Michael Hebbert

Figure-ground: history and practice of a planning technique

Figure-ground plans show the footprints of buildings and the pattern of unbuilt voids in urban space. Compared historically they reveal the erosion of the public realm over time and provide an analytical basis for tissue repair. The paper traces the communicative power of figure-ground technique to its roots in gestalt psychology, and follows its revival from Colin Rowe's studio at Cornell through to controversies in post-reunification Berlin. The impact of computerisation is discussed and the paper ends with illustrations drawn from current practice in the representation of urban past, present and future.

Keywords: Colin Rowe, figure-ground, post-modernism, urban cartography, urban design graphics

Introduction

Figure-ground plans are one of the commonest types of image used in town planning, so common that it is easy to overlook their peculiar characteristics. They offer an extreme example of reductionism, omitting most levels of information typically mapped in built-up areas – topography, highway infrastructure, administrative boundaries, landscape features, street names – to show just the plan-form of buildings. In representing that one set of objects – the solid structures of a town – the plan also reveals the voids formed by streets, squares, gardens, parks and outdoor spaces, both solids and voids being legible and intelligible to the viewer (Figure 1). The technique is used at many different scales, from close-ups (say 1:2,500) of the plan-form of individual buildings to synoptic images (say at 1:100,000) of the form and structure of entire urban areas. And for reasons that will become clear below, figure-ground graphics have earned a wide popularity in branding and can be found on t-shirts, ties, scarves, lampshades and place-mats, rivalling skyline silhouettes and images of iconic buildings in their ability to evoke a topographical uniqueness. My paper aims to explain the basis of this simple but expressive technique and show when and why it came to be used in town planning.

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Theory

Terminology offers a useful starting-point. Before the advent of digital mapping, figure-ground preparation involved laborious transfer of building outlines onto sheets of tracing paper and infill with an opaque tint, usually black ink: hence German *Schwarzpläne* or what Daniel Solomon calls 'black-plans' (2003). The French *plans de pochés urbain* has the same sense, 'poché' being the term used in the École des Beaux-Arts for the infill of solid parts of a building plan with *encre de Chine* (Lacan, 2004). An alternative French term defines the technique by its cartographic content, as in *plan de tissue bâti* (plan of built tissue) or *plan de morphologie du bâti et des espaces libres*

(morphological plan of buildings and voids). Portuguese urbanists use similar expressions such as *planta de morfologia do construído* or *planta de cheios e vazios* (that is, plan of full and empty, or solid and void).

The English term 'figure-ground' points to the utility of black plans. It originates in the science of optics and psychology, referring to the process by which eye and brain distinguish objects within a visual field (Arnheim, 1972). 'The relationship between figure and ground is one of the primary principles of visual perception and visual communication', writes Richard Poulin in the textbook *Language of Graphic Design* (2011, 198). Figure-ground distinction eliminates ambiguity, enabling viewers to focus on an object without struggling to decide what they are supposed to see. Since the early years of the twentieth century, gestalt psychology has explored the factors that assist such recognition: heterogeneity, contour, surroundedness, orientation, size, convexity, familiarity (Robinson, 1995, 326; MacEachren, 1995, 108). Many of the original gestalt experiments were based on deliberately ambiguous images, such as Edgar Rubin's diagram that might be read as a vase or as a pair of faces, nose to nose. The key insight of gestalt psychology was the impossibility of seeing vase and faces simultaneously. To 'see' one or the other, eye and mind must select them as figures, discarding or (literally) disregarding the visual field that surrounds them. The reversal can be subtle and cryptic, as demonstrated by the art historian Ernst Gombrich through a 1793 engraving of weeping willows over a funerary urn that reveals to Royalist eyes the silhouettes of Louis XVI and Marie-Antoinette. Alternatively, the reversal may involve equal and opposite elements, as in the celebrated image of black and white birds flying to left and right in M.C. Escher's engraving *Day and Night*, each forming the ground for the other's figure. Gombrich comments on the discontinuity between 'white' and 'black' readings:

> Easy though it is to discover this transformation, it is impossible to keep both readings stable in one's mind. The day reading drives out the night from the middle of the sheet, the night reading turns the black birds of the same area into neutral ground. Which forms we isolate for identification depends on where we arrive from. (Gombrich, 1963, 154)

The point of these experiments in what Gombrich calls 'visual deadlock' is that the complementary images are in no sense vague. Each is fully coherent in itself and the only question is which gestalt our eye and brain will read as figure, and which as ground.

Gestalt principles apply powerfully to urban figure-ground plans, topic of this paper. From one perspective, they display the configuration of buildings. From the other, they are a diagram of streets and routes, a navigation map to the urban maze. Making sense of either the solids or the voids involves an active process of selection and extrapolation based on our experience of urban space. Like the once-popular

silhouette portraits cut from black card with fine scissors, urban plan-forms are surprisingly easy to read and recognise. Recent advances in the science of spatial cognition may help to explain their communicative power. Our knowledge of environments is encoded within various types of cell within the hippocampus (the same region of the brain, incidentally, that provides a neural basis for memory and imagination). Different sets of hippocampus cells mark location, direction, distance and boundaries. It is the combining of these factors into 'cognitive maps' that enables humans and other vertebrates to navigate familiar environments. Jeffery and colleagues (2013) find that these 'maps' are held in the brain as mosaics of planar surfaces defined by vertical boundaries. That being so, a black-and white solid-void image matches, at a fundamental level, the perceptual basis of way-finding. Its simplification of three-dimensional complexity into a maze parallels the mental processes through which we make sense of the world.

