Pavement

Architecture differs from the other visual and performance-based arts in one fundamental respect: its interdependence on the ground upon which it sits. Clearly, sculpture, in its most monumental and public manifestation, shares with architecture its particularity of place; while at the other end of the spectrum, temporary art structures or installations – like nomadic tents, which can also be architectural – have more in common with the transience of performance and the passing of a musical note.

The grounded quality of architecture can also render it a significant meeting point for the specific historical and geological moment. In the ancient act of founding, the first incision of the plough marks out the boundaries of a city, the furrow peeling back the crust of the seasons to reveal the bedrock of time on which a defensive wall is erected and the future incubated.

The complex cultural interdependence of the surface and geological substance of the ground is immediately apparent in the 'fervour' of wine- or cheesemakers for their local *terroir*. Like a discussion of the specificity of the

Boyle Family, *Holland Park Avenue Study, London Series*, 1967 and *Cobbles Study, Lorrypark Series*, 1976
Boyle Family's 'Journey to the Surface of the Earth' raised the pavement through their urban taxidermy of the everyday, to the status of high culture. Shown here is part of a display of their work at the Scottish National Gallery of Modern Art, Edinburgh in 2003.

ecosystems that miraculously deliver the bacterial bloom on the skin of a grape, the stones that make up the pavements we walk on have their own particular qualities that, when combined with the traditions of laying down, create an instantly recognisable texture, colour and scale – an indelible link to a particular context.

Latent Common Ground

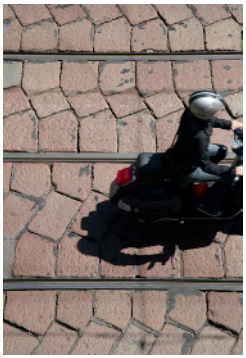
We tend to take pavements for granted. In fact, they are so much a part of the ritual of daily life that it is as sources of disruption that they first come to mind: the seemingly endless round of upheavals that are caused by the repairing of pipes, threading of new cables, or the re-laying of so often

inadequately repaired surfaces. Paradoxically, they bear the earliest and the most recent traces of habitation: on the one hand, the grid of streets that make up towns and cities is the most permanent of topographical features (ironically becoming more so as the ground beneath fills with an ever-increasingly complex maze of services); on the other hand, the rituals of renewal, the gathering of detritus and debris embodied in street cleaning are a litmus test of municipal order, the economics of taxation and social habit. I was first consciously struck by this extreme polarity in the work of the artists Boyle Family. Their exhibition 'Journey to the Surface of the Earth' at London's Serpentine Gallery in the early summer of 1975 depicted, with sharp-focused super-realism and a taxidermic instinct for preservation, the unexpected dislocation of sections of the pavement surfaces on to the gallery wall. The permanence of a kerb stone or a gulley was juxtaposed with the immediacy of the jettisoned and weather-blown human traces – cigarette butts, dust and paper – located by the chance encounter of a dart thrown at a city map.

Coincidentally, over time, gathering thoughts for seminars, for precedent studies and just musing on different settings, I became aware that my own pre-digital 35mm-film archive contained a series of photographs, taken inadvertently in the process of 'winding on' the film into the camera, which were often images of pavements. They became for me the equivalent of a scientist's Petri dish, for it becomes strikingly clear that so much that is particular to a place is embodied in its pavements, geology, modules, textures and habits. This chapter sets out to explore through examples the hidden depths of this latent common ground. Whether negotiated with the tapping antennae of the blind, the jogger's air-cushioned soles, or a child's running feet, we all share the continuous appraisal of what is at the next instant to be found underfoot. We are able to ascertain in a calibration of extraordinary finesse and agility, the paving stone's qualities: its firmness, slipperiness, evenness or even its inclination – something that has continued to elude the best efforts of robotics. For that is what pavements are about: movement and temporality.

Paving the Sacred, Profane and Political

The other dimension that is provocatively striking is the way that pavements, while embodying both the everyday and most seemingly mundane rituals of life, have also led to some of the most sophisticated representations of cosmological order. Pavements provide evidence of political and cultural will.

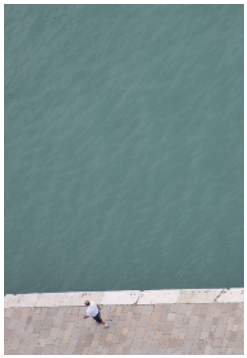
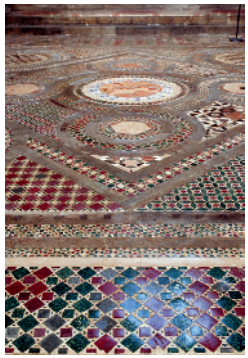



Close-up photographs of pavements
Left to right: Henrietta Street, Dublin, Ireland, vestiges of grandeur and dereliction; monumental interlocking slabs of the Corso di Porta Ticinese, Milan, Italy; pavement detail of the Chiado, Lisbon, Portugal; reordered field stones, setts and precast paths at the Stortorget, Kalmar, Sweden; Stolpersteine, Martin-Luther-King-Platz, Hamburg, Germany; water's edge at San Giorgio Maggiore, Venice, Italy; detail of the *opus sectile* work of the Cosmati sanctuary pavement, Westminster Abbey, London; Proconnesian marble slabs forming the floor, a frozen sea, in the Hagia Sophia, Istanbul, Turkey.

This can be autocratic as in the ubiquitous homogeneity of the brick surfaces of the Imperial Palace in the Forbidden City of Beijing, or the concrete *Autobahnen* of the Third Reich; mercantile as in the meeting of sea and desert in the Gulf States and the great trading routes of the Silk Road and salt roads; ceremonial as in the entry at London Bridge to the City of London (see the following section of this chapter); sacred as in the pilgrim routes of Europe and the processional way followed for millennia in a city like Enna in Sicily; or bridge the shared territories of the sacred and the secular as in the streets of Bhuleshwar in Mumbai.

The basic unit of paving, the stone, provides it with a universal and timeless quality, whether it is a trail staking out a route or a monument marking a deceased life. It is this aspect that is explored in the final section of this chapter, regarding memory, through the pilgrim passage around the sacred water basin of Banganga Tank in India and the Stolpersteine project by artist Gunter Demnig, which erects cobblestone-sized memorials to individual victims of the Nazis.

While the *Autobahnen*, trading and pilgrimage routes stretch the spatial boundaries of the citizen's right of passage as a pedestrian into the realm of travel over long homogeneous and repetitive surfaces that connect urban centres, the particularity of the paving of a sacred space combines a reverie on the ecstatic vertical contemplation of earth and sky. This culminates in the floorscapes of public buildings where meditation on surfaces becomes a key to temporal reflection – geological in the materiality of stone, historical through geometric arrangement, and human through the individual and the drama of ritual. This is highlighted in the sea-like expanse of the Proconnesian marble floor in the nave of the Hagia Sofia in Istanbul (see the section of


this chapter on 'Sacred Surfaces'). The pavement, or *der Bürgersteig* (literally 'citizens' way'), is therefore much more about the individual's liberty to see and be seen, to participate in the daily drama of the city, than about circulation, security and segregation. For Álvaro Siza, restoring the pavement of Lisbon's Chiado district (see 'Lisbon's Carpet' section of this chapter) was also an essential first step in revitalising the area after a fire in 1988. An emphasis on the routine aspects of the everyday points to the difference between the Situationists' 'society of the spectacle',[1] or the tourists' fleeting appetite, and the daily round of working, learning, playing and ageing in the unfolding cycles of politics and cultural change from the citizen's point of view. Public space is not a given that naturally evolves; it often has to be reasserted and redefined – most recently in order to fend off the dominance of the car. This is demonstrated in the successful regeneration and pedestrianisation of Stortorget, the 17th-century main square of Kalmar in Sweden, by Caruso St John Architects and artist Eva Löfdahl (see 'Field of Stones, Kalmar' section of this chapter). The citizens' pavement as opposed to the gated realm is also an important test of society's inclusiveness. Like a section of Giambattista Nolli's 1748 plan of Rome or the classical city, how far the stain of public access penetrates the body of the city suggests a culture's vitality and common ground. The artificiality of a corporate section of the city, like Broadgate or Canary Wharf in London, is made clear when these boundaries are challenged.

London Bridge

Closed doors and chain-link fencing are not the only protagonists in the shifting sands of the politics of the pavement; borders, for instance – those

of ownership as in the 'estates' of London or boroughs – play their part, as does the mind-set of the traffic engineer. The results for the citizen can be catastrophic, as at the edge of London Bridge. The bridge, a magnet for congestion and confusion, is the *raison d'être* of London. It was used as a crossing as early as Neolithic times (the 9th century BC). Further east than other ancient fords, it was the point of a natural causeway over the southern marshes leading across the river to the rise now known as Cornhill. When the Romans invaded, they layered their own structures here by initially building a temporary military pontoon and then replacing it with the first permanent, timber-piled bridge; in the ensuing centuries, it fell into disrepair, prey to the vicissitudes of Saxon and Danish squabbling. It was only following the Norman invasion of 1066 that the bridge was rebuilt. Henry II (1133–1189) created a monastic guild, the 'Brethren of the Bridge', to oversee all work on the timber bridge; and in 1176, Peter de Colechurch, a priest and head of the Brethren, began building the first stone bridge across the Thames, funded by a wool tax. This had a chapel dedicated to Thomas Becket at its centre, 19 arches, a drawbridge, and defensive gatehouses at each end. By Tudor times, the bridge had some two hundred buildings rising up to seven stories with a two-lane, 3.7-metre- (12-foot-) wide road tunnelling beneath – grinding, smoking and shitting like a Lilliputian nightmare. At its head, the tousled southern gateway was crowned by some thirty tarred traitors' heads, so vividly displayed in Claes Janszoon Visscher's 1616 *View of London from South Bank*.

