information and communication technologies and genetic engineering, and replacing the technological paradigm of the industrial age organised around the production and distribution of energy. His information is almost a taken-for-granted in all this: content or flow in the network, and dependant on this lightness of information for the 'synergies' he understands between different technologies.³⁰ Without this implausible lightness the synergies will depend on an ongoing work of translation and the maintenance of backward compatibilities. Knowledge paradigms are likely to be dense, specific, 'heavy' and durable. The fact that these networks are made and sited technical constructions would also suggest they can't be global in any way we can conceive outside of the networks themselves. It suggests that we technically construct more limited and specific 'global' paradigms in specific technical systems. I will illustrate this by looking at the work of Karin Knorr Cetina and her colleagues on working practices in financial markets and the way information and technology is incorporated into these practices, and then use their conceptual scheme to begin to interpret other real rather than virtual infrastructures.

Working with Information

Almost all today's business practices involve electronically mediated information, typically distributed and manipulated in expert systems, machine processed databases and even instantly updated information processed and streamed to screens in offices globally. At the same time a good deal of the communication between working professionals is transmitted electronically whether that be internationally or to the next office. The technology itself becomes part of the interaction, and humans and technologies participate together in working practices, which is to say that the division between the human and the technology is not simple or even necessarily locatable.³¹

What the financial trader (or trader and equipment) does is not so much read information and act on it, as produce in a 'production framework of interpretation', a 'shape' of the market. The attention of the trader is captured by an array of screens to which activities of perception and interpretation are directed. What is perceived however is not so much the data streaming out of them as the market and its components or objects rendered up in the technical apparatus.³² Ways of doing things are linked directly with ways of seeing things - including the literal use of visualisation techniques and software, like the software *Technical Analysis*. According to Margery Mayall, 'TA in the contemporary trading and technological environment can be conceived of as an object in itself - one which may replace the market as the central object to which traders relate'.³³ It is clear that objects are only present, and actions and events can only take place *through* the technical system - they are produced in it and are quite literally incoherent outside of it.

Knorr Cetina has proposed the idea of 'epistemic cultures' which are neither disciplines nor communities, but sets of 'arrangements and mechanisms' including people, objects and technologies associated with the processes of producing and interpreting

knowledge.³⁴ Epistemic cultures imply common modes of doing things in common situations and settings. The knowing of how to interpret things, and how and when to act, is supported *in* the situation delivered in the technics. A technically coordinated space and time is constructed in the apparatus, so that, as Knorr Cetina describes, traders in London and Zurich may be effectively in the same situation as they discuss a trade as it takes place in real time.³⁵ At the same time a common set of objects, a language to describe them, and common and coordinated ways of doing things, are built into and depend on these situations.

Knorr Cetina updates Goffman's face-to-face situations arguing that many of the interactions that matter today occur not in face-to-face situations³⁶ at all but in what she calls 'synthetic situations' technologically rendered and maintained. The interactions are not simply or directly human at all as humans act through technology and interact with technology: financial traders the world over sit focused on their screens and the coordinated stream of information, reacting in a technologically maintained space and time with its own objects and specialised interaction modes; and 'much depends on getting the synthetics right ... This in itself implies a shift in power and relevance from the interaction to the situation'.³⁷ What is established is a background condition for action combined with a routine set of objects and structure of expectations. It is this routinisation and regularisation of work and conduct and the objects of work and conduct in prescribed situations that instils trust rather than the eye-contact of face-to-face.

We end up with a microstructured network architecture of global financial trading, 'more richly structured than the relational vocabulary allows for, [displaying] patterns of coordination and behaviour that are global in scope and microlevel in character'.³⁸ A global culture, more texture than structure, is localised in precisely engineered situations of

common objects and understandings where the relevant factor is not so much the flow of information, which would be illegible in its pure form, but the objects and shapes and ways of doing things that emerge or belong in the infrastructure.

Technical Networks

Financial trading takes place in an arrangement of technologically generated situations, connecting and coordinating objects, subjects and practices. These situations are synthesised in the technologies, and the functionality of the system is very precisely limited by the reach of the technical systems involved and by access to and interface with the system. We see an arrangement here which is less global structure than a distributed set of precisely specified, engineered and connected sites which together maintain an epistemic culture with all its material and practical accoutrements.

