siteLINES

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Letter from the Editor

Landscapes of stone? Stonehenge: a prehistoric circle of megaliths; Egyptian pyramids and temples, rising stark and colossal from the desert; the Athenian acropolis towering above the Agora; Japanese and Chinese gardens; grottos; squares and plazas. All of these landscapes are man-made, some melded with nature, others quarried, carved, and constructed in their entirety. Their chief defining characteristic is durability, for rock outlives flesh – to the point that landscapes and structures made of stone are sometimes all that is left as material evidence of past cultures.

In his essay in this issue, "From Suzhou to Malibu: The Power of Stone in Landscape Design," the landscape architect Laurie Olin considers how past and present designers have made stone an essential element in their work. The mineral material underlying the built world, on the other hand, speaks of the macro-landscape – a product of cosmic forces operating on a vastly greater time scale. In my essay "Bedrock, Sand, and Water: The Geological Landscape of New York City" I attempt to describe these primordial processes of Earth's formation from a local perspective.

We worry, as we should, about the effects of a warming planet and bizarre weather turbulence on the lives of the eight million human inhabitants who call New York City home. But such concern only takes into account the tiniest, fractional part of a much larger, longer, and ongoing story of ice ages alternating with global warming and rising sea levels. Although the city's coastal reconfiguration allows us to perceive the effects of geology within the span of a single generation, it is nearly impossible for most of us to comprehend deep time – the millions upon millions of years that formed, eroded, re-formed, and again eroded the mountains whose roots are the rock outcrops found in Central Park and other city parks. That their surfaces bear grooves and scratches marking the passage of a two-mile-tall wall of glacial ice that scoured and polished them a few thousands of years ago is another cause for wonder. Talk about climate change!

Christa Sadler tells another geological story in "House of Stone and Time." A professional river guide, she rafts us in words on an imaginary trip through the Grand Canyon. A geologist by training, Sadler can speak with expertise about the processes that formed the extraordinary topography of the canyon's river-carved walls, which are banded by layer upon layer of sedimentary strata. But she proves herself something other than a scientist when she quotes the poet Alfred Bryan, who characterized this mind-boggling slash in the American desert landscape as "ten thousand cathedrals rolled into one." For Sadler, this confining landscape of towering walls is a never-ending wonder, and yet one that has become almost domestic through long familiarity.

In "Designed and Written in Stone: Four Freedoms Park and the FDR Memorial" landscape historian and author John Beardsley writes about the cut blocks and elegant geometries of Louis I. Kahn's final commission, recently realized forty years after it was designed for the southernmost tip of Roosevelt Island. Here pale granite is used to create an elevated platform for a greensward approached by imposing stairs; steeply canted walls defining a perimeter promenade; and a roofless, three-sided "room" enshrining an inscription – the resonant words of the wartime president's Four Freedoms speech. The view from the memorial is that of another landscape of stone: the memorable skyline of New York City.

On her home ground in rural Virginia, Carole George nourishes a spiritual relationship with the land. In this issue's Place Maker essay she writes about the inscribed stones she embedded into a hillside, a task undertaken in intimate dialogue with the site. George's project brings to mind Ian Hamilton Finlay's "Little Sparta," a garden of allusive words incised upon stones and structures that arrest the eye within the rolling sheep-studded landscape of southern Scotland. But whereas Finlay's rock-inscribed words are metaphorical, classicizing, and often polemical, hers are oracular and existential, an expressive articulation of ten qualities of being: character, simplicity, discipline, unity, harmony, restraint, boldness, solidity, délicatesse, and consecration.

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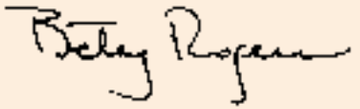
With good green wishes,



Elizabeth Barlow Rogers
President

On the Cover:
Late afternoon on the Colorado River in Marble Canyon, Grand Canyon National Park.

Note

Although the Foundation for Landscape Studies is committed to publishing *Site/Lines* in print format, our reconfigured website allows us to build out its contents in new ways.

All back issues are still available in pdf format, but now our Gallery page will allow you to view photographic slide shows associated with various essays.