London Bridge, Duke Hill Street and Tooley Street, Southwark: pre-existing site, London, 1996
As found in 1996, two photo collages of the site before the interventions. Top image to the left, London Bridge, and to the right, Duke Hill Street. The concrete balustrade to the ramp which leads to London Bridge Station acts as a defensive wall insulating commuters from the 'Borough'. The City of London Corporation owns the land demarcated by the paving slabs at the centre, Southwark the rest.

Though the relationship between the bridge and the tightly defined City of London are all clear in Visscher's etching, which looks towards the City from the South Bank, it was paradoxically the very existence of the City's physical borders – defined by the old Roman walls and the Thames – that first provided a catalyst for development on the opposite bank and the erosion of the significance of this route and its clear boundaries. Since the medieval period, the proximity of the South Bank to the City made it a popular site of entertainment and illegal activities, such as brothels and gaming exchanges, safely outside and beyond the City's jurisdiction. In the Elizabethan era, Shakespeare made Southwark the location for the Globe theatre; and

Eric Parry Architects, Southwark Gateway, London, 1997–9: needle
The stone needle, the trajectory of which marks the historic threshold to London, is fabricated of 25 keyed blocks of Portland stone that are post-tensioned to act as one element with a stepped base, which is an invitation or gateway southwards to Southwark.

during the Restoration in the mid-17th century, the Vauxhall Pleasure Gardens, which Samuel Pepys famously recorded visiting in his diaries, were established on the south bank of the Thames at Kennington. With industrialisation in the 18th and 19th centuries, commercial activities also intensified south of the river, and it became a magnet for industries that were deemed undesirable within the confines of the City's walls: noxious tanning, hatmaking, brewing, shipbuilding and the docks.

By the 18th century, the stone medieval bridge – now six hundred years old – had become a major source of congestion for road and river traffic alike.

Eric Parry Architects, Southwark Gateway, London, 1997–9: light pavement
The granite remains of one arch of John Rennie's 19th-century bridge are encapsulated within the structure of its 1973 replacement. The lost river edge is evoked through the LED light display held in cast-iron frames within in-situ washed aggregate concrete.

Interim measures were adopted, such as southbound carts and carriages being required to drive on the left-hand side and northbound vehicles on the right; and the demolition of all houses and shops on the bridge. In 1799, a competition was launched for a new design for London Bridge. Despite a field that included Thomas Telford, the Scottish engineer John Rennie (1761–1821) won with a proposal for a five-arched bridge that was adopted and eventually completed 32 years later under the supervision of his son. (It was Rennie's bridge that was famously sold in 1963 to the American tycoon Robert McCulloch, who allegedly mistook it for Tower Bridge; it has now been replaced by a 1973 bridge designed by Lord Holford.) The new bridge was built 30 metres (100 feet) to the west of the fabled medieval bridge, and the most expensive part of the project was the construction of the new approach roads to north and south. To either side of the bridge the embankment was cleared locally for the construction and reconstruction of subsequent bridge improvements watched over by the City of London with its economic interests in an uninterrupted flow of commerce. The South Bank, cut off from its hinterland by the acreage of railway-supporting brick vaults, was characterised by a comb of wharves perpendicular to the river's edge fed by small boats and the community of boatmen so vividly described by Charles Dickens in the opening chapters of *Our Mutual Friend* (1864–5).[2] The railway marked the exponential rise of pedestrians dutifully making a daily commute to the City possible. TS Eliot's seminal poem *The Waste Land*, first published in 1922, has London Bridge woven into its five sections and is a topography

Claes Janszoon Visscher, *View of London from South Bank*, 1616
This etching of the ever fascinating 17th-century panorama of London offers a vivid depiction of the South Bank, the city and the bridge – almost always a site of change and construction to the present.

that Eliot knew all too well, working as he did for eight years at Lloyds Bank after teaching and prior to his editorship at Faber and Faber. He explored the bridge at its most purgatorial in lines 60–69 in the first section of the poem, 'The Burial of the Dead', famously saying of the flow of commuters making their morning crossing: 'I had not thought death had undone so many.'[3]

Eliot's *The Waste Land* epitomises in its dark mood the general state of inertia of Southwark's South Bank until the mid-1990s: the hulk of the redundant power station; the dereliction of open sites like Potters Fields; the vast acreage of Victorian brick vaults supporting the railway infrastructure. Into this vacuum, just as property investors began to rediscover the area and it started to attract new residents, stepped the regeneration unit at the London Borough of Southwark, headed by Fred Manson who, wary of another grand urban masterplan, seeded through a competitive process a series of small-scale interventions of improved public realm. Under the broad title 'Future Southwark', an exhibition of the proposals was held in 1996 in a disused carwash shed (since demolished to make way for Crossrail). The artist Michael Craig-Martin painted a giant-scale Anglepoise lamp, the first of his numerous installation wall paintings, to signal the show on the street.

With hindsight, this exhibition was the catalyst for the trajectory of engagement with urban landscape design for several now well-known London practices. Muf proposed a scheme for Southwark Street called Groundswell. East, working in Borough High Street, proposed a repairing scheme including terrazzo threshold slabs, many of which were implemented. Florian Beigel and the Architecture Research Unit of what was then the University of North London (now London Metropolitan University) proposed linkages from Southwark Street to the southern open space of the power station which became the planning policy for the redevelopment of St Christopher's House. Patel Taylor proposed landscaping and connections to the north of the power station. All these practices have gone on to contribute internationally recognised public realm improvement schemes in London, which have been a notable contribution to a wider cultural debate.

Our contribution as the architects for this site was a study of the abject state of Colechurch House, a building owned by the Bridge House Estates (a charitable trust belonging to the City of London Corporation and a throwback to the 12th-century Brethren of the Bridge). The building straddles the conduit for human traffic from London Bridge station onto London Bridge while insulating them from the London Borough of Southwark to the south.

Gabriel Bodenehr, *Lisabon oder Olyssipo*, c 1700–58
Based on a 16th-century original, this engraving shows Lisbon as the image of organic urban growth in the alluvial valley between the higher ground before the earthquake of 1755.

This messy hit-and-miss picture of unrequited public realm ambitions evoked by London Bridge in which public infrastructure is patched up and dusted down, and only replaced when needs absolutely must, is typical of the way London has stumbled into existence free of any absolute or coherent planning force. In this respect the city form of Lisbon provides a stark contrast, having being reconstructed after the earthquake of 1755 and the fire of 1988. The continuity of its pavements remains a haunting presence.

Lisbon's Carpet

Watching a group of workmen lay a section of Lisbon pavement is, as Álvaro Siza has pointed out, like observing a craft tradition passed down continuously from generation to generation from at least Roman times – let us say therefore a couple of thousand years![4] The pavement is in Lisbon's historic Chiado district, an area that was destroyed by the fire of 1988 and has been reconstructed under Siza's direction. The paving has a characteristic tessellated form: hard white limestone cubes are bordered and patterned with black basalt cubes of a similar size. Both the limestone and basalt are

local to the Lisbon area; geologically Portugal can be divided around its central latitude between the granite-based north and the limestone and marble south. Siza recalls:

> In the Chiado I insisted in using the same pavement (granite cubes in the roads and traditional mosaics in the pedestrian walks) and I fought to maintain motorcar traffic in the whole area (which I didn't get completely), to guarantee continuity with most of the other streets in Baixa. This because I see with reserve the tendency to divide vehicle and pedestrian traffic – with some exceptions, of course. In this issue my favorite city is Naples, where everything is mixed and seems somehow chaotic … but there are no accidents and the whole city is full of life.[5]