When we say that real-time technologies eliminate place, they may quite literally do this - but always in some technical network and in some place. Technical networks become the thin alignments delivering thick infrastructures to a select group who have access to them. The synthetic situation traders in London and Zurich share is literally placeless but when the server in Zurich goes down the technician has no difficulty finding it. The design of the technical system may construct a specific space and time but it does this not in some transcendent realm but in the actual sites networked by that technology, which also means that the situations are available only to those who have the credentials to get access to the terminals. This is a matter of a very spatial politics.

All this serves to highlight both the extraordinarily synthetic nature of this context for global action, as well as the power differentials such synthetic arrangements may generate. The technological paradigm itself is no universal. It is delivered in specific sites and the project from here on becomes to understand how society and economics have

depended upon a sited materiality and technicity which has often gone unnoticed, or treated as if it were a constraint to more abstract processes rather than being itself the locus of social and economic process and the site of its very specific realisation.

The materiality and technicity of all this specifies very real anchor points for objects and infrastructures (even if these sometimes happen to be mobile devices) and definite and real interfaces between the different infrastructures financial traders act in, because they are not in the placeless space of global financial trading all the time, and the new paradigm has to be backwardly compatible with the old. The process of financial trading needs to be supported on the one hand by a precisely engineered infrastructure to make action possible or even coherent, and on the other it requires precisely engineered backward compatibilities with other infrastructures.

Today it may be possible to act towards some placeless place that presents itself as 'global', but this is an artefact designed into a technology which needs to be somewhere. Understanding knowledge in less disembodied ways, we might be able to ask whether other technological systems, like Roman roads, the Hanseatic League or the Thurn and Taxis postal system are not themselves also virtual and informational and something through which we act? The sorts of technologies that supported continental and even global networks historically were viable then as means to reliable action over sometimes vast distances. The old technologies, objects and practices had to factor in time delays but we do the same thing today when we set out on a journey to a place we know the technology we are using will get us to.

Could it be that the distinction between real and virtual is spurious when we are looking at the world through a network or relational lens? And is the world today as formless or simply bifurcated as the informational view would have us believe? It

appears that financial traders act in a 'thick' infrastructure which situates the objects, practices and knowledges they deal in. We have certainly synthesised thick infrastructures and situated objects and practices and codes of practical knowledge in them before. The medieval trading route was the high-tech global technology of its day, synthesising the situations from which people could act globally and connecting those towards which they could act. They contained all the apparatus and organisational factors to facilitate action, for those who had the correct access credentials. We could imagine the ports of mercantile trading as the equipped workstations of their day, with the bankers, agents, insiders' gossip, shipyards, warehouses, quays and jetties, and the skilled people to service all of these. The trading routes and ship departure schedules made doing something at a distance possible and reliable and not just a shot in the dark.

Places in this view are equipped terminals maintaining synthetic situations technologically. They maintain commensurability between their respective knowledges and equipments in order to maintain the functionality of the system. They come in networks and in packs, and we act from place to other places across networks which maintain compatibilities and equivalent possibilities for action. Action is therefore a joint achievement of the actor and the synthetic situation. The places towards which one could not act are simply not part of the particular technological paradigm, so that the system is both connected and bounded by the technics.

Modern Amsterdam

After 1850 a creeping technology-driven revolution took place in the Netherlands as land and water conditions were brought under increasingly centralised and bureaucratised control. Improvements in drainage and movement infrastructures saw large areas of an 'empty land'³⁹ become inhabited. The infrastructures laid down then were to determine the shape of the contemporary landscape.⁴⁰ But

in and between cities over continental and global ranges, infrastructures had been implicated in this determination for much longer. Pre-20th century Amsterdam was dominated by its harbour and internally structured around goods movement through a ring of canals oriented on the harbour.⁴¹ These canals centred an infrastructure with its associated knowledges, practices and objects, a material urban culture of merchant's houses, warehouses, quays, porters and barges, as well as other facilities and activities like markets and industry that depended on and oriented themselves towards the canals.