In addition, the website now contains a blog. This feature allows us to publish electronically more book reviews and topical articles than is possible within the numerical page constraint of a print issue. Please use the footer on the home page or the appropriate tab on the navigation bar to access reviews and other blog posts of interest to you.

We welcome your suggestions regarding further ways to expand and enhance our publishing outreach!

Native Ground, Architectural Substance: Landscapes of Stone

From Suzhou to Malibu:
The Power of Stone in Landscape Design,

When we contemplate nature, it is difficult not to think in terms of metaphors and similes: water is the blood of the earth; stones are the bones; soil and plants are the flesh. And we are like the clouds that drift across the moon or the leaves that are blown from the trees in all their colors, leaving bare branches against the sky of approaching winter. But earth and stone remain.

Stone, the mantle of the Earth, underlies everything everywhere and forms the topography of the lands on which we make our homes. Poets and painters, architects and landscape architects, garden designers, and builders all over the world have considered, sought out, confronted, and worked with stone: with boulders, rocks, and pebbles, whether cut, uncut, cleft, carved, or tumbled; with stone of every size, shape, color, and density; and with sand, stone's crushed or finely ground remains. Stone is fundamental, utilized throughout human environments for thousands of years.

Chinese scrolls and paintings early displayed a keen recognition of stone's absolute and obdurate nature. In the superb ink depictions of the Northern Sung and Jin Dynasties, like the *Streams and Mountains Without End* scroll now in the Cleveland Museum, human beings and their activities take place against a vast geological extravaganza of mountain ranges, cliffs, cataracts, and coastlines. Summer palaces are wedged between soaring peaks and fishermen's boats are tucked into inlets far below, while clouds and rain swirl in and around heaving masses and towers of stone.

Chinese scholars and political figures also collected stones and incorporated them into their gardens to evoke such imagery. Connoisseurship of rock and stones – their form, arrangement, and character – eventually produced a considerable literature, ranging from poetic treatises to how-to manuals on painting and garden construction. Some of the most revered gardens in China were created from the fifteenth through the eighteenth centuries in Suzhou, and many of these incorporate large and dramatic compositions of eroded limestone rocks extracted from nearby Lake Tai.

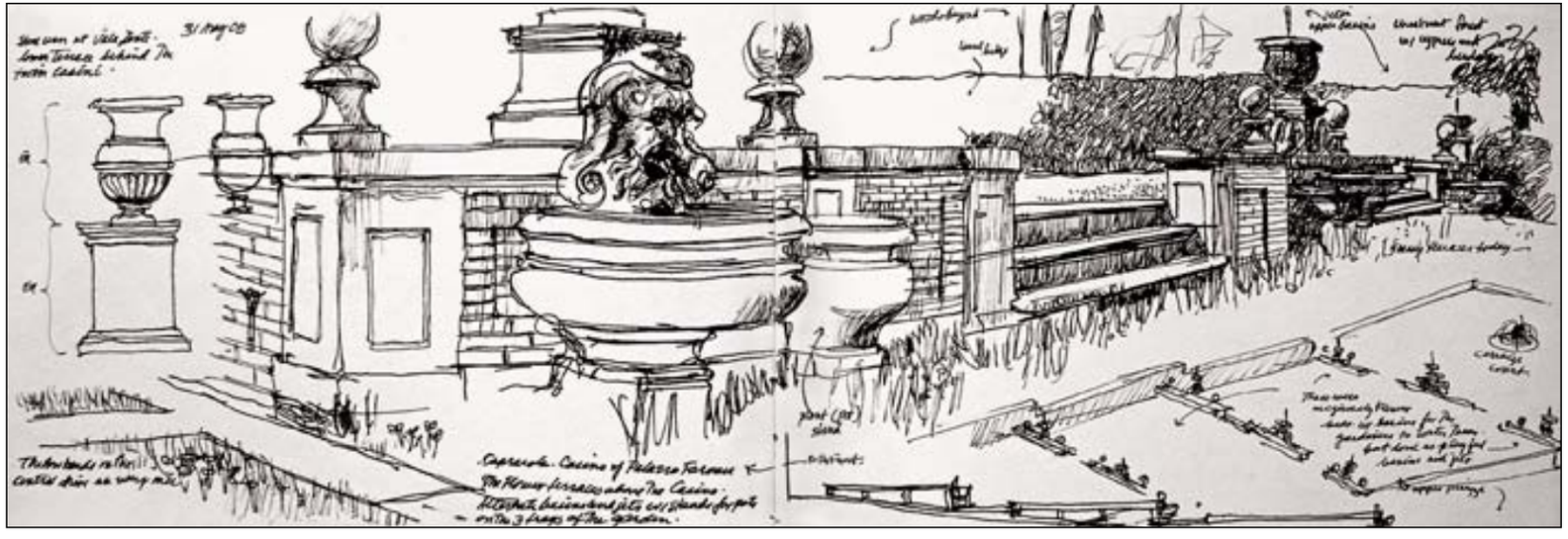
One of the most famous and impressive is the Lingering Garden, which contains what may be the single most famous stone in the country. This is the Cloud Capped Peak, a tall, menhir-like piece of bizarrely eroded karst that stands in a courtyard between two pavilions, affording each a markedly different perspective. Another superb example of this aesthetic is that of the nearby Lion Grove garden, which possesses an enormous rockery composed of dozens of upright stones ("lions") standing in a pool; as one travels the twisting paths around it, small caves and tunnels reveal themselves among the numerous outcroppings and recesses. Gardens such as these served as models for several built later by the Qianlong emperor: at a number of villas west of the Forbidden City; at others further afield at Yuan Ming Yuan; and at his summer palace at Chengde, in lower Mongolia.