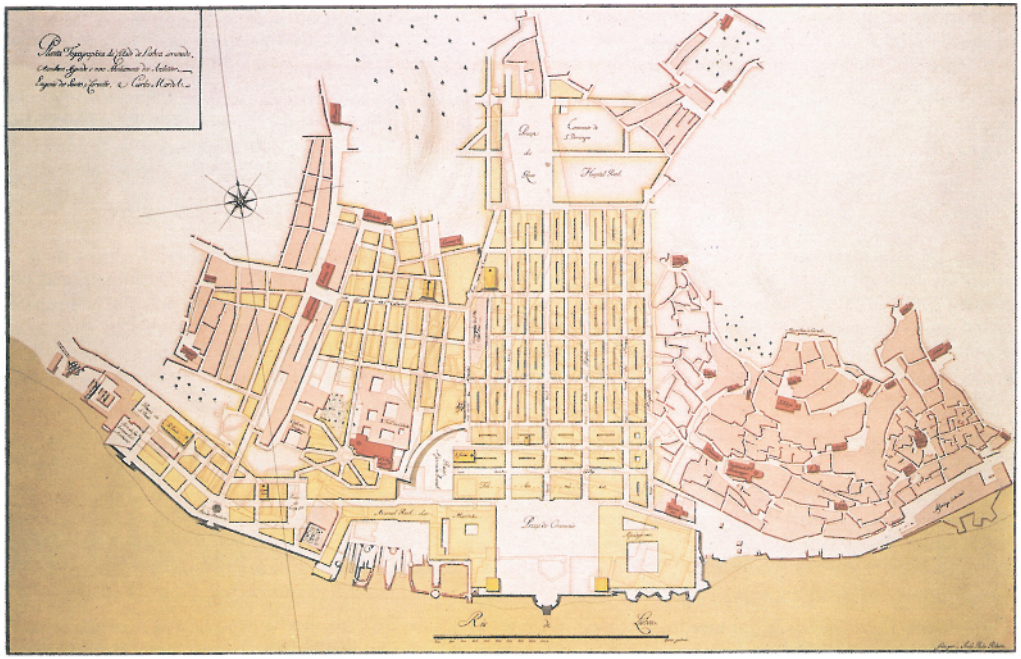
Trafficked streets traditionally are made from a larger module of the dark stone, but between kerbstones and stepped ramp edging all the paved surfaces flow sometimes across steep topography or negotiating abrupt changes in direction – an excellent solution for this historic city built across a hilly landscape and a deep alluvial valley where the downtown came to develop. The pavements unify and create a mental image like the ordering of a narrative as strong as those of the *azulejo*, the Portuguese tradition of painted tin-glazed ceramic wall tiles, which were imported from Flanders in the 16th century and later exported to the Indies. Found on the exteriors and interiors of domestic and public buildings, they often chronicle scenes from hagiography and Portuguese history.

But to return to those workmen: a group of four or five will be required to work on a relatively small area, if a complex border is required, such as the sign or number for an adjacent threshold. A guiding template is cut in plastic sheeting. At the centre, a hand picks out an appropriate-sized stone cube from a pile, delivered within arm's reach, and it is placed slightly raised and snugly close to its neighbours in a fine granular substrate. The pavers tap out a continuous light rhythm with their steel-headed hammers against the hard stones of the laid surface. It is a rhythm that is punctuated by a duller tone as the new stone finds its pitch and place. This quiet melody is very much part of the streetscape, a sign of continuous repair and maintenance – the city at work. The other response that the small module allows is the adjustment to local movement of the earth beneath the roads and buildings.

Despite the adjustment of traditional building techniques to Lisbon's dramatic topography and the looming threat of a seism, nothing could

have prepared Lisbon for the catastrophe of All Saints' Day 1755. Three earthquakes struck: the first during morning mass. The event gripped Enlightenment Europe and one of its most important figures, Voltaire, wrote an epic poem *On the Lisbon Disaster (or: An Examination of the Axiom 'All is Well')*, and playing on his imagination it formed a central section to the adventures of Candide in his novel of the same name, in which the eponymous hero after escaping the ravages finds himself in the part of the city of Lisbon 'still weeping over the death of their benefactor. Candide and Pangloss had hardly set foot in the town when they suddenly felt the earth shaking beneath their feet. The sea seethed in the port, wrecking the ships anchored there, and whirls of fire and ash covered the streets and the squares. Houses collapsed, roofs caving in on crumbling foundations.'[6] The devastation was most fierce in the alluvial plane running evenly towards the Tagus between two hills; to the east the concentric and irregular street pattern descending like a three-dimensional image from the Castelo de São Jorge; to the west the 16th-century grid of the Bairro Alto.

The 18th-century reconstruction proceeded under the autocratic direction of the remarkably energetic and gifted Sebastião José de Carvalho e Melo –



Eugénio dos Santos and Carlos Mardel, *Planta Topographica da Cidade de Lisboa*, 1758
This 1947 lithograph shows the chosen scheme of planned rebuilding of the gridded Baixa district of 1758, three years after the devastation: an Enlightenment essay in urban design in response to Voltaire's paradoxical statement 'All is well'.

the future Marquis of Pombal, who had eleven years earlier returned from a five-year ambassadorial posting in England, where he would have witnessed from his home in Golden Square, London, the 17th-century squares of Lincoln's Inn Fields, Covent Garden and St James's Square, but also the concurrent building boom of the Hanoverian ascension including St George Street and Hanover Square.

Following the havoc wreaked by the earthquake, he commissioned a detailed topographical survey, forbade any immediate rebuilding, and over the period of a year commissioned five alternative proposals. The chosen proposal by Eugénio dos Santos and Carlos Mardel, built out over the next century and a half, was startlingly closely adhered to, including the urban block, number of storeys, walling and window detailing, balconies, roofs and a very innovative construction methodology *a 'jaula' pombalina*,[7] essentially a sophisticated balloon-framed timber skeleton that would remain

Aerial photograph of Baixa-Chiado, Lisbon, 1988
A photograph of the Baixa-Chiado district taken after the fire, the aftermath of which is clearly visible in the centre left margin. Of note, the built mirror of the Santos/Mardel plan of 1758

intact if the outer stone skin collapsed in an earthquake, without disturbing the adjacent building – this last concern also helping to determine the width of streets. The district has come to be known as the Baixa, and its light-honed limestone paving reflects the sky and distant water by day, lightening the tones of the stone walls at their junction, and reflects by night the life of public ground-floor interiors.

When the Chiado district bordering the western edge of the Baixa was engulfed in fire on 25 August 1988, a collective groan of despair, as soul-searching as Voltaire's, could be felt. A significant setting of Portuguese 19th- and 20th-century literary and artistic culture vaporised. In truth the area had lost its shine in recent years and the fact that the fire burnt undeterred was the result of many of the upper floors of the buildings being used purely for paper and archival storage.

Almost a quarter of a century after the fire, the Chiado is rebuilt. It is again alive with a dense mix of uses. There are new urban courts and passages, and the Baixa-Chiado Metro Station, a transport interchange on the scale of the ancient Baths of Caracalla in Rome. This new hub, reconnecting the city, was envisaged by Álvaro Siza early on in the district's reconstruction. In the immediate aftermath of the tragedy the city council simply turned to Siza for guidance, as Jorge Sampaio, the then Mayor of Lisbon, and latterly President of Portugal, recalled it:

> As Mayor, I was responsible for the recovery process of a zone that represents the heart of the city … one of the most beautiful sites in the world. … All the difficulties and efforts were compensated for by the privilege and immediate delight of my permanent contact with Professor Álvaro Siza. Evidently, we had agreements and disagreements, but we kept up a stimulating debate that was so enriching for me that it became one of my most vivid memories of public life.[8]

These words condense what the following chapters might otherwise struggle to do by highlighting the intensity and importance of a project that, through its pavements, defines new space and routes, recasting an urban quarter with a modesty that is surprising from the hand of the great master of form. As Siza's public access plan for Chiado illustrates, the reconstruction of more than twenty buildings is contained within three blocks: A, B and C. Block A contains a new heart, an open patio. This is perched between the 12.5-metre (41-foot) difference in level of the Rua Ivens to the west and the Rua Nova do

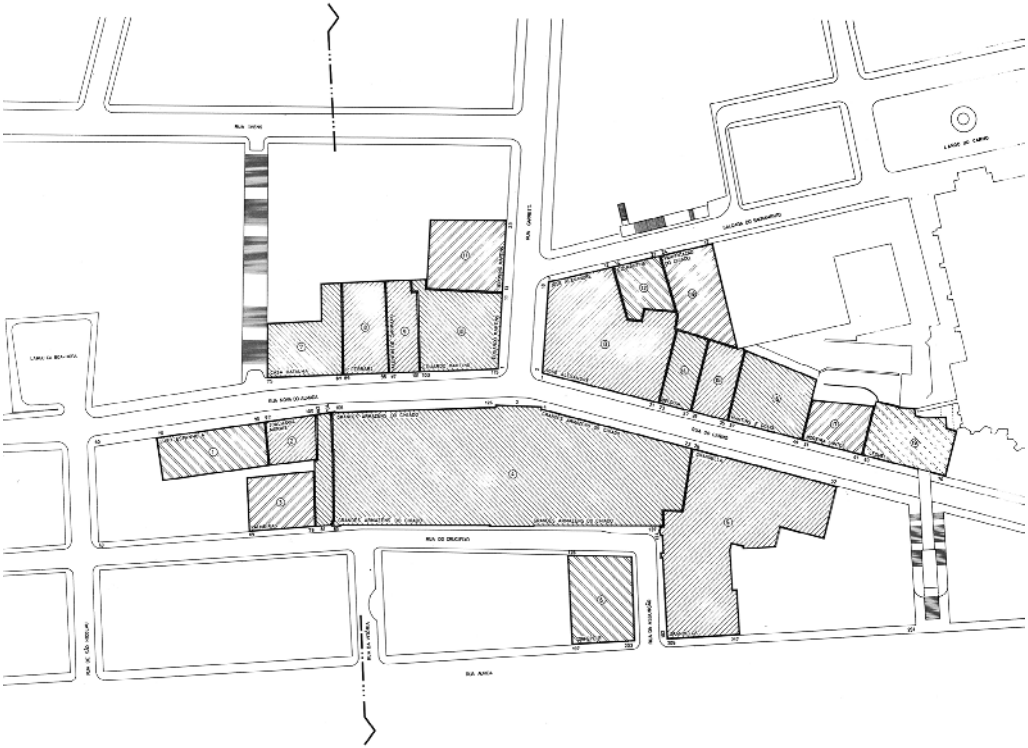
Almada, and lying directly over the new underground pedestrian tunnel that emerges under Block C in the Rua do Crucifixo, 22 metres (72 feet) below the level of Rua Ivens. Notable but tangential to the discussion of pavements is the entirely rebuilt Castro & Melo building at 89 to 101 Rua Nova do Almada, a mixed-use urban building of breathtakingly simple elegance in its planning and detailing. Block C contains the Chiado department store, topped by a new hotel, and the reworking of the interior of the late 19th-century Grandella department store. Another opportunity was offered by the reconstruction of Block B whose width spreads from its southern elevation facing the Rua Garrett, along the western elevation facing the Calçada do Sacramento, and the east-facing elevation along Rua do Carmo. Siza's early sketch of March 1989 shows the intuition, later reinforced by historical evidence, of the potential of a new ramped pedestrian spine leading from the epicentre of the district at the junction of the three blocks to the skeletal shattered ruins of the Convento do Carmo embodying the memory of 1755.