But the harbour was not just a part of Amsterdam, it was also part of an infrastructure of trade and colonial exploitation that connected to other ports in Europe and the East and West Indies. It was through the harbour that significant contact with the outside world was made. The harbour was also where most of the activity was - at the interface and articulation between the intra-city infrastructure of canals and water transport and an inter-city system of trade and exploitation. In the second half of the 19th century a belated industrialisation brought renewed economic vigour and Amsterdam began to expand. New industrial, harbour and housing areas began being built beyond the walls that had contained the city since the 17th century.

The city changed suddenly from being a declining trading port into a small but dense and growing industrial city. A city within walls and oriented on its harbour began reorienting as it expanded on the land side. A number of significant street grid adjustments were made as the street pattern was adapted to new patterns of use and movement.⁴² The wall itself was demolished to build new housing and factories as well as take traffic around the edge of the centre. Around the turn of the century the municipality began taking more control of developments. This time also coincided with the municipal take-over of the tram, gas, water, electricity and telephone services and the beginnings of a different

kind of modern social contract between citizen and government.⁴³

The public take-over of the already rather well-developed tram system in 1900 put in place an important component of the project of city building of the post-first world war years. This project saw the completion of much of the Berlage Plan Zuid in time for the Olympics in 1928, and created a modern, social-democratic city in the place of the faded trading port Amsterdam had been just 60 years earlier. Infrastructure projects were concrete means to the realisation of the modern city: the logic of infrastructure was not just of accessibility but involved a project of the re-formation of the city. Van der Woud stresses a normality and 'common interest' as part of a structure of governance. This normality is instilled in people in modern technological and organisational conditions which along with their technological underpinnings become part of a collective field of perception, feeling and action.⁴⁴

When new city areas were designed, the circulation pattern and public access to the centre were designed along with them. The public transportation system became an essential strategy for realising the municipal vision of a modern city.⁴⁵ An urban territorial unit became established as the city was concretely realised and 'clearly identified in different spheres of social action and social consciousness'.⁴⁶ The result could be seen as a material institutionalisation of a commonly known functional and perceptual structure within which people would communicate, interact and coordinate their activities.

It is not simply the plan of the city that was realised around public transportation; all the components of the modern city were realised at the same time. This distributed complex of components were ordered in relation to one another in an ongoing work of organisation and maintenance, and maintained in their order for the sense they made by being in place.

The agency of this maintenance was not so much an organic society as a civic tidiness. This meant municipal minders: politicians and planners, but also gangs of street sweepers and rubbish removers. It had as much to do however with the fact that shops and houses and the other physical components of the modern city need to appear where we expect them, that we walk and cycle and take the tram, for the most part, in appropriate places, and that street signs and tram-stops and traffic-lights are where they are supposed to be. We establish in the infrastructure, a material semiotics of things in place which we maintain and do things in, as if these ways of doing things were perfectly normal - which of course they are.

The construction of a place is in a very fundamental way about the realisation and *objectification* of the thing and its components. It is also about the synthesis of a network of situations which are commensurable and connect with each other. In the simple case I am highlighting it means that a transport means and its associated schedules, routes, stops, and relations with local facilities, enable one to act in the network. There is a technological rationality about this that is inescapable. But this rationality is not universal: it is of the particular technical network, its objects and practices, and it ends where they end.

The question of how power is distributed in a city built around a technical armature designed for public access is interesting and more complex than it would appear at first sight. Firstly the normality built into the infrastructure is not innocent and the public regulation of behaviour at Foucault's bio-power level would require an analysis in its own terms. But, as interesting in the context of city building and design is the way orientations appear in the fabric. These appear in gradients in intensities of activity and types of activity that reflect our commonsense understandings of centrality and are tied to the logic of the technological paradigm. But

they are also reflected in the distributions of ethnic minorities, property values, or a general sense of place-value. Some of this looks historical (the direction to the centre is the reverse of the direction of spread of the fabric), but a closer look at the activity patterns suggests also that value and centrality is formed in the overlap and articulation of one infrastructure with other infrastructures. The harbour of pre-20th century Amsterdam was an interface and articulation between a global infrastructure of ports and another one of canals transporting and distributing goods within the city. The same place in the mid-20th century is an interface and articulation between a late 20th-century regional infrastructure of exurban centres and suburbs built around road and rail systems, and an early 20th century urban infrastructure of residential neighbourhoods and public transportation.