Cartographic antecedents

The communicative power of figure-ground mapping was an eighteenth century discovery. Urban cartography in the early modern period had sought to capture the visual appearance of settlements. The 546 town maps published Georg Braun and Frans Hogenberg of Cologne between 1572 and 1618 were all iconographic. They and their many followers portrayed towns from bird's-eye views or (often imaginary) hill-top vantage points, first with stylised buildings and then with increasingly accurate miniature depictions (Harvey, 1980; Millea, 2003; Whitfield, 2005). However, city portraits crowded with architectural detail were little use for way-finding or urban management. An alternative approach is prefigured in collection of maps by Leonardo da Vinci in the Royal Library of Windsor Castle: most are pictorial but the Imola map of 1502 is different: it is an exact survey-based plan, not iconographic but *ichnographic* – i.e. it represents the ground plan of buildings and spaces rather than their appearance (Harvey, 1980). Caesar Borgia was strengthening the town's fortifications at the time, and this was the type of representation that military engineers needed, depicting the layout of sites, structures, routes, spaces and barriers. Ichnographic survey became standard in military maps but proved equally valuable for civil purposes such as municipal administration, cadastral registration and the wayfinding requirements of pilgrims and tourists. The seminal example was Giambattista Nolli's *Nuova Pianta di Roma* published in 12 sheets (44 cm × 69 cm) in 1748. An accurate figure-ground of the buildings and spaces of the city, the plan revealed publicly accessible interiors as extensions of the street realm. In Nicholas Warner's words (2005, xiii):

> This plan replaced the traditional perspective or iconographical view of the city with a
> systematic ichnographical representation in which a clearly legible distinction is made
> between public and private spaces for the first time. In Nolli's work, the plans of all

public buildings (such as churches) are shown so that they can be understood as interior spaces in continuity with the streets and squares that figure the city. Private space, within closed blocks, is shown with dense hatching that provides a strong visual contrast (a 'ground' for the figuration) and analogue for 'closed' areas.

Nolli set a benchmark for the accuracy of survey on the scale of an entire city. The approach was widely emulated, especially in the most-visited historic cities. For example, William Faden's 1789 *Plan of Oxford* engraved in copper-plate at a scale of 1:2,450 is a meticulously detailed figure-ground, the colleges double-hatched and other buildings single-hatched, with a shadow line added on two sides to suggest three-dimensionality (Millea, 2003, 40). French cartographers produced a monumental three-sheet figure-ground of Cairo in the aftermath of Napoleon's invasion of 1798, the narrowness of the streets and alleys and the density of building expressed by the closely spaced diagonal hatching on the copper plates, with south and west aspect given depth by a shadow line (Warner, 2005, 14).

In the nineteenth-century urban transformation, the ichnographic plan became a city's most readily recognisable visual identifier. The *Guide to Knowledge*, the weekly miscellany of useful facts published by the evangelical William Pinnock in the mid-1830s, mixed white-on-black plans of cities such as Liverpool, Dublin, Leeds and Manchester alongside maps of star constellations and anatomical diagrams of mammals (Pinnock, 1834, 225). Between 1830 and 1843, the Society for the Diffusion of Useful Knowledge published map-plans of forty cities in nineteen countries (Branch,

Figure 2   Parma 1840 (detail from *Atlas Map of the Society for the Diffusion of Useful Knowledge*), from Branch, 1997
*Source:* Princeton Architectural Press, by kind permission

Figure 3   Late nineteenth-century Baedeker map of Rimini
Source: Author's collection

1997). The example of Parma in Figure 2 illustrates the extraordinarily detailed figure-ground effect produced by steel-engraved hatchures. As the nineteenth-century tourist and travel industries developed, pocket urban plans became an indispensable feature of guidebooks, none more famous than the series produced by Karl Baedeker of Leipzig. The plans for large cities, typically at scales of 1:35,000, showed the footprints only of major buildings, the rest of the built-up area being shown symbolically, with entire street blocks hatched as solid units. But for smaller, historic towns the Baedeker guides represented building grain in detail, revealing the depth of construction behind street facades, and the extent of unbuilt space in the interior of blocks. In the finest of these maps the black metal-plate of the urban figure-ground is supplemented with blue engraving for water features and brown hatchures or contours for physical relief. Figure 3 shows a simpler example, the plan of Rimini from the *Baedeker Guide to Rome and Southern Italy* of 1896.