Álvaro Siza, Plan of Public Access, Chiado, Lisbon, 1989
From within and between the renewed buildings, a network of passages, courts and stair re-establish the previously choked secondary routes of the public realm.

Key

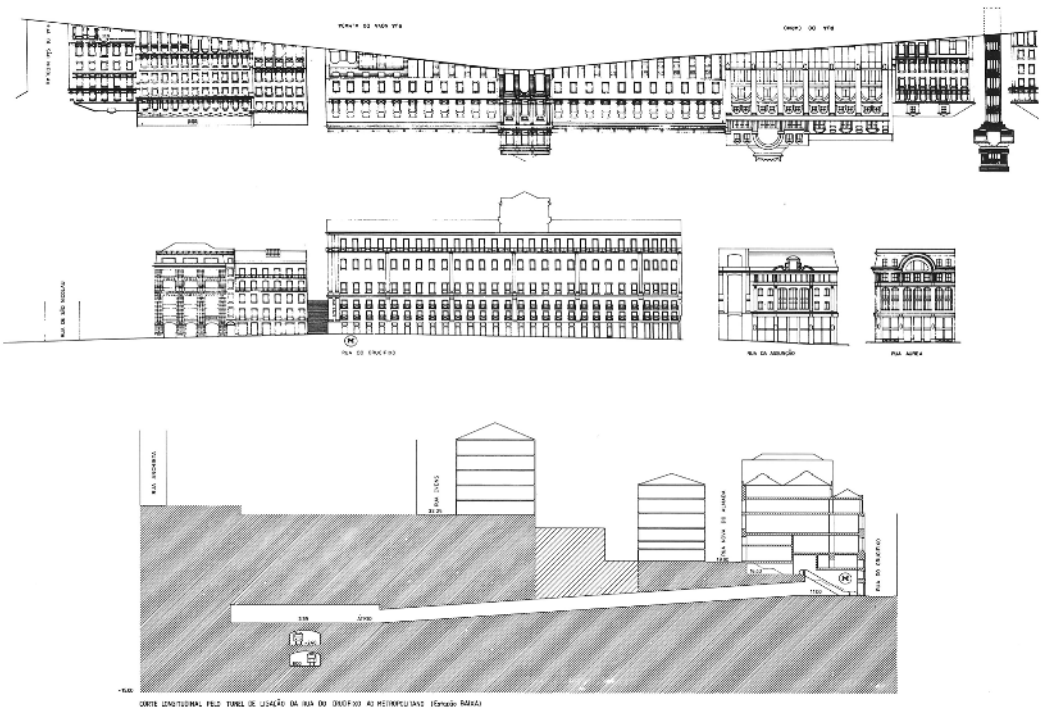
Buildings affected by the fire

- Entirely destroyed
- Partially destroyed
- Integrated in the affected area

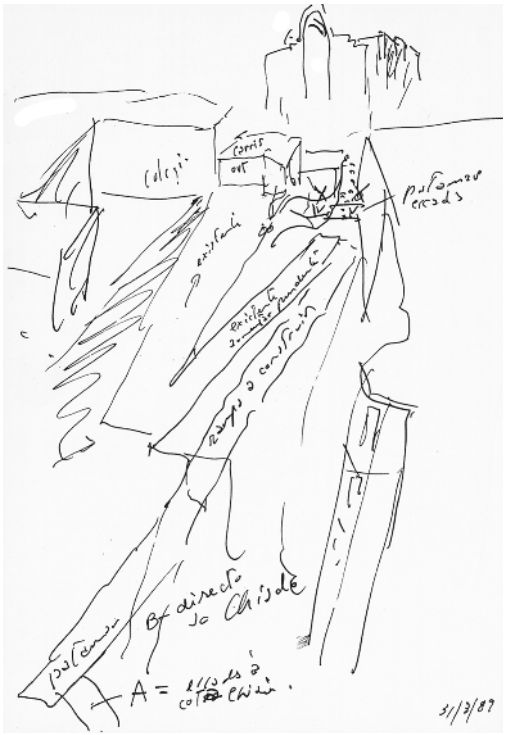


At the head of the new ramp, the passage bifurcates along the southern wall of the monastery west to the finely proportioned square Largo do Carmo and east to the bridge and belvedere of the Santa Justa lift. The comparison with the downtown plan before the fire reinforces the perception that the Chiado was in a state of relative decay, with dwellings almost eliminated; the remarkable reworking of the buildings has seen rejuvenation with a good percentage of housing mixed with other uses, around the wonderfully inventive sets of block interiors, patios and passages. The history and topography that appear so restrictive have through the calamity of the fire become an opportunity to reactivate the hierarchy of the urban pavement and interconnecting tissue. In Siza's words:

> The undulation of the hills opens up like a carpet that someone has stretched out, a dense pattern, stones from which great but serenely simplistic buildings emerge, large terraces, supporting walls covered in gladioli; it opens out, follows the river, as if in breath taking 'Traveling'. Your gaze is lost at sea, the horizon trembles.[9]



Álvaro Siza, Elevations of Rua do Carmo and Rua Nova do Almada, Chiado, Lisbon, 1989
The striking surface topography in plan and section is reinforced by the new infrastructure of the underground station set close by the 19th-century lift tower.



Field of Stones, Kalmar

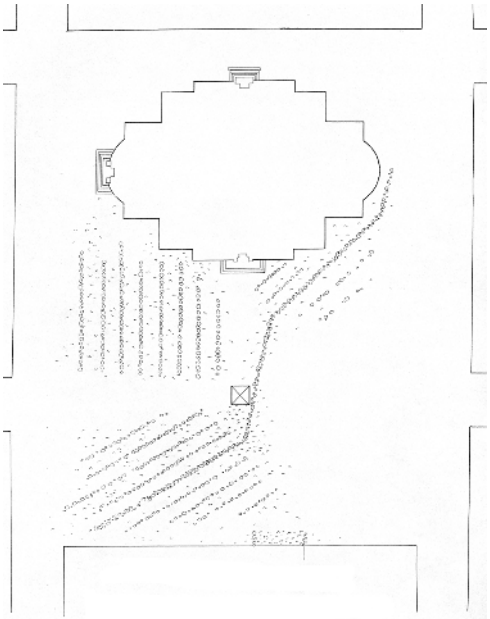
After the historical and topographical excitement of Lisbon and London, the reordered surface of Stortorget, the main square of the small city of Kalmar in southeast Sweden, stands out for its stark simplicity. Far removed from the scrutiny of a capital city, Kalmar lies on the Swedish Baltic seaboard. Founded around the year 1200, it is one of the country's oldest cities, having grown out of close trading links with the Hanseatic League: the confederation of merchant guilds and market towns that dominated and protected trade from the Late Middle Ages in Northern Germany and the Baltic. Located near the Danish border, Kalmar became strategically important in the 16th and 17th centuries during the Swedish–Danish Kalmar Wars, but this military focus gave way to shipping as the border was permanently settled south. Kalmar's massive defensive castle, with its accumulation of square towers, corner knuckles and enfilades of grand rooms ranged around a central court, was host to the original city around its curtilage.

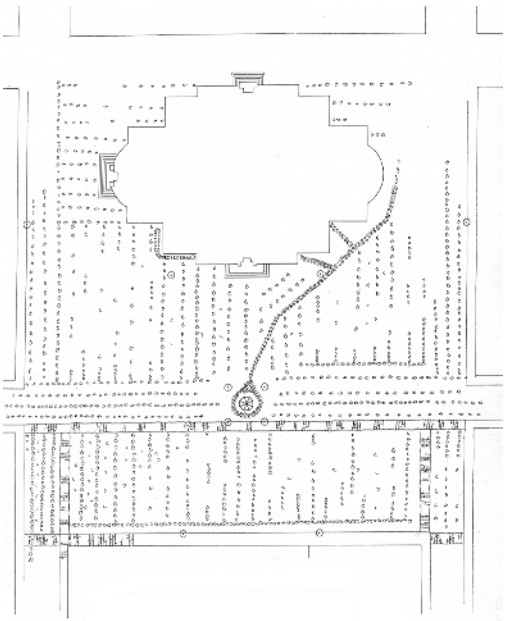
Georges Demaye, Grandella department store, Chiado, Lisbon, 1907
Photograph of the Grandella department store looking southwards up the Rua do Carmo, c 1940, showing the paving system of tessellated blocks – larger for vehicles, smaller for pedestrians – capable of gymnastic topographical manipulation.