The regional infrastructure supports a network of business, industry, commerce, residential areas and the practices of goods transport, commuting, shopping and leisure that go with them. All this overlaps in the historic centre with a transforming modern urban infrastructure. Today the largest infrastructure project in Amsterdam, the Noord-Zuid metro line is intended to strategically accelerate the transformation of the modern city of Amsterdam to a post-modern, post-industrial, urban node integrated into a metropolitan region. It draws the interface between modern and post-modern infrastructures through the modern fabric, opening new areas in the city itself for metropolitan scaled functions. It also creates new gradients and power differentials in the fabric which may condemn marginal areas to an even deeper marginality. The public opposition to this plan by many of the city's residents reflects the way it is seen to undermine, and even dismantle, an earlier realised ideal. [fig.1]

The Form of the City Today

At the beginning of the 21st century it is no longer the tram system or a municipal city which is dominat-

ing discussion about the form of Amsterdam, but the motor car, European rail links, the airport, tourism, and regional polycentricity. Regimes of movement and place-identity today, for a large proportion of the urban population, are tied not to inner-city neighbourhoods and places but to networks of places beyond the bounds of the modern city. For some this means that the order cities once had is lost and that the city is exploding formlessly into the periphery. Here, in a sprawl of disparate and unrelated elements, we are condemned to live in a 'state of suspension'⁴⁷ between a disconnected local and the fluidity of networks.

The view I am sketching here allows us to see the order in all this: regional and national rail and road systems are the thin technical networks towards which thick infrastructures of regional objects, subjects and practices are oriented. For Reyner Banham, writing more than 30 years ago of Los Angeles, '[t]he freeway system in its totality is now a single comprehensible place, a coherent state of mind, a complete way of life'.⁴⁸ Business, commerce and industry exist today in production, supply, and customer networks as part of this infrastructure, and urban people and functions have relocated here. While the process of the making of the metropolitan city has not been as politically explicit or publicly visible a matter as was the making of the modern city, we nevertheless see a specific technological rationality in it as transportation planning and highway engineering have worked to systematise it and give it form. Luki Budiarto is tracing the evolution of the highway network since 1955 and showing how it has been designed for performance around new standards of traffic speed and capacity. He has shown how a regional space and scale has been constructed in that time, establishing a space distinct from that of the modern city.⁴⁹

But the objects and practices that gather to this new infrastructure don't exist on their own. Many of the metropolitan places metropolitan people

