perfect exemplar of the immutable mobile: a container of information gathered at specific locations, returned to a 'centre of calculation', and then placed once more into circulation as a vehicle and instrument of scientific knowledge and further hypotheses. The entire history of cartography can be told as a history of struggle to realize such a status for the map. Thus Claudius Ptolemy, whose tables of locational coordinates introduced modern mapping to Renaissance Europe, may never have drawn actual maps. His book gave sufficient information for a skilled reader to construct a projection and plot the coordinates necessary to produce the maps from his data. Text and tabulated figures are far more easily and accurately copied and transported than a set of drawn maps. Securing the immutability of the mobile has been a constant obsession of cartography. It is fundamental to the map's claim to be more than an imaginative picture. Indeed, cartographers have actually drawn upon the authority of cartographic procedure to grant legitimacy to what were in fact complete fabrications. Thus the sixteenth-century French cosmographer André Thevet plotted lines of latitude and longitude around maps of completely illusory islands.[31] Such charlatanry reveals the ultimate impossibility of the cartographic conceit. The only true map is the territory itself, as Louis Borges long ago pointed out.

The search to secure immutable mobility for the map reveals another feature: cartography's prosthetic quality. The map is one of those instruments that serves to extend the capacities of the human body. Like the telescope or microscope, it allows us to see at scales impossible for the naked eye to see and without moving the physical body over space. The thematic map reveals the presence of phenomena that are beyond our normal bodily senses, as for example a trend surface map of property values or of air pollution. The map also has a powerful recursive quality, at once a memory device and a foundation for projective action. This is immediately apparent in European mapping in the 'age of discovery', where the map was at once a necessary starting point for the exploration process and a principal outcome of that process.

These prosthetic and circulatory aspects of mapping are true also for the social survey, and they remain so for the most technically advanced mappings of today. It is these features of the mapping process that makes it such a fertile and powerful epistemology in knowing and representing the world. The map is at once empirically rooted and imaginatively liberated and liberating. No spaces can be controlled, inhabited or represented completely. But the map permits the illusion of such possibilities. Mapping is a creative process of inserting our humanity into the world and seizing the world for ourselves. This is why today the boundaries between the art and science of mapping, so long and so arbitrarily surveyed, charted and policed, are increasingly smudged and faded, and why the imaginative and projective potential of mappings has become so vitally present in contemporary life.

10 Carto-city

Urban space and cartographic space are intimately related. This is so historically, practically and conceptually. Urban origins, at Ur or Sumer for example, are revealed through the mapped reconstruction of their street geometry and building plot plans.[1] Buildings eventually fall, but ground plans remain; elevation is the least durable element of urban form, but plot forms its longest lasting element. Urban archaeology reconstructs urban places through peeling back successive surfaces, like the pages of a historical atlas, and mapping the stratigraphy of material deposits stretched across former urban space. From such material mappings we reconstruct not only a city's physical appearance but also its social, political, commercial and religious life.

Practically, a visitor's confrontation with an unfamiliar city is typically mediated by the map: of transit routes, of streets, of tourist destinations. Urban experience in a new city is often a process of negotiating the divergence between cartographic and material spaces. In cities with complex underground rail systems, such as Tokyo, London or Paris, it can take years before the point pattern of stations familiar from the subway map is fully coordinated with the surface experience of townscape. In great metropolises, possession and use of a standard street directory such as London's pocket A–Z guide or Los Angeles' Thomas Guide are almost signs of citizenship. Appropriately to their different densities, London's Geographers' A–Z guide can be held in the hand and carried in the pocket. (Fig. 10.1). Los Angeles' Thomas Guide, by contrast, is designed to sit on the passenger seat of a car. These handbooks have become cartographic icons of the cities whose streets and addresses they designate. Much more than functional instruments, aids to fixing destinations or following routes, they are bearers of urban meaning and character: the map becomes to some degree the territory.