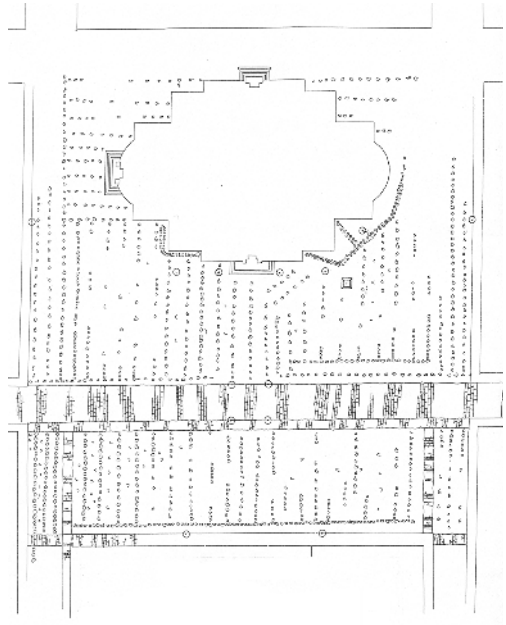
Álvaro Siza, study of the access landings to Carmo, Chiado, Lisbon, 1989
The poetic intention of Siza's early sketch of the re-establishment of the route to the Carmo, the living skeleton reminder of 1755 at the heart of his Chiado proposals.

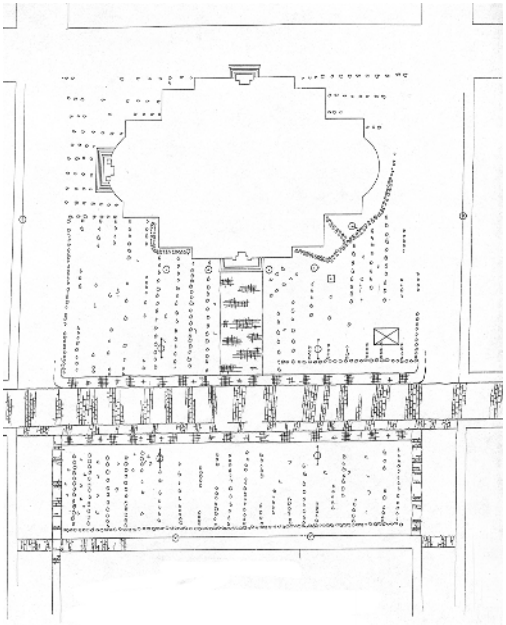
In 1639 the Swedish council of the realm decided that the entire city should be moved from its vulnerable position to the unpopulated island of Kvarnholmen. It was at this stage that Stortorget, the main square, was conceived as a 98-by-107-meter (320-by-350-foot) opening in the grid of the urban block: a space that was then to be dominated by the autonomous mass of Nicodemus Tessin the Elder's Baroque cathedral, begun in 1660, on a base of cyclopean-scale masonry rising out of the surface of the square. The mass of the church, to this day, effectively overshadows half of the square with its south portal centred on the axis of the square, and a line that bisects the square north to south passing just south of the portal steps. The remainder of the square, which was originally used as a space for military drills, the weekly market and public meetings, and as an important source for water as the site of the city's main well, is significantly placed on the axis of the church and Storgatan, the city's main street. This road crosses the public double-squared rectangle at approximately the centre of its shorter side. By the end of the 20th century, this road had come to dominate the square. When, in 1998, the Kalmar County Museum published a document tracing the metamorphosis of the square's surface, they entitled it *Stortorget, från brunn till P-mätare* (*Main Square, from Well to Parking Metre*).[10] Four plans, reconstructing the square's surfaces in 1800, 1900, 1920 and 1940 respectively, describe the progressive formalisation of the segregation of pedestrian and vehicular movement. This point is evocatively illustrated in an etching of Stortorget by Nils-Isak

Aerial photograph of Kvarnholmen, Sweden, 2005
The Stortorget lies at the centre of Kvarnholmen, planned in the 1600s and executed in full.









Nicodemus Tessin the Elder, Kalmar Cathedral, Kvarnholmen, begun 1660
An aerial photograph taken in 1920, showing Nicodemus Tessin the Elder's monumental Baroque cathedral dominating the square.

Löfgren dating back to 1837. The square's original surfacing resonated with the place in its use of available material and its unselfconsciousness. The stones that made up the original surface are 'field stones', a geological mix of predominantly granite pebbles and boulders ground to a smooth finish by the progresses and recessions of the Ice Age, stacked into dry-stone walling and providing the raw material to make the streets and squares of the Baroque city over centuries. These variegated stones have been laid, shifted and re-laid, and are easily distinguished from the homogeneity of the later cut-granite street paving. The field stone surface was evidently laid by first creating parallel level rows of larger stones, called line stones, and infilling the space between with smaller stones to create a level surface throughout.

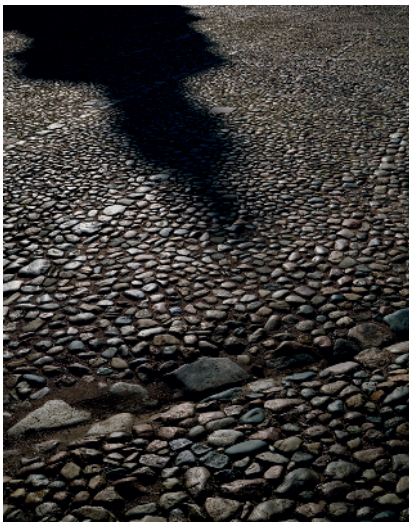
Richard Edlund and Örjan Molander, drawings from *Stortorget, från brunn till P-mätare*, Kalmar Läns Museum (Kalmar), 1998
Drawings of the surface materials of the square in 1800, 1900, 1920 and 1940 (right to left, top to bottom) showing the 'line stones' used to establish the levels of parallel lines and the surfaces in between, a progression that ended in the domination of the car.

The photographic documentation of the square preceding its renovation by Caruso St John Architects and Eva Löfdahl in 2002 shows the continuous process of segregation of the public space in detail: raised kerbs defining pedestrian areas, bollards, bicycle racks, flagpoles, folk light fitting and ugly signage. In short, it represented that all too typical relapse into half measures that are universally taken for granted as acceptable. An inspired and crucial part of the success of the built project was the mutually supportive relationship between the selected design team of artist and architects. An interest in architecture was kindled by a government directive demanding that the Swedish Arts Council's remit for the commission include the 'public environment'. The scheme, which was well developed by the time that the team entered the international competition for the square's design in 1999, broadly meant that the architects took responsibility for the surface of

Nils-Isak Löfgren, *Stortorget, Kalmar*, 1837
Löfgren's etching of the Stortorget suggests a continuous homogeneous stage upon which the civic participants create a foreground and hinterland.

the square, and the artist Eva Löfdahl, the imaginary space above and the chthonic space below this surface. Their intense relationship is evoked in Löfdahl's words:

> our correspondence relating to Stortorget is plentiful. It spans five years and is intense at times, with several exchanges a day .... Naturally it contains a great deal of practical information … but the rest is just as significant. Our sessions in Kalmar were packed with presentations and meetings with representatives. Afterwards we were often too tired to speak. … During the periods when not much was happening, we all digressed into other ideas and tasks. We then needed to repeat what had already been discussed, to 're-establish the energy' over and over again.[11]



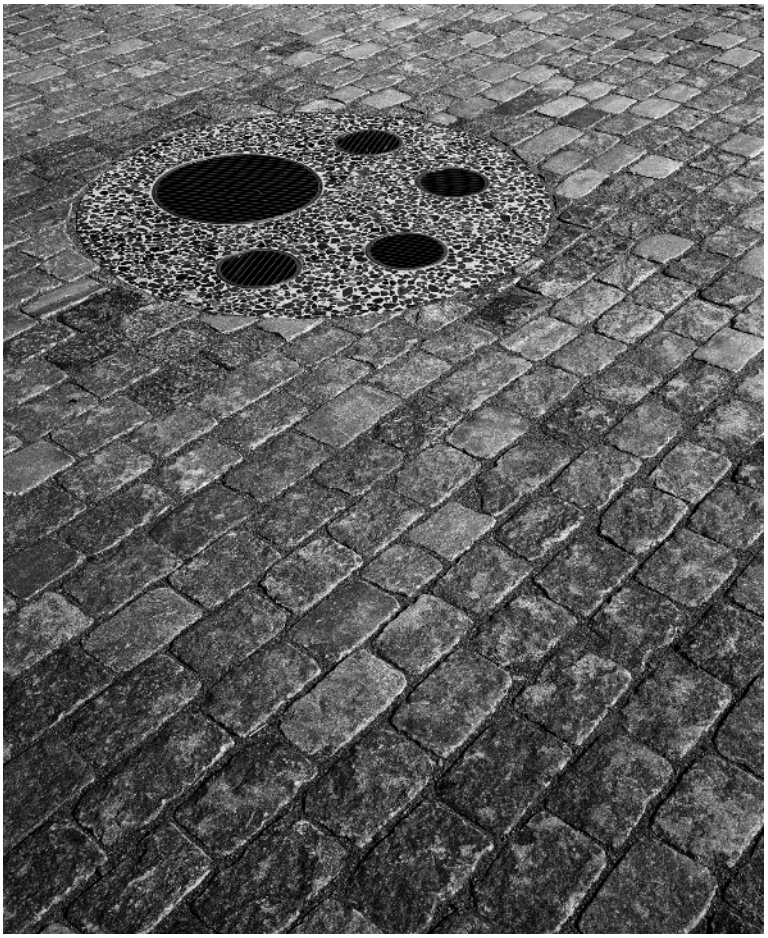
Eva Löfdahl and Caruso St John Architects, regeneration of Stortorget, Kalmar, Sweden, 2003: detail of pavement
Detail of the 'line stones' and infilling field stones with the shadow of one of the cathedral's four lantern-topped towers.