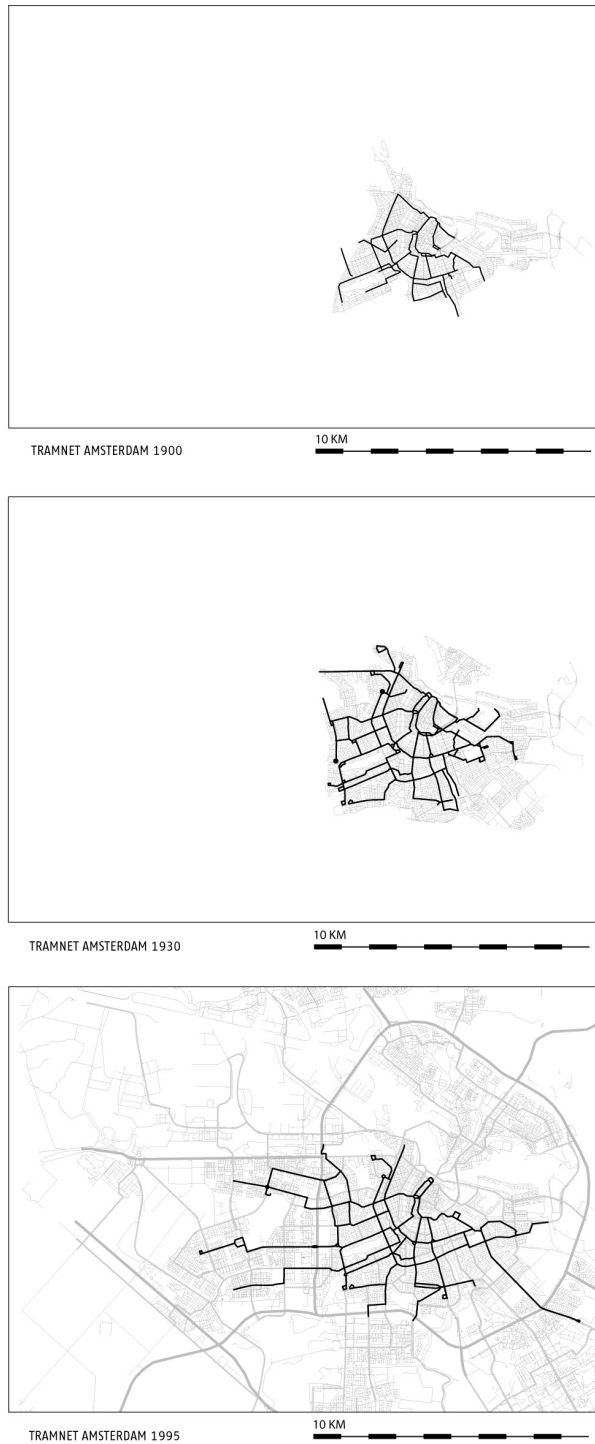


Fig.1: The municipal tram system in evolution 1900, 1930, 1995. From 1900 to 1930 we see the growth of the modern city of Amsterdam around the tram network. Beyond that the further extensions of the municipal city have become increasingly remote from the centre, socially problematic and tied up in uncomfortable conjunctions with new objects and places oriented to the metropolitan infrastructures.

travel to are strongly articulated with other already established infrastructures, and the metropolitan infrastructure, as it has grown, has always been backwardly compatible with historical infrastructures. I have already mentioned the backward compatibility of new practices with older ones, but there are important spatial senses in which backward compatibility works as infrastructures articulate with other infrastructures. Infrastructures are articulated with one another so that, for example, the centre of a modern city may be at the same time a centre in a network of regional centres, and this overlap may be generative and place forming.

Backward compatibility means also that as the process extends, we will tend only to see places already made and already named. In the network topology I am describing, we no longer do things on a Cartesian surface but in networks of places from inside of which all we can see and all we have to work with are the places in the network. The imperative of backward compatibility works also at a level of connection with invisible networks like water, energy and waste removal, not to mention access roads and sites for building.

So the growth of a new infrastructure like that of the metropolitan city is always and necessarily constrained by backward compatibilities with what was built before. Medieval, mercantile, industrial and municipal networks all contribute to the way van der Woud's 'empty land' has been transformed in a process that combines new, usually bigger infrastructures with already real places that articulate and direct not only real developments but also our virtual knowledge of them. The place of Amsterdam's centre is not bounded therefore, but sits as a hinge at the articulation of infrastructures separated by an order of scale - as city infrastructures meet regional ones.

I don't propose a finished picture here of the metropolitan city, rather a sketch of a framework

for understanding it as fundamentally relational and historical - and above all ordered. Using a framework that supports neither the centre-periphery form nor the bifurcation of urban space into physical and technological components, it becomes possible to propose a different way of looking at the development of the periphery. The idea of sprawl and of a disordered fragmented periphery follows from the idea that interurban development can be conceived as a disaggregation of the material of the city outwards from the centre and into a theoretically limitless extension. The 'dust cloud'⁵⁰ of peripheral growth into the 'horizontal city',⁵¹ and the *terrains vagues*⁵² that are their result, are ideas which represent this way of thinking in an at least residual form. Richard Ingersoll refers to Bergson however to warn us that disorder may be just an order we don't yet recognise.⁵³ In a view which sees metropolitan growth and form as part of the development of new infrastructures, stabilising new sets of objects, subjects and practices as wholes, sprawl becomes an ordered phenomenon oriented to a particular network.