This style of cartography was specific to its time. Crafted on steel or copper plates by the engraver's burin, nineteenth-century town maps vividly express the figure-ground basis of urban space. Technical advances during the twentieth century allowed a wider range of thematic detail and fuller use of colour printing, but de-emphasised

Figure 4   Figure-ground as image of urban fossilisation: 'Ulm: the ancient stratified encampment', from Le Corbusier, 1977 [1924], 13
Source: Author's collection
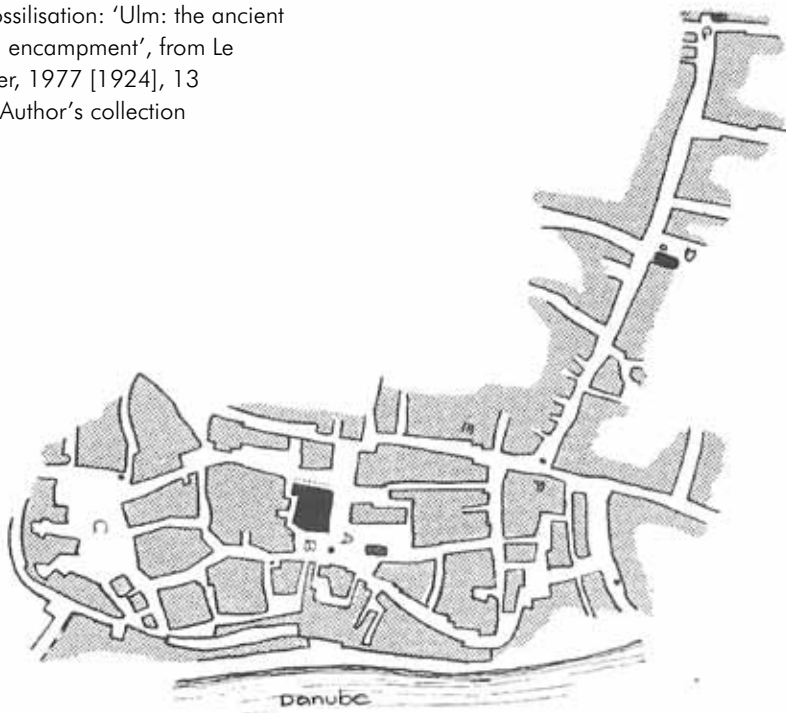
the gestalt of solid and voids. The shift in representational technique could be seen in planning literature. At the turn of the twentieth century, Camillo Sitte used figure-ground diagrams to illustrate his conception of *Stadtraum* (urban space) shaped by regional history and culture. Equally they were used by his arch-opponent Le Corbusier to point a contrast between the claustrophobic enclosure of traditional street patterns, and the space, light and greenery of Modernism. Figure 4 is Le Corbusier's image of Ulm in *L'Urbanisme* (1924), 'the ancient stratified encampment [where] six centuries later everything remains the same'. In the modern city everything would be different, as motorisation burst open the sides of the street canyon, architecture escaped the constraints of party walls, and the historic reciprocity between the solids and voids was broken. And so it turned out. In rejecting the street, Modernism had no use for figure-ground. Black-plan technique fell into abeyance. It rarely appears in the reconstruction plans of the 1940s and remained absent even when second-generation Modernists began to rediscover 'the heart of the city' and 'townscape' in the 1950s. The nascent urban design movement appealed to three-dimensional arguments, using visual techniques of sketching and photography or conceptual mapping of qualities such as gateways, barriers, focal points and views: as yet, figure-ground played no part.

The technique revived

For the rediscovery and revival of solid-void mapping we can thank one individual, the architectural theorist Colin Rowe (1920–99). Yorkshire-born, he studied architecture at Liverpool University and spent three years at the Warburg Institute studying Palladianism with Rudolf Wittkower. Rowe played a central role in the emergence of post-modern urbanism (Solomon, 2003). He liked to explore cities on foot, taking a pedestrian view of urban space. As a Warburg student in the era of Ernst Gombrich he was familiar with gestalt theory and its application to the visual arts. As a Renaissance historian he knew Nolli's *Pianta Grande*. He particularly admired the way that the engraved maps in pocket-sized Baedeker guidebooks revealed the space-conforming – *Raumgestaltung* – role of street-blocks (Carragone, 1995, 159).

While lecturing at the University of Texas at Austin in 1953–57, Rowe co-founded with Robert Slutzky the architectural group known as the Texas Rangers. Pioneers of a New Urbanism, they rejected the Modernist doctrine that architecture should be free-standing, cultivating awareness of the architectural qualities of urban space carved from the solid mass of older street facades. A famous profile of Lockhart, Texas by Rowe and John Hejduk (1957), tucked among 400 pages of construction trade advertisements and commercial office profiles in the March 1957 issue of *Architectural Record*, anticipated Vincent Scully in its appreciation of a timeless quality of urbanism in the Main Streets and Courthouse Squares of small American towns (Frei, 2006).