Conceptually, the map has often either preceded the physical presence of the city or served to regulate and coordinate its continued existence. St
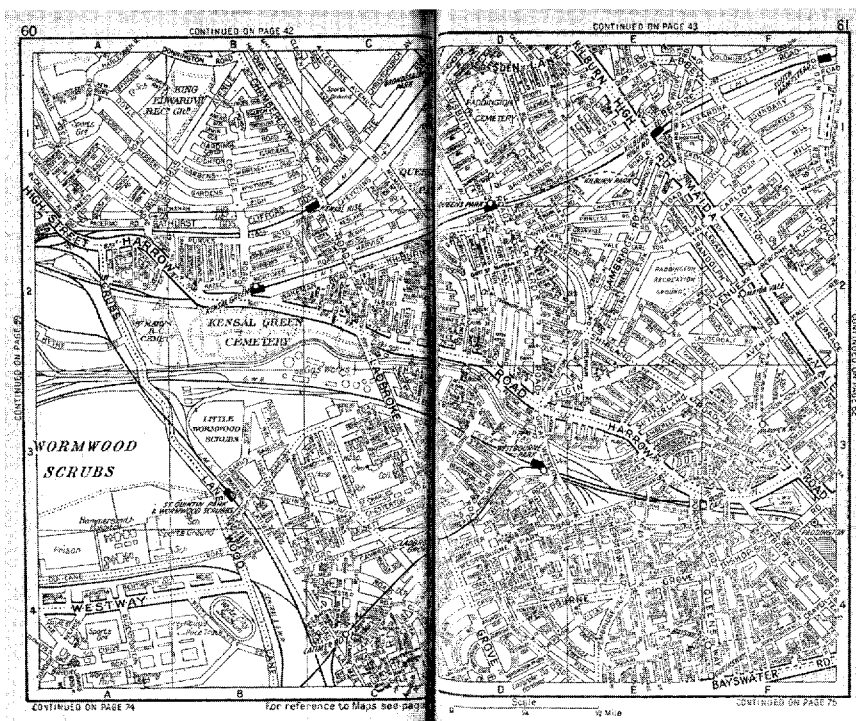
Figure 10.1 Kilburn area of London, *London A–Z*, 1968, pp.60–1 (Geographers A–Z Company, London)

Petersburg, Washington DC, New Delhi, Brasilia, and countless fortress and colonial cities from ancient Greece onwards, existed on paper (or its equivalent) before they had any material expression. Paris, Rome, Vienna, Amsterdam, Beijing, Jerusalem – virtually every great city – has been either reconstructed or expanded by means of a drawn plan.[2] And beyond the physical extension or reconstruction of urban space, the map has both recorded and determined countless aspects of urban life and citizenship. Maps of disease and morbidity, for example the cholera cartography of Victorian London or Philadelphia, discussed in the previous chapter, helped make the modern metropolis a survivable space in the face of those viruses and bacteria that thrive on human density.[3] Maps of social and ethnic status have shaped the political life of urban democracies, nowhere more dramatically than in the case of twentieth-century American zoning maps, used by housing and loan companies for 'red-lining' inner-city ghettos and later by government agencies to assert and monitor civil rights. In every way, the map registers the city as a distinct place and a unique landscape. Cartography acts not merely to record the various ways that the city is materially

present, but as a creative intervention in urban space, shaping both the physical city and the urban life experienced and performed there.[4]

The ubiquity of cartography as a dimension of urban life and form makes a comprehensive survey of their relations impossible. I focus here on ways that the urban map is positioned between creating and recording the city. It is this dual function that releases the imaginative energy of mapping, and which has consistently attracted the attention of artists as well as technicians to urban mapping. From the vast archive of urban maps, plans and artistic interventions into urban mapping, I explore how the modern city as material and social space interacts with the map as scientific instrument and artistic representation of its space and life.

The complexity of the interaction is dramatically apparent in a post-modern American city such as Los Angeles, Houston or Phoenix. These are among the most intensively mapped spaces in the history and geography of the planet: every square metre is geo-coded by government and private or commercial agencies for purposes ranging from environmental protection, public health and safety, efficient transportation and taxation to property insurance, marketing, political persuasion and religious proselytizing.[5] Maps have played a critical role in shaping their physical spaces and land uses, and continue to control the daily lives of citizens through zoning ordinances, ZIP codes and the myriad territorial regulations that shape urban daily life. Theoretically, scientific cartography should make these cities highly rational, coherent spaces. Indeed, flying over a city such as Houston, a cartographic order is immediately visible in the repetitive grid of major streets, and within this in the curvilinear geometry of residential roads and house lots, or in the distribution along arteries of office, production, storage/distribution and retail spaces whose rectangularity reproduces the grid at a larger scale. Yet, on the ground, such cities are among the least 'legible' places on earth. Moving across their surfaces, an individual familiar with the spatial sorting of land uses and the hierarchy of distinctive symbolic structures that characterize the urban structure of earlier cities is confused, even assaulted, by the seemingly random scatter, individuality of design and consequent visual chaos of urban elements. The twenty-first-century urban landscape seems to confirm the problem of legibility in the constant and competitive presence within it of words, phrases and whole texts: billboards, street signs and posted ordinances.[6] The volume of written language in the public spaces of contemporary cities far exceeds that in more traditional ones. Image and text, whose effective harmonizing is cartography's signal contribution to spatial representation, have become disjointed, and their falling apart denotes the erosion of a relationship that underpinned urban modernity.[7]