This view becomes even more plausible today as we look at the extraordinary developments along the freeway network over the last years in the Netherlands. Driving on the intercity freeway today becomes ever less an intercity experience and ever more an urban one. This may be not a result of bad policies or planning, but rather an inexorable product of contemporary technologies and ways of living.⁵⁴ [fig. 2]

Conclusion

Peter Hall identified the Randstad in the 1960s as a multi-centred urban form emerging in the European context,⁵⁵ soon after Jean Gottmann identified a process of sprawling intercity growth emerging on the north-eastern seaboard of the United States.⁵⁶ Almost 50 years later we are still trying to understand this phenomenon, and to find adequate conceptualisations of its modes of growth

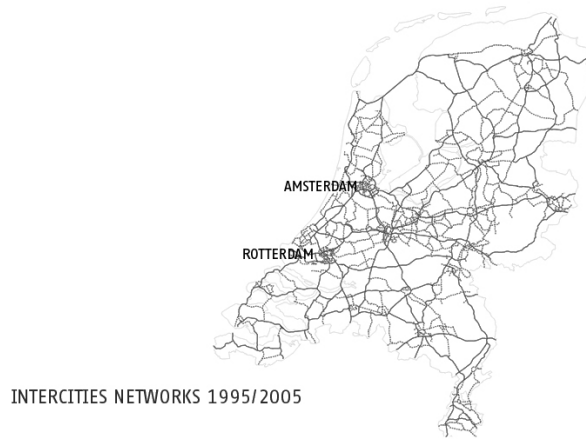
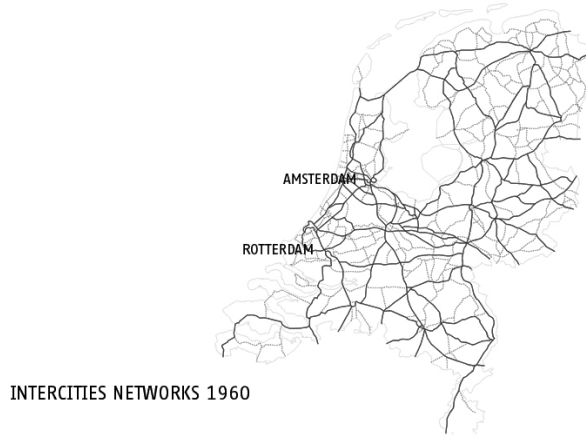
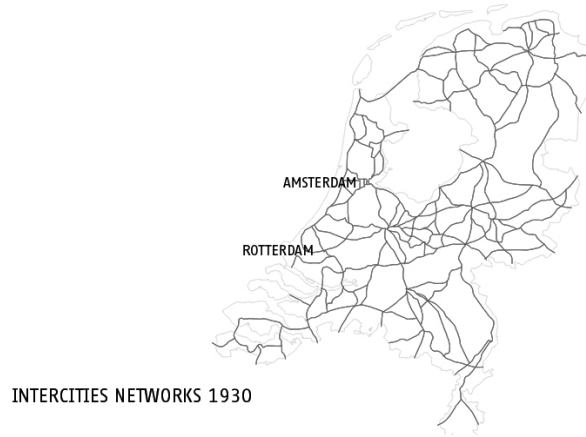


Fig. 2: The metropolitan highway system in evolution 1930, 1960, 1995. There is a steady systematisation which culminates today in a unity and wholeness that Reyner Banham found in metropolitan Los Angeles in 1971.

and transformation. I have argued that the real and virtual networks of today do not simply distribute already constituted knowledge, things, people and practices. These come to be and are organised and given form in relational complexes in which they all become context for one another. These relational complexes are not constraints to larger spatial or societal processes, instead they are the socio-technical systems in which social objects, subjects and practices are realised in the first place. I have called these complexes infrastructures, and described how they are discrete and bounded, heavy and durable, articulated with one another, and that changes have to transmit through the complex, redefining other things on the way.

The urban territory has been manufactured in infrastructures and networks of connected places and in historical time. Orders of scale have been established in the technical systems themselves. They are part of no ideal or universal scheme: the scales of urban networks are material-technological, specific and situated, and correspond with the objects and places - cities, neighbourhoods, houses, regions, even nations and globes - those networks realise.

Infrastructures are material and technical constructions which are costly and require purposeful design and installation, adjustment, upgrading and continual maintenance. Much of this work entails the mundane maintenance of keeping things in their normal or proper arrangements with other things so that they may be what they are and in place. Each of these arrangements embodies different material cultures, rationalities, and spacetimes specific to their networks. We may create placeless spaces and timeless times in particular infrastructures but have to be in place and on time in order to experience them. Mobile devices and wireless technologies change things, but we still have to be somewhere when we use them and forgetting this can lead us very quickly to methodological prob-

lems of spaces generating specious universalities and without concrete means of support.