After a brief spell teaching in Leslie Martin's architecture school at Cambridge,

Rowe returned to the USA in 1962 to found an urban design programme at Cornell University, his base for the next three decades. Regrouping with former Texas colleagues, he built the school into a leading centre of postmodern urbanism, based on awareness of the capacity of architecture to shape and define urban space (Cornell, 2000). The public realm of a town was seen as the locus of its collective memory, or, as Colin Rowe and Fred Koetter (1978, 49) put it, echoing the work of the Warburg scholar Frances Yates on Renaissance mnemonics, a 'Theatre of Memory'. The Cornell studio set out to revive awareness of urban design as an intrinsically historical practice at a moment when few others saw it that way. Many students joining Colin Rowe's Cornell studio had graduated from architecture programmes with no historical content and were trained to assume that urban renewal meant *tabula rasa*. The drawing of figure-grounds was a powerful pedagogical corrective. Reduction of the complex form of the city to a black-and-white plan served the double purpose of revealing the legacies of successive historical periods, and providing comparable images of the gestalt at different dates: past, present and future. In the words of Steven Hurtt (1982, 57), it was Rowe's way of encouraging 'complete openness to the lessons and uses of history'. Daniel Solomon (2003, 89) likens these students to medieval monastic scribes:

Figure 5 Turin, from Wayne Copper's Masters dissertation at Cornell (1982)
Source: Cornell Journal of Architecture, by kind permission of Cornell University

who kept classical learning alive during the long dark times of general illiteracy. The patient, detailed recording of city forms in black ink became the conservatory of a critically important body of knowledge that was nearly wiped away. That knowledge concerns the way that buildings shape the spaces of the city and the realisation that urbanism is above all a spatial matter.

Through projects with successive generations of students the studio developed a philosophy of contextual urbanism with its own vocabulary and graphic tradition (Schumacher, 1996). Rowe saw the figure-ground plan as a basis for reconciling the two different and usually antagonistic traditions of street-based urbanism and Modernist object-building:

> Together these two conceptions of the city may be seen as the alternative readings of a figure-ground or solid-void relationship, the one, a city of isolated solids in a continuous void, the other a condition of defined voids (streets, squares etc.) contained within a virtually continuous built solid. (Koetter and Rowe, 1980, 109)

All his students prepared them: Wayne Copper's virtuoso thesis of 1966 compiled 37 figure-grounds for cities including Turin (Figure 5) and St Petersburg, images that would be reproduced for years to come (Copper, 1982). Another student, Charles P. Graves Jr, built up a collection of no fewer than a thousand black plans for eventual publication (via CD) in his homage volume *The Genealogy of Cities* (2009). Graves demonstrated the potential of the technique at every scale, from the close-up settings of individual buildings to overviews of town, suburb and country. Cornell students would draw the entire city to illustrate site-specific proposals: for example, Derek

Figure 6   Dublin figure-ground by Derek Tynan, from Hurtt, 1982
Source: Cornell Journal of Architecture, by kind permission of Cornell University

Figure 7 Nolli-patterned endpapers of Geoffrey Broadbent post-modern textbook *Emerging Concepts in Urban Space Design* (1990); by kind permission

Tynan's dissertation figure-ground of Dublin (Figure 6) supports a design for a single development along the boundary of Prospect Park.

In its preference for free-standing object-building, the architectural mainstream had become indifferent to the erosion of urban fabric. Figure-ground method focused attention on the lost space of the city, re-establishing its claim to be – in the words of Christopher Alexander's *Pattern Language* – figurative, positive and convex (Alexander et al., 1977, 518). Harvard University's copy of the Nolli plan of 1748, resurrected into public view, provided a benchmark, becoming the seminal image of postmodern urbanism, fashioned into lampshades, tea-towels and ties (Verstegen and Ceen, 2014), and used for the endpapers of Broadbent's 1997 textbook *Emerging Concepts in Urban Space Design* (Figure 7). Colin Rowe's student James Tice continues the tradition to this day, integrating the classic masterpiece of Renaissance cartography with GIS technology and web-based diffusion (Tice 2005).

Diffusion

As the Cornell studio's work got exhibited and circulated through the practice of graduates such as Stuart Cohen, Tom Schumacher and Fred Koetter, the efficacy of its technique became recognised on both sides of the Atlantic. Old city maps were dug out of the archives and republished to new appreciation. From Cornell, John W. Reps launched his series *Historic Urban Plans* in 1964, while in 1978 the Melville Branch of the University of Southern California published reprints of 60 maps of the Society for the Diffusion of Useful Knowledge, under the title *Comparative Urban Design: Rare Engravings, 1830–1843*. In the same year, Colin Rowe and Fred Koetter published their seminal text *Collage City* (1978). The authorial voice was unmistakeably Rowe's – erudite, quasi-conversational, somewhat elliptical – but the book's greatest impact was visual in its reproductions of parts of the Nolli map of 1748 and of the black and white output of the Cornell studio.

In his classic *Finding Lost Space* of 1986, Roger Trancik located figure-ground alongside linkage theory and place theory, all three combining to provide the technical basis through which lost space might be found and reclaimed in urban design. In practice, figure-ground was dominant. Black-plan preparation was laborious but yielded an image of greater accuracy and legibility than, say, Kevin Lynch's symbolic maps, Gordon Cullen's picturesque townscape sketches, the arrows and photomontages of Edward Bacon (1967), Stanford Anderson's complex diagrams of interior structures and exterior space (1978), or the quirky stippled renderings and axonometrics of Robert and Léon Krier (2009). While the diffusion of figure-ground technique can be traced on both sides of the Atlantic, the focus of this paper rests with Europe.