This does not signify a reduction in the map's role in urban place-making and experience. Indeed, a characteristic way of negotiating movement

within the post-modern American city is the computer-generated map, custom produced for any destination address, from any point of departure within the United States. Map Quest© can create an instant digital image of any urban location at any requisite scale, using a simplified set of standard colours and cartographic signs. Such images are resolutely functional, entirely ignoring the context of the places they represent, utterly unconcerned with the urban iconography that traditionally expressed *civitas* or the city as public space. No urban map could be further removed from an image such as Jacopo de' Barbari's map of Venice in 1500 (Fig. 10.2). The paradigm example of early modern city mapping, de' Barbari's detailed
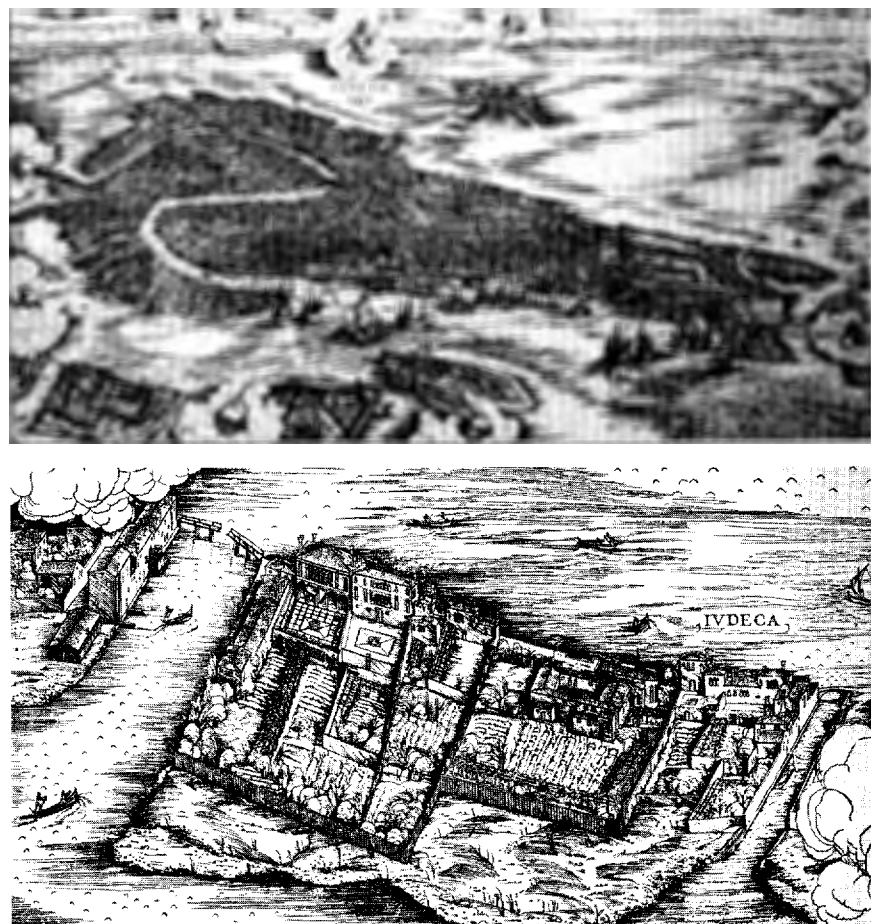

Figure 10.2 Jacopo de' Barbari, *Venetia*, woodcut map, 1500; the detail (below) shows the Giudecca area (Museo Correr, Venice)

townscape guided the observer not to a physical destination but to the civic spirit of Europe's greatest commercial city.[8]

'Scientific' cartography's inability to capture the apparent incoherence of the contemporary city has, however, opened new possibilities for urban mapping. As I shall illustrate, these have been colonized creatively for a wide variety of projects: conceptual, political, and purely ludic, breathing new life into the connections between city space, city life and mapping.