In the final project, this manifested itself in the artist devising the choreography and latent meaning for the installation of new wells or

sound chambers and stainless-steel lighting masts, which effectively mediate the earth, sky and nearby water; while the almost abstract composition of the plan generated by the presence of buildings, traces of movement and the craftsmanship of the past, was engendered by the architects' idea of a collage of textures, which responds to the passing of people and the moving shadows of the buildings and masts. Taking the past as an inspiration, Löfdahl has rekindled a hauntingly trapped connection to the underworld with her sound chambers that speak to the passer-by coming in and passing out of auditory focus through the freedom of movement in the social world. The stainless-steel masts, topped by hand-blown red glass domed cylinders, act by night as a loose web whose disconnection from the orthogonal surface order are like the inaccessible jewels of a paradisiacal sphere.

The admirably refined drawing of the surface, as completed, culminated in a process that was begun by Caruso St John during the competition, of creating almost rug-dimensioned drawings. It is interesting that Stortorget runs counter to the urban grain of streets by being represented as an independent square. The traces of the positions of entry and exit roads are the vestigial inflections of the kerb stones forming the only framing device at the perimeter of the space. Four finely proportioned rectangles reminiscent of

Eva Löfdahl and Caruso St John Architects, regeneration of Stortorget, Kalmar, Sweden, 2003: view from Kalmar Cathedral
The reordering of the surface area (98 by 107 metres (320 by 350 feet)) involved the reuse of field stones; large and small cobblestones; precast concrete slabs; six 12-metre- (40-foot-) tall stainless-steel masts topped by hand-blown glass lanterns; five wells with precast lids; and cast-iron bollards.



Eva Löfdahl and Caruso St John Architects, regeneration of Stortorget, Kalmar, Sweden, 2003: detail of pavement
The 1.5-metre- (5-foot-) diameter precast covers of the artist Eva Löfdahl's sound chambers establish a link to a chthonic underworld.

constructivist compositional exercises are described as 'clearings', places that acknowledge the square's other major buildings. These are made of granite setts of cobblestone pavement known colloquially as *kullersten*, of a regular width that have been skilfully re-laid using the material that made up the road surface introduced in the early 20th century. The treatment given to the stone pavement was intended to reflect the nature of its geological and fossil material, namely the so-called 'cat skulls' (*kattskallar*), a type of fossil almost only found on the Swedish island of Gotland. The lightness and smoothness creates a sharp contrast with the older irregularity of the field stone surface that has been repaired and expanded as the principal body of the square. The

main axis through the square, now marked as a pedestrian width, is formed by large precast slabs that create another scaling, larger than a single pace, introducing a miniature pattern not unlike the field stones in the washed and exposed granite aggregate. These panels have also a subtle shift in width and direction that acknowledges the primary entry and the change of axiality leading to the south porch of the cathedral. Altogether it is a very satisfying combination of modesty – acknowledging the history of the place – and clarity of purpose. In Adam Caruso's words:

> Without the freedom to choose material or technique this project is completely about form and largely about shifting existing material. It is energy neutral in a way that Beuys and Smithson might have approved of.[12]

What is clear is that the re-imagination of Stortorget by Caruso St John and Löfdahl required the breadth of vision of large-scale land art, such as Joseph Beuys's *7000 Oaks – City Forestation Instead of City Administration*, presented at Documenta 7 in Kassel (1982), or Robert Smithson's *Spiral Jetty* (1970). Paradoxically, though, as Caruso has pointed out through the complementary juxtaposition of the new and the original, a cycle of intervention was cleansed. It thus raised the ire of antiquarians who saw the erasure as arrogant; in Caruso's words: 'After long and philosophical discussions, formal coherence was chosen over the ambiguity of history.'[13]

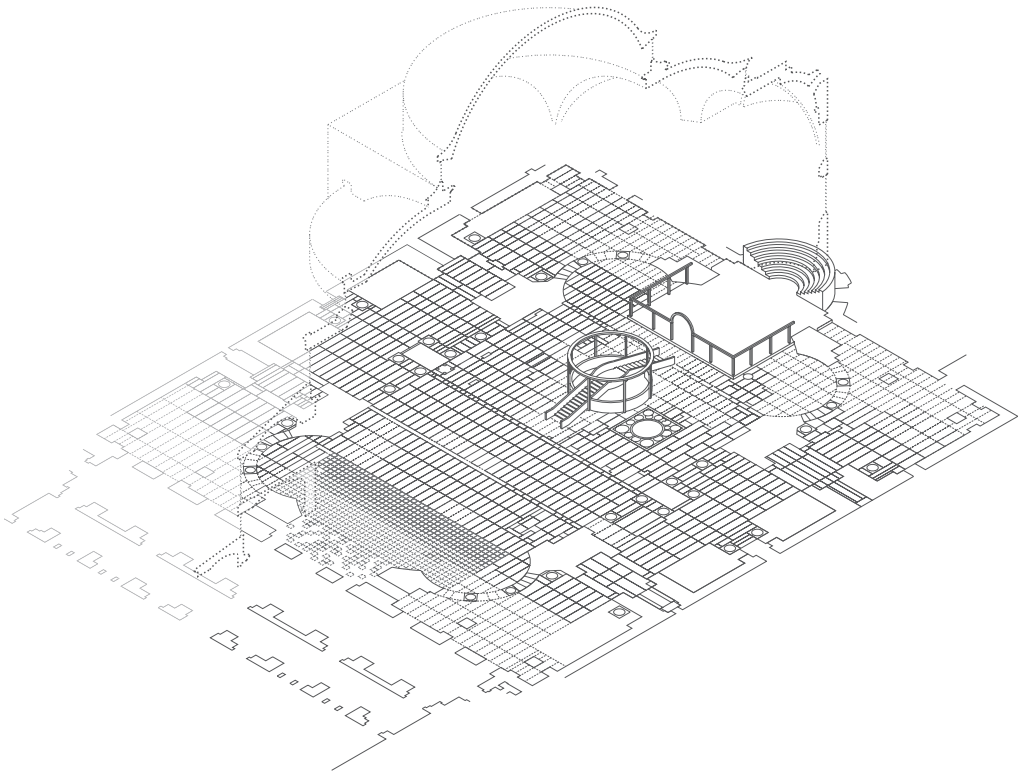
It is with the injection of a certain element of 'sparkle' in the scheme that a wonderful balance of nature, place and artifice is achieved in this exemplary project. This is attained by the needle-like, stainless-steel light ports with their worked surfaces and the sharpness of their gnomon-like shadows cast over the new and old surfaces; and by the highly polished circular precast and stainless-steel grille well covers that are the mouthpieces of a chthonic underworld.

Sacred Surfaces

The composition and scale of pavements, the resonance of their materiality and their capacity to transcend the everyday are most evident historically in sacred spaces. In this penultimate section of this chapter, the extremes of relatively undifferentiated material in the marvellous paving of the Hagia Sophia in Istanbul (532–7) are investigated, at one end of the spectrum, and at the other, the complex material and geometric symbolism of the Cosmati Pavement (1238) in Westminster Abbey.

At the turn of the 20th century, the influential Arts and Crafts architect WR Lethaby (1857–1931) inspired a group of young likeminded enthusiasts to explore the architecture of the early Christian church in the Eastern Roman Empire through his research and writings on iconography and cosmology and specifically his monograph on the Hagia Sophia or Sancta Sophia.[14] Robert Weir Schultz and Sidney Howard Barnsley, for instance, went on to write *The Monastery of Saint Luke of Stiris, in Phocis, and the Dependent Monastery of Saint Nicolas in the Fields near Skripou in Boeotia* (published in 1901).

These further studies gave rise to a number of neo-Byzantine buildings, most prominently Westminster Cathedral (1903) by John Francis Bentley (1839–1902) with a chapel by Robert Weir Schultz (1860–1951), but also at a smaller scale the Church of the Holy Wisdom at Lower Kingswood, Surrey (1891) by Sidney Barnsley (1865–1926), which is now less well known than it ought to be. Adopting the form of a Roman basilica with a central apse,



Eric Parry Architects, axonometric section of the Hagia Sophia, Constantinople (Istanbul) (from AD 360), 2013
Drawing showing the layout and orientation of the Justinian-era marble floor slabs within the original interior at the time containing the ambo referred to by Paul the Silentiary.

Detail of Proconnesian marble floor, Hagia Sophia, Constantinople (Istanbul), from AD 360
Paul the Silentiary's 6th-century description of the ambo – 'And as an island rises amidst the waves of the sea' – suggests the metaphor of the frozen sea evoked so clearly by the slabs of Proconnesian marble.