Contemporary orders have developed by new infrastructures being superimposed over old, transforming what came before while being constrained by what was there. Our urban world consists of multiple real socio-technical infrastructures which link up equipped places in which we act and which make such actions both possible and reliable across distance. Many spaces for action are secured in other spaces and access to them restricted to the particular people accredited to carry out those actions. There are other technical networks that are more overtly urban though and which distribute urban elements like harbours, airports, railway stations, bus and tram stops, parking garages, regional shopping centres, business and industrial clusters and historical centres, facilitating a systematised access to places in networks and to the ways of life and of doing things they support.

There are a number of more general conclusions that lead from this proposal. The first and most subtle is that all spatial relations require the intervention of something else to frame the relation. The fact that a shop and another shop are related requires the intervention of a shopper or a street to make the relation. In this sense no relations are pure; all are relations with the participation of an actor or an active infrastructure to whom or to which that relation refers and means something. Things don't just have relations of their own accord and there is no natural spatial order of cities as central place theory and other branches of spatial economics⁵⁷ would have us believe. Rather, human beings intervene in the world, making networks to put things in order and hold whole stabilised arrangements of subjects, objects and practices in place.

Perhaps the strangest conclusion we have to draw though is that all these infrastructures, whether built around virtual financial trading systems, or real tram

systems, are as real *and* as virtual as each other. Bruno Latour suggests that something is real if it is connected and does something. The shape of the market on a trader's screens and the tram stop in Amsterdam have exactly the same reality factor. But a tram stop also depends on being where it is and connected to what it is connected to to be a tram stop. Somewhere else it will be an incongruous construction of glass and steel, or scrap metal, or a feature in children's games. And if we imagine a sea captain coming into a Hanse trading port in the thirteenth century, the fact that he makes a *port* of a rather low-tech collection of houses, trades, quays, merchants and porters, is at one level a result of a customary and ongoing use and maintenance of this port in relation to other ports. The port is not simply a labour of the sea captain's imagination but it retains a virtuality that may change the object.

The same port is also a place of unexpected dangers and no-go areas to a woman, a minefield of canine territoriality to a dog, and an adventure playground to a young boy. Infrastructures may stabilise objects, subjects and practices but all events that take place in them need to be activated by specific human perceptions and intentions.

I have argued that the technological paradigm of Castells is far more divided and differentiated than he would seem to allow, with multiple technological paradigms all generating limited spaces and specialised possibilities for action. We need to think through the question of the respective powers of the global and the local: are we subject to a macro-physical architecture of technological networks delivering power from above, or are we able to enrol technologies of all types to maintain, invent and reinvent microphysical architectures of enabling places offering multiple ways of being and living? I have outlined a material and relational view of the city that finds our ability to do things in our immersion in spaces we ourselves construct precisely so that we can act in that way. The foundation of

urban form is, I have claimed, in these purposefully and strategically constructed spaces, each of which embodies particular knowledges, frames particular objects and subjects and facilitates particular ways of doing things. Much of the power and efficacy of these networks lies in the detail, and talk of a pervasive connectivity is going to gloss and elide detailed factors crucial to the exact outcome of our strategic space-making. We need to think the way technological paradigms are differentiated and articulated and use this knowledge to deliver a 'dappled world' of varying niches or inhabitable places from the very large to the very small. By ensuring we don't live in a world of smooth pervasive power we can make diverse and creative places for action and inhabitation possible.

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Biography

Stephen Read is associate professor in the chair of Spatial Planning and Strategy in the Faculty of Architecture, Delft University of Technology. He completed his PhD in Delft and a fellowship at University College London before starting Spacelab Research Laboratory of the Contemporary City in 2002. He is interested in relationality in urban space and place and in the form of the contemporary city. Besides being busy on a series of papers exploring Heidegger's space, he is busy with investigations of real urban places as sociotechnical constructions in networks of multiple scales, and is working on a book provisionally titled Urban Life.