Radial axis and the grid

Geometry, specifically the radial axis and the grid, underpinned both scientific cartography and modern urban form. Their power and historical endurance in both the map and the city lies in their combination of practical and symbolic efficacy. The circle's 360 degrees generate a 'centre enhancing' axial form focused on a single point. Functionally and symbolically, this extends power panoptically to the horizon, encompassing a potentially infinite territory. Versailles, Karlsruhe, baroque Rome and Second Empire Paris have all inscribed this simple geometry into urban space. The same axial pattern emerges from the simplest mapping technique: taking radial sightlines from a single point. Multiple survey points can be selected randomly along a pathway or be connected to a cardinal base line. Back-sighting confirms positional accuracy, producing a network of intersecting axes, such as the wind-related rhumb lines on a marine chart. The magnetic compass connects these sightings to global and even celestial geometry. The radial planning of a city is at once practical and symbolic, as the Roman architectural writer Vitruvius recognized in his description of the city perfectly oriented in respect of wind directions. The first recorded systematic urban mapping was the 'description' of Rome undertaken by Vitruvius's first modern popularizer, Leon Battista Alberti. No actual map exists for Alberti's project, merely a set of coordinates produced for known locations along axes converging on a single point of observation, and this may indeed be as much as Alberti intended to produce.[9]

The alternative geometrical form shared by urban plan and mapping is the grid or chequerboard of orthogonal lines crossing at right angles. While radial axes enhance the centre, the grid is 'space equalizing', infinitely extendable over the surface and privileging no single point, but rather reducing each to a unique coordinate. The grid generates the simplest and most widespread form of urban plan. It is found in the earliest Greek colonies in the Mediterranean, in the design of imperial Chinese cities, in Spanish New World pueblos, in the Tudor planted towns of Ulster and the urban settlements of the USA. The colonial urban form *par excellence*, the grid

can also be an expression of urban democracy, equalizing lot sizes and maximizing the ease of platting and disposing of urban land into private property. As William Penn's Philadelphia design reveals, the grid can easily be elaborated to generate open spaces – squares – to interrupt its monotony and produce public space within an otherwise privatized territory.

The grid performs a similar function in mapping. Introduced into modern Western cartography in the early fifteenth century through Claudius Ptolemy's *Geography*, but known to Chinese cartographers at least 300 years earlier, the introduction of a graticule of longitude and latitude lines as the basis for determining location and translating the sphere into a two-dimensional map is by far the most significant feature of modern cartography.[10] The grid is a ubiquitous location-fixing device. Unrelated to planetary coordinates, the grid can be stretched across any spatial scale, as the British Ordnance Survey's national grid or the lettered and numbered squares superimposed on countless urban maps demonstrate.

These shared geometries of urban design and cartography are instrumentally effective and symbolically significant. They are conceptually easy to grasp and relatively simple to use in spatial design and representation. Neither is restricted to a single scale but may be applied from microcosm to macrocosm. Thus, each not only possesses specific symbolic attributes – power and panopticism, reason and democracy respectively – but also shares the capacity to connect mundane space to the cosmic patterns, movements and logic. They therefore propose and permit urban mapping as a philosophical exercise.

The philosophy and ethics of the urban map are apparent across the history of modern urbanism. The profound impact of Vitruvius's urban designs in Renaissance Europe derived from their appeal to humanists and natural philosophers engaged in rethinking both the nature of urban life and the mapping of global space. The 'ideal city' debate, conducted among architectural writers from Alberti and Francesco di Giorgio Martini to Sebastiano Serlio and Vincenzo Scamozzi, concerned more than the formal design of urban space. It was about mapping urban life and citizenship.[11] Thus the city represented in the anonymous urban image now in Baltimore (see *Fig. 5.3*) represents much more than a symmetrical grid of buildings, streets and open spaces rendered in deep perspective. It also maps an image of citizenship, derived from Republican Rome and the Stoic writings of Cicero, Seneca and Marcus Aurelius. The cardinal virtues of Justice, Prudence, Temperance and Fortitude stand atop the four columns that define its central square. The buildings gathered around that space correspond to the public functions that regulate urban life. And across the foreground of the image creeps the bent and burdened, but immensely dignified, figure of the Stoic. Acknowledging the cosmic order mapped into urban space, and subordinating body to mind, he signifies the good citizen's duties of reason,

reverence and sociability. This map of urban space is also the map of urban virtue.

Axial and grid geometries were united in the service of modernity's grandest social project: the creation of the USA, as represented in the design of America's federal capital. Positioned within the cardinal square of the federal district, Charles L'Enfant's map for Washington DC combined the democratic principles of the Constitution and Bill of Rights in the chequerboard of residential streets, with the inscription of federal authority in axes radiating from the separate seats of executive and legislative power. The plan generated 15 public open spaces, one for each state of the Union at the time of the city's foundation. 'Universal' principles embodied in the new republic were thus mapped into its capital.[12]