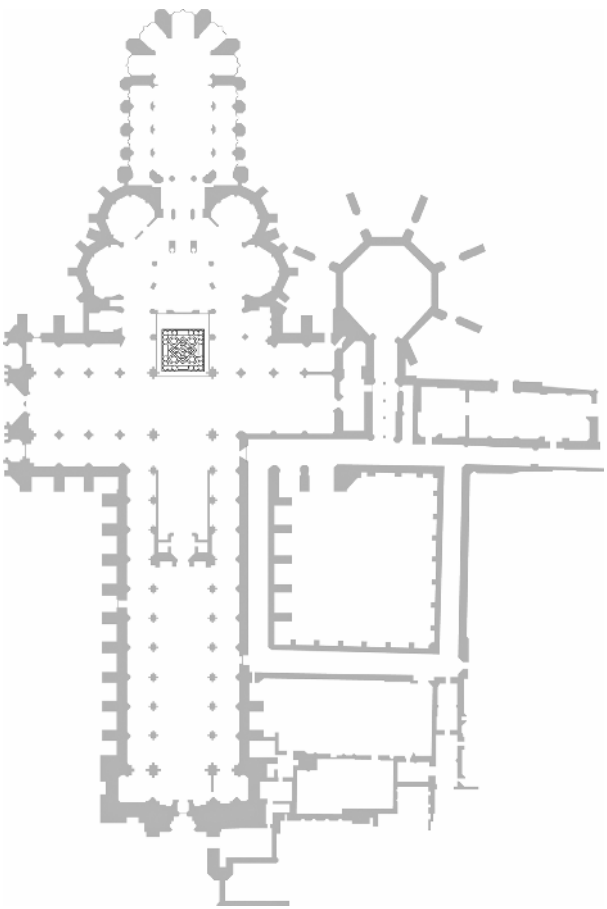
it takes its name from the full Greek title of the Hagia Sophia (Shrine of the Holy Wisdom of God). In all the original studies about this church, the composition of the church floors proved of particular interest. This can be traced back to Lethaby's influential summary of his thoughts on iconography in *Architecture, Mysticism and Myth* of 1891,[15] in which he devoted two chapters to floors: the first (Chapter VII), entitled 'The Labyrinth', looks at the labyrinth as a recurring symbol in pavement design; while the second, 'Pavements like the Sea' (Chapter XI), is a short but brilliant summary on the role that the floor has in sacred spaces across a wide range of cultures and periods, representing a cosmic realm. He pointed to an Assyrian pavement in the British Museum entirely patterned with lotus; to the black polished reflective stone in front of Pheidias' enthroned Zeus at the temple of Zeus at Olympia – 'A representation of the sea of heaven with its stars is especially appropriate to the floor of the holy place, which bears the figure of the god, or the altar'[16] – and speculated on the evidence that the Byzantine floors of the upper ambulatory at the Hagia Sophia were intended to symbolise a celestial sea. At the time of Lethaby's speculation, the building was used as a mosque and the main floor of the nave was covered in carpets. It was revealed for the first time since the 17th century in 1935 when under President Atatürk the building was turned into a museum. The massive slabs that make up the nave of the Hagia Sophia are Proconnesian marble, named after the island of Proconnesus (present-day Marmara Adasi in Turkey) from which it was extracted.

This coarse variegated marble was renowned in antiquity; large quantities were exported to Greece to carve into sarcophagi, and later it made up a great deal of the walling for the Byzantine city of Constantinople. Like many sources of stone in the same territory, it can vary hugely in character. This marble could provide a very even, clear, white type, but also came in a grey-veined form with a hint of green background that was chosen for the floor of the nearby Church of the Holy Apostles (*c* 536–550; now demolished) –

built, like the Hagia Sophia, by the Emperor Justinian I (c 482–565). In the Hagia Sophia, the staggering effect of the cascade of the dome with its ring of lantern windows, semi-domes and squinches, mediating between pierced walls to achieve the clear span of 30 metres (100 feet), has been movingly described at various points of the church's history.[17]

Justinian's expenditure on the Hagia Sophia was astounding. It was massive in scale and remained the world's largest cathedral for a thousand years. With its many chapels and shrines, gilded octagonal dome and mosaics, its interior was sumptuously decorated. It was purported that forty thousand pounds of silver went into the sanctuary alone.[18] Through its very splendour, the Hagia Sophia provided the Eastern Orthodox Church with a highly majestic presence in Constantinople. While the figurative mosaics were not introduced until after the period of iconoclasm in the 9th century, it is clear that the surfaces were intricately articulated, and the capitals and dosserets elaborately carved; a panoply of liturgical furniture, hangings and screens in precious metals and polychromatic stones were installed. The floor, though, is the exception, relying on its sheer expanse of book-matched, veined marble flagstones to speak to the faithful, and on its clear association with water. From antiquity to the European enlightenment and to this day in poetic interpretations, marble is understood as a metamorphosis of liquid into stone, its shimmering, polished qualities combining with its veining to suggest the movement of waves.

Thrust into the celestial sea floor of the Hagia Sophia is the circular ambo from which the priest would recite from



Eric Parry Architects, plan of Westminster Abbey, London (from AD 1090), 2013
The plan illustrates the location of the sanctuary and Edward the Confessor's Chapel, both subject to the Cosmati craftsmen's art.

biblical texts, emerging and retiring by means of a raised causeway connecting to the solea and the sanctuary of the altar. The imperial marshal Paul the Silentiary, commenting on the ambo of the Hagia Sophia in his famous eulogy to the cathedral after the reconstruction of the dome in 563, made the iconographic connection between the marble floor and the sea quite clear:

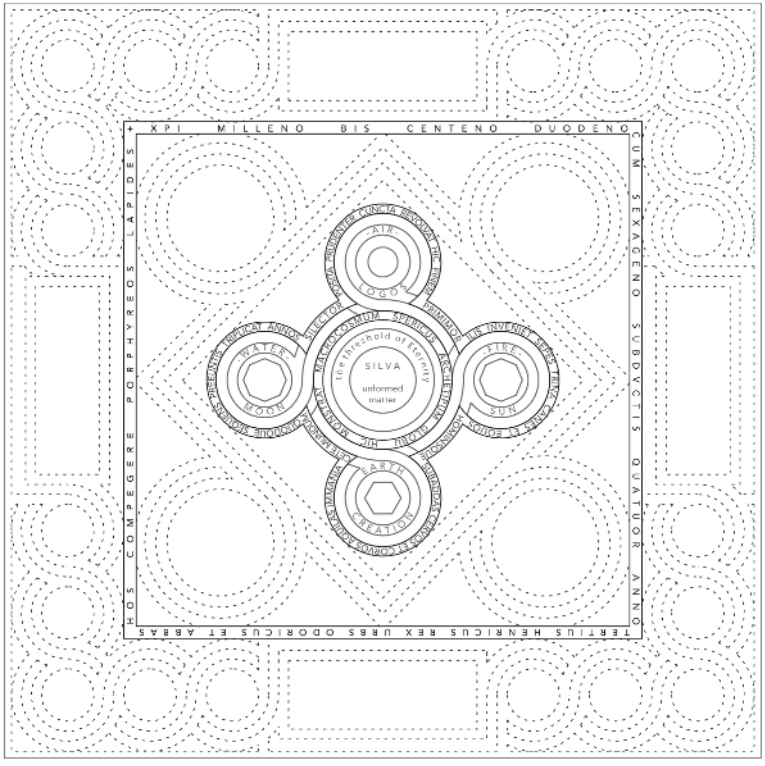
> And as an island rises amidst the waves of the sea … while the travellers are gladdened by it … so in the midst of the boundless temple rises upright the tower-like ambo of stone adorned with its meadow of marble, wrought with the beauty of the craftsman's art … it rather resembles some wave-lashed land … Projecting into the watery deep.[19]

The watery floor lying under the celestial sphere of a golden dome 'is a simulacrum of God's separation of the waters in Genesis 1:2–8': 'And the spirit of God moved upon the face of the water … and God made

Cosmati Pavement, Westminster Abbey, London, 1268
The Cosmati or Great Pavement of the sanctuary at Westminster Abbey, seen normally in anamorphic perspective by the human eye, centred on an onyx disk representing the unformed matter of a cosmic beginning.

the firmament, and divided the waters which were under the firmament from the waters which were above the firmament … And God called the firmament "heaven".'[20]

Turning westwards and northwards, unexpectedly perhaps to London, we find one of the greatest masterpieces of pavement crafting in the so-called Cosmati Pavement in the sanctuary of Westminster Abbey. Like the floor of the Hagia Sophia, this work has attracted intense interest, and an extensive bibliography of primary and secondary sources exists. I was first drawn to it as a rather mysterious presence because it was covered by carpet and was ceremoniously uncovered for a day in the year and for regal occasions like coronations; thankfully it has recently undergone an exercise in conservation, and since 2010 has been permanently on view to public scrutiny.[21] The pavement has been attributed with medieval mystical significance throughout its history. According to a 15th-century monk at Westminster Abbey, Richard



Eric Parry Architects, drawing of the Cosmati Pavement at Westminster Abbey, London (1268), 2013
The drawing incorporates Richard Foster's interpretation of the original Latin inscription set in brass letters as well as of the intended meaning, from Foster's 'Symbolic schema of the pavement's central quincunx', published in his *Patterns of Thought* (1991).