Nan Ellin (1999) sets the scene in her masterly overview of the international currents of post-modern urbanism. Southern Europe was broadly dominated by the Italian typo-morphological tendency which sought, as its name implies, to combine analysis of the external morphology of the urban plan with appreciation of the internal typologies of building plans. In graphic terms, it produced maps of great complexity and poor legibility. Northern Europe was more open to the simplicity of figure-ground representation. An early example was the sequence of four images of the Marais Quarter in Paris by Louis Arretche, Michel Mart, Bernard Vitry and Maurice Minost, the architectural team for Paris's most celebrated *secteur sauvegardé* under the Loi Malraux of 1962: the ample district of aristocratic town-houses mapped by Turgot in 1739; its post-revolutionary transition in the early nineteenth-century cadastral atlas of Vasserot; and the dense industrial quarter that it had become in 1965 – a zone with a resident population of 82,000 and a workforce of 40,000 employees in 7,000 businesses. The final image, 'Futur', showed the proposed conservation strategy (Sonne, 2014). As demolition of the dense accretions in the courtyards of the *hotels particulières* involved mass displacements, the Marais conservation project

was a notorious instance of gentrification (Kain, 1981). More commonly, however, figure-grounds were being used to reclaim voids lost to vehicle circulation, parking and abandonment. The repair of continuous street facades asserted Henri Lefebvre's *droit à la ville*, the right of citizens to their city, the claim of pedestrians on urban space Bédarida, 1985; Ellin, 1996). It was in the spirit of squats, *comités de quartier*, *luttes urbaines*, *contre-projets* that readers of *L'Architecture d'Aujourd'hui*, were offered, in 1980, images of Berlin's Wittenbergplatz, Winterfeldplatz and Theodor-Heuss Platz, as they had been, were, and might be (Brandt, 1980).

Berlin would play a vital role in this story. The German architect Josef-Paul Kleihues had acquired a typological approach through his training at the Académie des Beaux-Arts in Paris and taught at Cooper Union under John Hejduk's deanship. As early as 1970, he produced an atlas of the historic morphology of the Charlottenberg and Kreuzberg districts of Berlin that used a figure-ground approach to reveal the loss of urban tissue (Meseck and Scheer, 1996, 11). Charged with setting up the 1984–87 International Building Exhibition (IBA) to celebrate Berlin's 750th anniversary, he prepared a huge figure-ground of the city on seventy sheets at a scale of 1:1,000 – the whole measuring 6 metres × 5.6 metres – with the skeleton plans for the two IBA renewal areas in colour. Though the master-plan was elaborated in a written statement of policies for 'critical reconstruction', it was the figure-ground that won publicity and provided the strongest guidance for designers. IBA-Berlin attracted a hundred architects, a third of them international, in a post-modern roll-call that included Alvaro Siza, James Stirling, Aldo Rossi, Bernard Huet and (of a large Cornell contingent) John Hejduk, Peter Eisenman, Douglas Frederick, Esteban Sennyey and Colin Rowe himself (Zohlen, 2000). Many of the international drawings for IBA-Berlin displayed by J.-P. Kleihues at the Milan Triennale in 1985 were triptychs of past, present and future (De Michelis 1985). The giant figure-ground became the centre-piece of Kleihues's exhibition display for *La Ricostruzione della Città*, the Milan Triennale of 1985 (de Michelis, 1985).

The intention of IBA-Berlin was to celebrate the city's 750th anniversary. Soon after its completion the reunification of East and West provided the opportunity to apply the same approach on a city-wide scale. In 1999, Senator Peter Strieder and his building director, Hans Stimmann, set out the city's strategy of long-term morphological repair in the *Stadt ohne Form* (Oswalt, 2000), a city characterised by its 'desolation, emptiness and discontinuity' (Cupers and Miesson, 2002, 8). With existing fabric in grey, and new insertions in orange, the draft plan for inner Berlin, *Planwerk Innenstadt Berlin* indicated how streets could be restored, lost frontage rebuilt and the grid extended over voids such as the goods yards of the old Hauptbahnhof, the grass verges at the Alexanderplatz end of the Karlmarxallee, and along the projected motorway route to the south of An Der Uranie Strasse. Figure-ground in varying tones revealed how infill and densification might rebuild streets, squares and quarters,

Figure 8   Berlin 1989
Source: From the online collection of Schwarzpläne published by the Berlin Senatsverwaltung für Stadtentwicklung und Umwelt (2015); by kind permission

and join the city together again (Burg, 1997). The city displayed its work at the Venice Architecture-Biennale in October 2000. The event was entitled *Città – less aesthetics, more ethics*, and most of the 90 exhibits were multi-media installations around the themes of non-Cartesian space, chaos and transgression. Berlin's exhibit was utterly different: just three huge *Schwarzpläne*, drawn to a scale of 1:5,000. The first showed the urban fabric in 1940, substantially unchanged since the turn of the twentieth century, the second a contemporary Berlin of gaps and voids, the third a vision of the reunified city as it might be in 2015. The exhibit was entitled *Stadtwende* – city change. A variant of the display is still available on the city's website (Figure 8).