Geometry, the map and urban legibility

Early modern and Enlightenment city planning saw in geometry a medium of legibility. The city was to be read as a text: by and for its rulers, its citizens and its visitors. Printed urban maps expressed and reinforced the city's legibility. These were not initially intended primarily as location markers or way-finding instruments, except for a small number of guide-book maps such as those describing the monuments and pilgrimage sites of Rome. The earliest urban maps are overwhelmingly celebratory, intended to frame in a comprehensive image the city's complex social and spatial totality. By the late sixteenth century such maps formed a distinct genre, having emerged first in Europe's most heavily urbanized, mercantile regions: upper Italy, southern Germany and Flanders. Some Italian urban maps such as Leonardo da Vinci's map of Imola adopted an orthographic perspective; others took the high angle, bird's eye view apparent in de' Barbari's Venice. Northern maps were more commonly townscape views, graphing the urban skyline in silhouette along a horizontal perspective.[13] While the former universalized the city by representing it according to a standard set of geometrical rules and surveying principles that reflected universal ideals of order, the latter particularized the city through the unique elements of its skyline: cathedral, guildhall, parish churches. By the middle of the century that distinction was fading. Nicholas Crane captures the impact of changes in urban mapping by describing the cartographer Mercator's reaction to Hieronymous Cock's 1557 view of Antwerp:

> As long as Mercator could remember, Antwerp had been pictured from the water, as a bustling, dishevelled river port. Cock's viewpoint was high above the opposite side of the city. Antwerp had become a disciplined urban network of streets and civic symbols surrounded by

massive geometric defences. Wagons entered landward gates, bound for fleets of patient ships on a distant, placid Schelde. Cock's Antwerp was a celebration of mercantile might, and a working diagram of a modern city.[14]

The paradigm of early modern urban mapping projects was the multi-volume urban atlas, *Civitates Orbis Terrarum*, published in Cologne from 1572 and edited by Georg Braun and Franz Hogenberg. Intended to illustrate every major city in the world according to a standard, printed cartographic format, it was conceived in response to Abraham Ortelius's world atlas of 1570. Earlier encyclopaedias and cosmographies had illustrated cities, but while some places were well served by recognizable images – Constantinople, Rome, Paris and Venice for example – many of the named cities in Hartmann Schedel's *Chronicle* of 1493 or Sebastian Münster's *Cosmographia* of 1544 had been illustrated by generic townscape images. Braun and Hogenberg gathered printed city maps from local sources to ensure the most accurate and up-to-date image of specific cities, allowing the atlas owner to survey the *civilized* globe of urban places within the privacy of a study or reading room. While some images adopted the urban silhouette, the favoured perspective was the bird's eye view, exemplified perfectly in the maps of Cologne or Amsterdam. The city is revealed as a theatre, seen from an elevated point far above and beyond its confines, at an angle sufficient to reveal both its plan pattern of streets, squares and open spaces, and the elevation of its principal buildings and monuments. Distant, to be sure, yet close enough for the rhythm of its life to be pictured in the pedestrians, carriages, wagons and ships moving on its roads and waterways, the city is immediately legible as a coherent community. Its citizenry and their distinctive customs are denoted in the costumed figures who regard the map user from within the cartographic space declaring their citizenship as the principal determinant of their identity.[15]

Decorating their maps with the city's coat of arms and those of its great families or principal guilds reinforced Braun and Hogenberg's emphasis on unity and civic order. Cartouches and printed text press the point further: each city is honoured by the depth of its history, the nobility of its citizens, the wealth of its merchants and the beauty of its buildings. The urban map is synthetic rather than analytic; its goal celebration rather than analysis or critique. This is true even of the two New World city maps included in the collection: the Aztec capital Tenochtitlan (see Fig. 3.5) and the Inca city of Cuzco. As discussed in Chapter 3, the former map, based on Cortez's own illustration of the Aztec capital, illustrates the very antithesis of *civilization* in the classical sense of civic virtue lived out in urban space. Its central square is dominated by the great ziggurat upon which human sacrifices are being performed. Cartographic parallels between the island cities of Tenochtitlan and Venice reinforced the Aztec capital as 'Other' to Europe's self-proclaimed model of civic perfection, yet Braun and Hogenberg's urban mapping principles subordinate such difference to stylistic consistency.[16]