Sporley, the pavement and its inscription symbolised the world, or the universe, and its end.[22] In 1991, a book devoted to the history and meaning of the pavement was published entitled *Patterns of Thought: The Hidden Meaning of the Great Pavement of Westminster Abbey*, by Richard Foster.[23] The work has been identified reasonably conclusively to Italian craftsmen belonging to a group known as the Cosmati. The families involved with this signature form of ornament, used both for architectural artefacts like ciboria, tombs and candelabra, as well as for pavements, were active for about two centuries. Their work involved the cutting of stone 'opus sectile', as opposed to the mosaicist's craft of placing small units of the same size, usually square. The materials the Cosmati used were a mix of marbles, limestones and granites, often local, with their trademark green and purple porphyries and other rare stones reused from ruins of classical buildings, and notably during this period unavailable because the source quarries had been lost to contemporary medieval use.

The Mnemonic Device

The immense mnemonic capacity of a pavement is vividly illustrated by two final examples: the ongoing Europe-wide Stolpersteine project by artist Gunter Demnig, and the plan formed by pilgrims' repeated passage around the sacred water basin of Banganga Tank in India.

The latter is situated at the centre of the village of Walkeshwar, one of the seven islands joined over the last two centuries to form the metropolis of Mumbai. The site has been a point of pilgrimage for about a thousand years and its legendary origin is based on an episode in the epic tale of Rama Dasarathi, the seventh reincarnation of the god Vishnu. A stepped water basin hewn out of the basalt rock is a composite derived from *bana* (arrow) and *ganga* (sacred stream). When Rama arrived at Walkeshwar he was thirsty from his travels, so he took an arrow and shot it into the ground. Water sprang forth and he drank; the spring he created is the course of Banganga Tank rising on the northeast corner. It is thus a *tirtha* (place of pilgrimage), and once the religious significance is understood the formal topography becomes clear.

The approach to Banganga is by a street known as Ladder Street, and at the top of the hill above the village the circumambulation of the sacred waters of the tank begins, proceeding in a clockwise direction. It is immediately clear

Banganga Tank (first built 12th century, reconstruction 18th century) and Walkeshwar village, Mumbai, India: site plan
At the centre is the rock-cut stepped water basin, and surrounding it a dense grouping of temples and sacred landscapes of many different scales that are ranged along the circumambulatory path of pilgrims.

from the plan that all the buildings – mainly hostels, temples and a multitude of shrines – relate to this rite of passage. The route is intended to reveal and incorporate all the aspects of the divine and represents the lifelong journey and all the various qualities of manifest divinity, by participating in which the pilgrim can obtain *moksa* – final release. Walkeshwar is built and understood as the *imago mundi* – a microcosm. At the centre of the tank and the circumambulation rises a wooden pole located on a stone base which is the *axis mundi* of this microcosm, with the tank representing the cosmic ocean. The pole symbolises the great rod fixed to Vishnu the turtle's back, which the gods struggled over and so churned the ocean to create the ordered world. The slopes are negotiated by street-wide cut steps. The surface is made of accumulated dust like a makeup over the natural stone bed, all living material – an animated world of libations and purificatory rites.

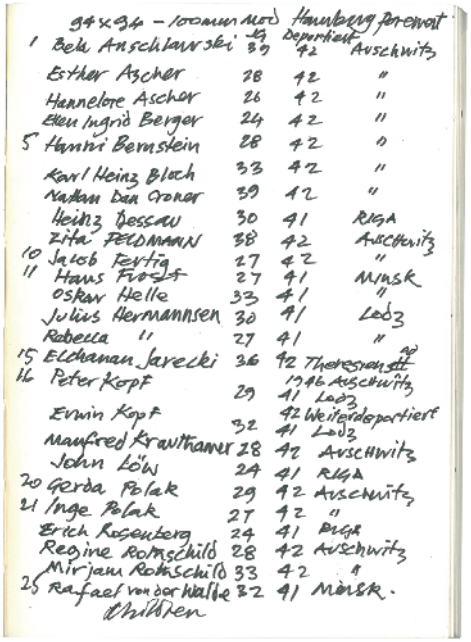
The other example is the Stolpersteine (literally meaning 'stumbling stones') project conceived by the Cologne-born artist Gunter Demnig. Begun in 1995, it consists of non-ferrous alloy cubes with 94-millimetre (3¾-inch) sides (to fit

a 100-millimetre (3⅞-inch) grid), each stamped with a first and family name, date of birth and date of deportation and standing in front of the building in which the particular Holocaust victim lived.

It is harrowing when the glint that appears at first sight as merely decorative becomes understood as a physical manifestation of such a tyrannical clinical atrocity. The extraordinary project is extending like a cleansing stain across Europe, most recently in Rome. Nowhere in my urban wanderings has the feeling of nausea been more marked than in a side alley named Martin-Luther-King-Platz in Hamburg – now a patch of pavement between an underground car park entrance and a service yard off the fast-paced Grindelallee in Hamburg's Eimsbüttel district, on the edge of a leafy university quarter – where, almost like a gaming board, 31 of these 'stumbling' blocks are placed with one that states:

Hier stand ein
jüdisches
WAISENHAUS
BIS 1942
[Here stood a Jewish orphanage until 1942]

Gunter Demnig, Stolpersteine, Martin-Luther-King-Platz, Hamburg, Germany, 1995
A harrowing example of the Stolpersteine ('stumbling stones') project by artist Gunter Demnig, started in 1995 in Cologne, now present throughout Germany and being picked up in other European countries. Each named cube, with sides measuring 94 millimetres (3¾-inches), represents an individual deportation to the Nazi extermination camps.



Eric Parry, personal annotations, Hamburg, Germany, April 2012
A list of the Holocaust victims from the Jewish Orphanage in Martin-Luther-King-Platz, from my notebook.

Twenty-five children between the ages of three and eighteen and six adults between the ages of 32 and 51, deported in 1941 and 1942 to certain death, before the harrowing bombing of the city that eradicated so many buildings in July 1943.

With so many other tantalising examples unexplored because of limited space, at least between the Boyle Family and the Waisenhaus the significance of the palimpsest of urban life understood through the pavement stands as a reminder against the tide of asphalt neutrality. The necessarily planimetric focus of this chapter on the surfaces of the ground has nonetheless hints of the perspectival results: the reflectivity of Lisbon's streets; the anamorphic character of a Cosmati pavement; the mesmeric reflection of Proconnesian marble slabs in the Hagia Sophia. Now, raising our gaze leads naturally to the next chapter: 'Horizon'.

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2. Charles Dickens, *Our Mutual Friend* [1864–5], Modern Library (New York), 2002, passim.
3. TS Eliot, *The Waste Land* [1922], in *Selected Poems*, Faber and Faber (London), 1969, p 53: lines 60–63.
4. Álvaro Siza in conversation with the author, Porto, September 2011.
5. Álvaro Siza, personal letter to the author, 25 February 2013.
6. Voltaire, *Candide or Optimism* [*Candide, ou l'Optimisme*, 1759], translated by Peter Constantine, Modern Library (New York), 2005, p 16.
7. The term *jaula* employed by Siza means 'animal cage', as opposed to the original phrase *gaiola pombalina*, where *gaiola* means 'bird cage'. The phrase *gaiola pombalina* has traditionally been used to describe this structure, in possible reference to the original 18th-century scale models. Ironically, *pombal* means 'dovecote', from which follows that *gaiola pombalina* would mean literally 'Pombal's bird cage'.
8. Jorge Sampaio, President of Portugal, 'Speech at the Netherlands Architecture Institute' (Rotterdam, 1997), quoted in Álvaro Siza, Dominique Machabert, Emílio de Santiago *et al*, *The Reconstruction of the Chiado: Lisbon*, ICEP (Porto), 1997, p 9.
9. Siza, Machabert, De Santiago *et al* 1997, p 120.
10. Richard Edlund and Örjan Molander, *Stortorget, från brunn till P-mätare*, Kalmar Läns Museum (Kalmar), 1998.
11. In Helena Mattsson (ed), *Kalmar Stortorg: Art/Architecture in Urban Space*, The National Public Art Council Sweden, 2005, p 132.
12. *Ibid* p 155.
13. *Ibid*.
14. William Lethaby, *Architecture, Mysticism and Myth*, Percival (London), 1891 and *The Church of Sancta Sophia, Constantinople: A Study of Byzantine Building*, Macmillan & Co (London), 1894.
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16. *Ibid* p 214.
17. For an excellent interpretative and searching essay see Fabio Barry, 'Walking on Water: Cosmic Floors in Antiquity and the Middle Ages', *The Art Bulletin*, vol 89, no 4, December 2007, pp 627–56: http://www.jstor.org/discover/10.2307/25067354?uid=43145&uid=3738032&uid=2129&uid=68&uid=2&uid=70&uid=3&uid=43144&uid=62&sid=21101867176127 (accessed 19 November 2014).
18. *Ibid* p 627.
19. *Ibid* p 647.
20. *Ibid* p 634.
21. For further information on the conservation of the pavement see: http://www.westminster-abbey.org/conservation (accessed 19 November 2014).
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23. Richard Foster, *Patterns of Thought: The Hidden Meaning of the Great Pavement of Westminster Abbey*, Jonathan Cape (London), 1991.