   Berlin's post-unification strategy generated intense controversy (Colomb, 2012; Hebbert, 2005). Advocates of the *Planwerk Innenstadt* saw it as an intelligent application of the 'critical reconstruction' method that had already proved its worth in IBA-Berlin (Kündiger, 1997; Sonne, 2014). Critics saw rather the denial of Berlin's real history of the city in favour of a nostalgic urbanism practised by a reactionary clique (Giovannini, 1988; Ladd, 1997; Oswalt, 2000). The architectural historian Simone Hain (2001) went so far as to describe the figure-grounds of the *Planwerk Innenstadt* as 'a declaration of war'. Daniel Solomon offers a judicious verdict on the controversy. In the building boom of the 1990s the city was under intense pressure from developers and their high-profile designers, many proposing isolated, self-referential buildings. The use of figure-ground by Hans Stimman and his staff was a pure exercise in urban design, making the least possible encroachment on the autonomy of private architecture while strongly defending the integrity of the public realm (Solomon, 2003, 98–100).

Normalisation

Figure-ground technique had become well established by the 1990s but was still labour-intensive. At IUAV, the famous architecture school of Venice, Pier Luigi Cervellati's students were set to work mapping the solids and voids of the city by drawing over large-scale cadastral maps of the Napoleonic and Austro-Hungarian eras. In the London branch of Koetter Kim Associates, interns and students on placement spent time with tracing paper over Ordnance Survey sheets, adding building by building to the immense image of the city (Figure 9) that stretched along the wall of the company's Kingsway office.

David Graham Shane (2009) depicts black-plans as a transitional drawing technique, a passing phenomenon briefly popular before computerisation transformed the designer's work environment. But this seems wrong. Far from eclipsing the technique, information technology gave it a fresh boost. The deconstruction of digital maps into layers allowed selection of particular classes of objects such as the polygonal shapes of buildings, while software such as Adobe Photoshop made light work of graphic manipulation. Figure-grounds became plentiful and accessible as never before. For their Masters dissertation at the University of Strathclyde Joanna Hooi and Laura Hart compiled a fine historical atlas of the evolving figure-grounds of 50 of Scotland's smaller towns, among them the image of Mauchline, East Ayrshire which opens this paper (Figure 1). The website www.schwarzplan.eu offers 124 cities at a scale of 1:200,000 for sale or free downloading. Some cities – Munich, for example, http://www.stadtatlas-muenchen.de/stadtatlas/schwarzplan2003.html – offer a figure-ground in their online map collections. The graphic tool is now readily accessible to students whether or not they have had prior experience of cartography or design. The Urban Skills Portal developed by the Bartlett UCL in partnership with Architecture and Design Scotland and twelve other design schools, starts from a free

Figure 9   Koetter Kim Associates London wall map (1980s)
Source: Pushpa Arabindoo, by kind permission

Figure 10   URBED community
engagement in the historic
Thames-side town of Brentford
Source: URBED, 2010, by kind
permission

Figure 11   Chalkboard
figure-ground, Crown Heights,
Brooklyn, New York City, in
2011
Source: Frank Hebbert, by kind
permission

online figure-ground workshop in which the skill of making 'one of the simplest and most common diagrams used by built environment professionals' can be acquired in just two hours' learning time (Bartlett 2015).

So the technique remains widespread and in everyday use. Looking more closely we can discern three principal applications, reflecting different positions along the time-line of the town as it is, as it was, and as it might become. First and most simply, the technique offers a crisp representation of the actual urban gestalt. For reasons given above, it communicates essential information about built form and urban space in a graphic that is readily intelligible. Viewers know where they are. In the community participation methodology of the British design practice URBED, residents may be given fibre-tip pens to ink in the outlines of buildings on tracing paper over Ordnance Survey base maps, mapping the plan-form of their home space (Figure 10). Or the base map can be used by community activists as a basis for gathering comments on issues, as in Figure 11's chalk-board figure-ground on a sidewalk of Crown Heights, Brooklyn. As a recognisable and memorable silhouette, the plan-form of a town can be charged with
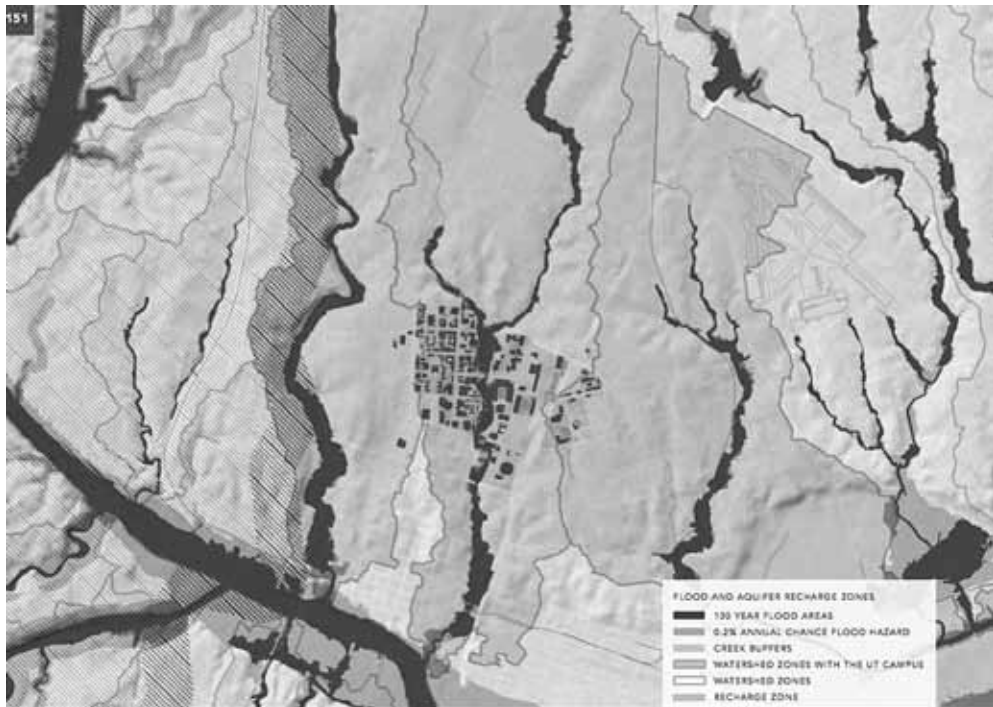