Legibility, improvement and control

The decorative, celebratory style of urban mapping exemplified by *Civitates Orbis Terrarum* dominated European urban mapping into the eighteenth century. Urban plans projecting newly founded cities or urban expansion adopted a more severe, undecorated style as part of their rhetoric of practicality. This is already apparent in Vincenzo Scamozzi's 1599 plan of the Venetian fortress city of Palmanova, in John Evelyn's 1666 plan for rebuilding fire-damaged London, or in the 1703 drawings for St Petersburg. Their draughtsmanship provided the model for the 'scientific' urban maps of the Enlightenment such as Michel Etienne Turgot's 1739 *Plan de Paris*. Urban legibility becomes the overarching goal of Enlightenment city mapping, to be achieved through precisely measured survey using carefully calibrated instruments. The undecorated simplicity of eighteenth-century graphic design articulates goals of cartographic accuracy and objectivity by erasing evidence of human intervention between survey instrument and printed image.[17] The severely constrained outline of carefully surveyed streets, open spaces, building footprints and plots, the absence of citizens in distinctive costume and of cartouches and inserts narrating the town's history, together with monochrome printing from fine-line copper engraving or later lithography, all signify new ways of thinking about the city and about urban life. The traditional vision of the city as a self-governing *polis* or Christian community had underpinned earlier cartographic emphasis on civic harmony, identity, community and dignity within a unified urban space. This vision was being eroded by the city's subordination within the emerging territoriality of the nation-state, along with modern secularism and individualism, and by urban population growth and spatial expansion, industrial production, and new forms of social cleavage and solidarity. In response, the city was reconceived, and new ways of imagining and experiencing urban life were reflected in maps whose intent was increasingly analytic rather than synthetic.

By the mid-nineteenth century, surveyed urban plans had become the base maps for the emerging science of urban statistics, by means of which expanding state capitals and new industrial cities were to be regulated. As we saw in the previous chapter, cholera and typhoid, poverty and prostitution, alcohol consumption and criminal 'deviance' – all regarded as primarily urban ills – came to be understood through the medium of the urban

map.[18] The accuracy and authority of the base map was fundamental to the persuasive power of the statistical information plotted onto it. Rather than celebrating the unity and harmony of urban community, the map's task was to bring into the light of practical reason invisible but all-too-potent urban pathologies. Their amelioration often itself involved further mapping of urban space: clearing and re-planning 'crowded districts,' laying water supply and drainage systems, platting new suburbs, cemeteries and parklands.

The celebratory aspect of the urban map did not entirely disappear. In the United States, for example, it gained a new lease of life in mid-nineteenth-century county atlases lauding western expansion. The bird's eye perspective was perfect for demonstrating the elegance and prosperity of newly established and often scarcely built towns.[19] Emphasizing their grid of streets and the bustle of carriages and carts, the maps promoted what were often in reality chaotic, unregulated places as well-ordered civic communities. They contrast strongly with the Sandford Company's fire insurance maps from the same years whose functional goal of assessing risk and determining premiums is apparent in the severity of unembellished detail, coding such data as street width, building height and constructional materials, or the proximity of fire hydrants. Anticipating the zoning and planning maps, insurance cartography, more than the celebratory urban images, foreshadowed the dominant direction of urban mapping in the succeeding decades.

Controlling metropolitan cities was a dominant theme of twentieth-century urban mapping. The response to 'monster urbanism' is recorded in maps, with the modern metropolis constantly threatening to outstrip the map's capacity either to make it legible or to regulate its material and social disorder. London, the first world city of the twentieth century, is a prime example. The seemingly uncoordinated and uncontrollable sprawl of its suburbs, dramatically accelerated by mass transportation and later by car ownership, anticipated the forms and processes that now dominate city landscape and life globally. One heroic, individual response to metropolitan legibility was Phyllis Pearsall's 1935 creation of The London A–Z, a pocket atlas with gazetteer of every street address in London county and the suburbs beyond (see Fig. 10.1). Her hugely successful, commercial project began in response to a personal dilemma, that of finding an individual address without an adequate street guide to London. To create her urban atlas she walked 23,000 streets and a distance of nearly 5,000 kilometers.[20] The outcome was a work that remains a handbook for every Londoner, but it reduces every urban element to the same format, abandoning any semblance of the city as a coherent urban structure in favour of its legibility as a continuously coded surface.

A more bureaucratic cartographic attempt to control the British metropolis was the 1932–4 National Land Use Survey in which schoolchildren were deployed as part of their geographical training for citizenship to record land uses across England and Wales, including 'non-productive' urban land. As we have seen, the London plate of the resulting national map series uses a livid purple to illustrate vascular urban tentacles strangling the soft green of rural England.[21] It can be read alongside the 1904 plan for Letchworth garden city or the 1969 street plan of Milton Keynes which mapped alternative urban visions, designed to control London's spread (see Plate 6). These twentieth-century cartographies represent the apotheosis of the map as an instrument of urban policy, not only to recapture the legibility of the modern metropolis on paper, but to sustain its physical and social coherence as a material space.

In their own ways, such city maps reveal an unsustainable Modernist faith in geometry as the guarantor of urban legibility. Conventional Euclidean principles and forms neither describe nor contain the spaces of the increasingly flexible, mobile, cybernetic city. Since the late eighteenth century, the free-flowing serpentine line has battled with orthogonal geometry as the privileged design medium for expressing the triumph of individual, 'natural' man over the classical or Christian model of the citizen.[22] The serpentine line, apparent in John Nash's work in London's West End connecting St James's and Regent's parks and present as a relatively minor element in the picturesque Letchworth plan, is omnipresent by the mid-twentieth century in the design of Milton Keynes. It dominates post-modern urbanism in both street plan and built form. Indeed, high-tech mapping techniques help assure its triumph. Computer-based digital laser technologies allow twenty-first-century architects to deform conventional building structures in response to new materials.[23] These are mapping techniques that will soon be applied beyond such signature urban buildings as Frank Gehry's Guggenheim Museum in Bilbao or Los Angeles' Disney Concert Hall, to the form of the city as a whole. Scientific mapping remains more successful in projecting the future form of the city than in capturing the legibility of its daily life.

New legibilities: the artist, the map, and the city

Pearsall's London A–Z project was precisely intended to make London legible for everyday life. We might contrast it with an entirely different but contemporary mapping of the modern metropolis, that of the German cartographer, Hermann Böllmann. Armed with a technique known to nineteenth-century artist-cartographers as Vogelschaukarten, and which dates back at least to Jacopo de' Barbari's Venice image, Böllmann confronted modernity's most demanding urban landscape: Manhattan. Using 67,000 photographs, 17,000 taken from the air, he created in 1948 a hand-drawn

map image that captures precisely the soaring quality of the New York skyline while rendering street plan and building plots with remarkable accuracy and clarity. Pearsall's and Böllmann's distinctive mappings of the mid-twentieth-century metropolis help to illustrate a debate over how urban space is known and experienced and thus how it should be mapped (Fig. 10.3).

Like Pearsall's, Böllmann's concerns in making the city legible through cartography were principally commercial. But in the immediately succeeding decade, the idea of urban legibility became a dominant concern of progressive urban thinkers on both sides of the Atlantic. In the late 1950s the American urban designer Kevin Lynch drew upon the economist and polymath Kenneth Boulding's highly influential text The Image to design a research project that used 'mental maps', drawn by ordinary individuals interviewed about their knowledge of the urban spaces in which they lived and worked, to make general statements about 'urban legibility', that is, the clarity of urban space in everyday life.[24] Cities with strongly defined formal elements – simple geometry of plan, clearly defined district boundaries (edges), landmarks and other easily visible features – such as Boston, were defined as more 'legible' than less formally or more loosely structured urban spaces such as Newark, NJ and Los Angeles respectively. For Lynch and his many followers the citizen's ability to map the city became the principal measure of urban environmental quality, and strongly visible,
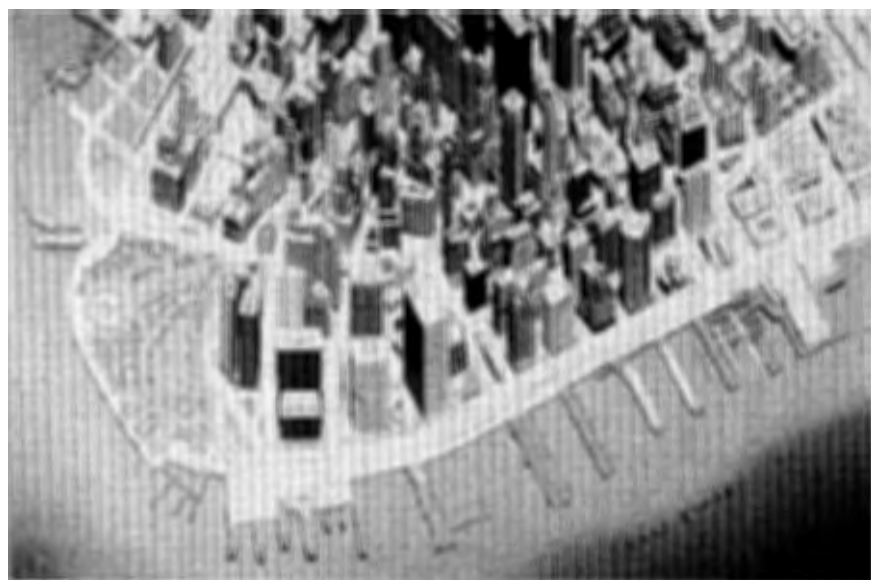

Figure 10.3 Hermann Böllmann, New York, a picture map, 1962. Detail of Manhattan showing Battery Park area (Pictorial maps Inc., UCLA Library)

material features of plan and elevation were promoted as determinants of successful urban design. The eye was figured as the privileged organ of urban experience. Cartography and mapping are thus strongly privileged as the media through which the city is known and improved.