Figure 12   University of Texas Austin Masterplan, San Jacinto Corridor flood and aquifer recharge zones (p. 151)
Source: Sasaki Associates (2011), by kind permission

economic, social or environmental data, or information on land use or building age or condition, or overprinted on diagrammatic information about movement flows. The Sasaki Associates' masterplan for the University of Texas at Austin offers an example of its use as a base-map. The figure of the campus's central cluster of buildings becomes the unifying leitmotif in a wide-ranging masterplan document; Figure 12 shows how it anchors the landscape analysis of flood drainage (Grubiak, 2011; Sasaki, 2011). The pragmatic utility of a good figure-ground base-map can be seen in towns such as Sheffield, Pontefract and Wakefield, for which Fred Koetter of Koetter Kim Associates
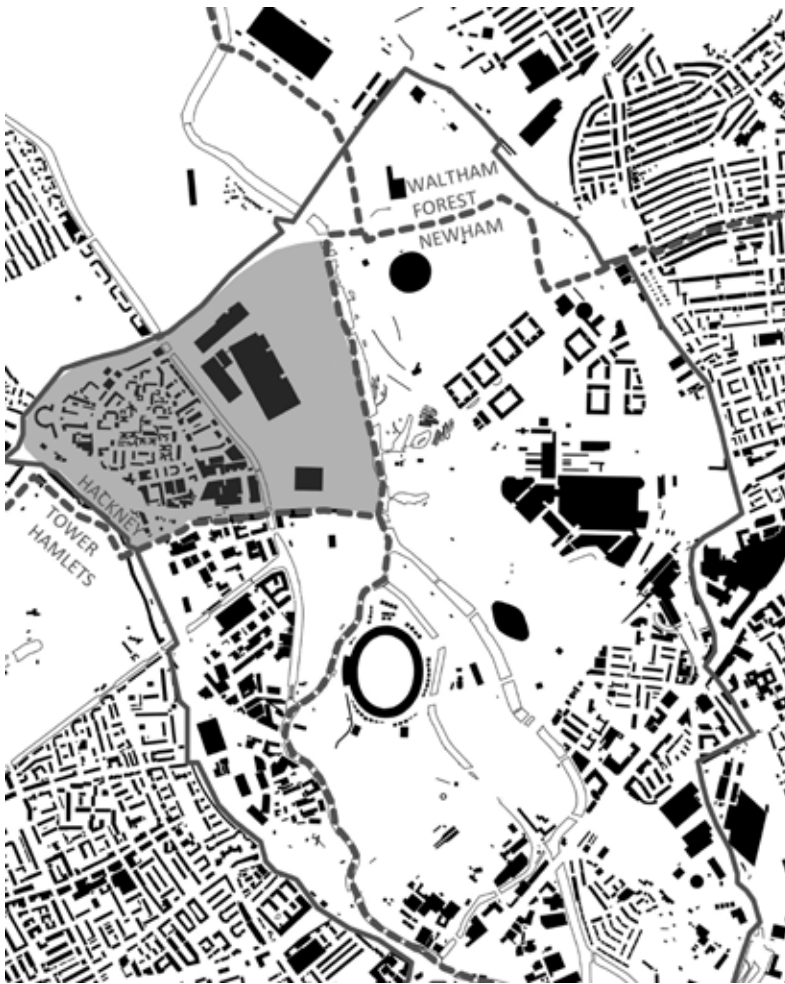

Figure 13   Hackney Wick in 2015
Source: Juliet Davis (2016), by kind permission

provided master-plan consultancy in the early years of the millennium through the good offices of the regional development agency Yorkshire Forward: more than a decade later, his graphics are still serviceable and used.

Those examples show the use of black-plans in urban design practice. The technique is also widely used in academic scholarship to frame the urban context in a legible image. Alan Jacobs, for example, uses it to introduce the case studies in his classic monograph on *Great Streets* (1993). There the cartography reveals centrality. By contrast the figure-grounds in Juliet Davis's study of the 'urban edgeland' of Hackney Wick demonstrate the peripherality of her study area in relation to nearby neighbourhoods (Figure 13). Going back in time to show the evolution of the district through the twentieth century, Davis takes us to the second category of figure-ground application: the representation of history.

Because of the deep continuities of buildings, plots and street-forms over time, and their significance for collective memory, town planning is as much about the past as the future. As Colin Rowe emphasised with the phrase 'theatre of memory', figure-ground is a powerful way of revealing the time dimension and articulating collective memory of shared space (Hebbert, 2005, 2014). In challenged cities the figure-ground sequence starkly shows the disintegration of urban space though abandonment, car-parking lots, big-box retailing and warehousing, the voracious requirements of modern highway geometry and urban renewal. The urbanist David Rudlin hand-drew a sequence of figure-grounds for Manchester, capital of industrial Lancashire, for 1774, 1824, 1924, 1981 and 2000. Exhibited at the Centre for the Urban and Built Environment (CUBE) in 2002, and frequently reproduced in slides and illustrations, they have provided an iconic summary of the coming of the industrial revolution to eighteenth-century Manchester, the city's explosive growth at the heart of nineteenth-century industrial capitalism, the impact of twentieth-century economic decline and planning intervention, and the twenty-first century tasks of post-industrial recovery and repair. Conrad Kickert's recent PhD thesis at the University of Michigan incorporated a compelling set of figure-grounds of downtown Detroit from 1885 to 2011 (Kickert 2014): the decay starts early from the apogee of 1921 (Figure 14) and was already well advanced in 1938. Combined in sequence, these black-plans offer an extraordinary slow-motion animation – available online at Kickert (2015) – of a city's rise and fall.

And so to the third category of representation, design. Representation of proposed futures was an essential component of Cornell studio projects, of Berlin's critical reconstruction method and the post-modern philosophy of tissue repair. Often the proposed intervention is expressed in a different tint to show how new-build may fit with existing tissue and contribute to place-making. Christopher Alexander's *Oregon Experiment* (1975) and *New Theory of Urban Design* (1987) conceived the design process as a sequence of such figure-ground modifications, progressively eliminating non-convex and non-figurative space without need for any *a priori* plan. That theory may work in

Figure 14   Downtown Detroit in 1938
Source: Conrad Kickert (2014), by kind permission

a studio environment, but real-world urbanism does require indicative frameworks. Figure-ground comes into its own as a technique to analyse existing tissue, generate master-plan parameters of street alignment and dimensions, set frontage lines, and determine the footprint appropriate to new construction. In all of this its limitations turn out to be its greatest advantage. Since it deals only with the conformation of urban space, not with appearances, it respects the distinction between planning and architecture. It is, as Daniel Solomon said, a pure tool for urban design.

Conclusion

This paper has sought to trace the diffusion of figure-ground since Colin Rowe and his students in the Cornell Urban Design Studio revived the forgotten art of mapping

urban solids and voids and revealed its 'rich perceptual potential' (Hurtt, 1982, 56). Their cartographic inspiration came from nineteenth- and eighteenth-century town maps engraved on steel and copper. And the graphic power of those maps derives in turn from the fundamentals of gestalt psychology, since the complementarity of solids and voids in urban space is most economically expressed as a reversible figure-ground pattern.

Let me conclude with a disclaimer and a caution. The disclaimer relates to the limitations of this graphic technique. Figure-ground imagery is parsimonious. Its simplification of the city to a pattern of solids and voids omits all the variables of interest to social science – ownership, power, status, human agency, gender, exchange, mobilities. Also missing are aesthetics, visual culture, skyline dominance, likewise biosphere and ecosystem variables. All we can say is that morphology has a bearing on every one of these factors, and no graphic better expresses a city's morphology than its figure-ground plan.

The caution relates to information technology and the computing power and software available to the designer. The information revolution accelerated the adoption of figure-ground graphics, bringing an exceptionally laborious mapping technique into everyday use. Equally it multiplied the available alternatives – CAD renderings, wire-frame axonometrics, game visualisation, photomontage, web-accessed imagery, Sketch-Up, Street-View, Google Earth maps. Digital design opened up entirely new worlds of multidimensionality and temporal dynamism: in Brian McGrath's phrase, architectural drawing became 'cinemetric' (McGrath and Gardner 2007; McGrath 2008). Yet thanks to their powerful imageability, and despite their static and two-dimensional quality, figure-ground plans are still widely used to represent the building layer in urban cyberspace. Other digital techniques can outdo them for visual interest, but in a neo-iconographic era of digital eye-candy, the ichnographic figure-ground remains effective and deservedly holds its own.

Acknowledgements

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