In the same years, a more critical and politicized perspective on urban mapping was adopted by a group of French political radicals whose ideas had originated in avant-garde artistic movements associated with Surrealism. The Situationists, led by Guy Debord and inspired in part by Walter Benjamin's celebrations of urban space and life, celebrated the dérive or 'drift' as a way of experiencing everyday life in the city free from the attempts of authority to plan and regulate urban movement.[25] They explicitly associated the panoptical map with rational, alienating modernity. Pearsall's London rather than Böllmann's Manhattan might be taken as the paradigm mapping mode for this way of relating to the city, which derived from walking and taking the perspective from the street. Situationist urban mapping sought to emphasizes the breadth of embodied, sensory experience in the city, refusing all hierarchy of urban locations and celebrating the casual and adventitious aspects of urban life. The Situationist critique of the totalizing urban plan in favour of the city as performance art has been adopted by later urban progressives such as Michel de Certeau and Rosalyn Deutsche, opening the idea of urban mapping to a range of artistic intervention over the closing years of the twentieth and the opening years of the twenty-first century.[26] Their 'mappings' may deploy the analytic capacities of scientific cartography, often using advanced technologies to rework some of the goals of earlier urban mapping. They seek to capture legibility from the contemporary city, not as a means of reworking its material spaces, but as a way of enhancing the experience of everyday urban life.

9/11: urban mapping and art

Space permits discussion of only one example of such creative urban mapping. But it is a powerfully telling example in its symbolic and ethical dimensions. De Certeau's celebrated critique of scientific mapping's distanced and totalizing vision of the city in The Practice of Everyday Life took as its model the view of Manhattan from the top of the World Trade Center, the very perspective that Böllmann's map celebrates. Ironically, the destruction of those towers on 11 September 2001 presented perhaps history's greatest single challenge to urban mapping. Maps and plans of every urban system affected by the attack – transportation, utilities, communications, air quality – and new cartographies detailing the rapidly evolving impacts of the buildings' collapse on all aspects of city life, were vital to the response mounted by New York's myriad public and private agencies. Cartographers used the

latest Geographic Information Science (GIS) technology to coordinate and plot these diverse data sets in real time. Maps could not be carefully redrawn in such a rapidly and continuously evolving situation, as information fed in from scanners, satellites and photogrammetric surveys had to be integrated with existing maps and data bases for the affected zone. Over a three-month period more than 2600 maps were produced, using 'techniques of layering, seriality and transparency, complemented by the destabilizing power of interactivity, movement and animation'.[27] Many were made immediately available on the Internet.

Over the extended period of recovery, interest among the public in the site of the attack and collapse remained intense: victims' relatives, New York citizens, distinguished visitors and ordinary Americans came to bear witness and observe progress at Ground Zero. The scale of the urban footprint and the barriers erected to protect the recovery work made it almost impossible for casual visitors to comprehend what they saw. In response, the artist Laura Kurgan, who had previously used mapping techniques to explore a range of issues surrounding political violence, gained funding for the production of two editions of a map: *Around Ground Zero*, published in December 2001 and March 2002. Her maps use primary colours and simple graphics to identify key elements of the site: viewing platforms, temporary memorials, cranes and trucks as well as variously demolished or damaged buildings. The project had to negotiate the most delicate of ethical dilemmas, given the implications of viewing a scene of mass murder from which human remains were being actively removed. They were distributed free to visitors.[28]

The contemporary city presents both complex new challenges and enormous opportunities for mapping, as do emerging survey and plotting technologies. Indeed, the map may be the only medium through which contemporary urbanism can achieve any sort of visual coherence. There remains a strong, if unrecognized, celebratory dimension to urban mapping, not merely in the banal sense of cities' self-promotion through advertising or tourist maps and plans, but in the choice of the scale, content, design and colour of the myriad cartographic devices (many today interactive) developed by public agencies and private bodies to communicate and regulate contemporary urban systems and processes. The goal of rendering legible the complex, dynamic and living entity that is a city remains an urgent one. But today's acute awareness that cartographic images can never be innocent vehicles of information dissolves neat distinctions between celebratory and regulatory urban maps. Urban space and cartographic space remain inseparable. As each is transformed the relationship between them alters, and current visual technologies mean that the opportunity for creativity in shaping and recording urban experience is greater than ever, as too is the need for critical attention to the making and meaning of both public and private urban spaces.

VI Metageographic visions