From very early times many cultural practices, ranging from Buddhism to metalworking, were imported from India and China to Japan, where they would then evolve in fresh and sophisticated ways. Despite Buddhist tenets of asceticism, a latent animism from ancient Shinto beliefs seems to have predisposed many Japanese artists, designers, connoisseurs, and spiritual leaders to perceive and express the essence or spirit of things, especially from the realm of nature. The koans and haiku by Basho and Issa and the flung-ink drawings by Zen monks like Sesshu exemplify both an urge toward refinement and abstraction and a direct expression of the material properties of the physical world. This tension also produced some of the most stunning gardens in history, and their principal element – sometimes their only element – was stone: natural and raw; cleft, carved, shaped, and shattered; raked, swept, and piled. Kyoto has one of the most outstanding collections of important gardens in the world, displaying a broad range of expression and form. Many of them were created for members of the Imperial court and are associated with palaces, villas, and country retreats, but a number of the most admired, such as Ryoan-ji and Daisen-in, were developed within monastic enclaves.

In Kyoto, as in Suzhou, stone is key. One first encounters it on approaching the gardens: as the base for stucco walls and drain channels. Next, one inevitably finds a handsome threshold of granite while stepping through a gate into the garden itself, where a path of beautifully fitted and perfectly placed stones awaits. Sometimes it might be a carpet of tightly set, irregular shapes fused into a dramatic strip; elsewhere, even within the same garden, slabs may be irregularly clustered or scattered, causing the visitor to consider each

Rockwork forming a mountain composition by a pond of a former imperial villa on the grounds of Tsinghua University, Beijing. (Drawings by the author.)

footstep, newly aware of his or her progress. In some gardens, rocks exist almost solely as a vehicle to support the growth of mosses; in others, they form the edge or shore of a pond; in still others, they have been used to create miniature versions of familiar yet distant mountains, cliffs, and bays. The serene stretch of beach at Sento-gosho, made of polished black stones, is a reference to a beloved spot on the coast of Honshu. The arrangement of rocks within the rectangular gravel court at Ryoan-ji has been likened to a representation of the archipelago of Japan itself; it has also been compared to the swirling cosmos and its planets.



Stone construction details for retaining wall with steps, basins, plinths, and urns at the Villino of the Palazzo Farnese at Caprarola.

If the nature of stone – stone *as nature* – is the paramount leitmotif in Asian gardens, then the articulation of stone in gardens *as architecture* is a Western phenomenon. One way to gain insight and feeling for classical gardens – at least those of premedieval urban and suburban villas – is to study those of Islam. In the gardens of Spain, Morocco, Tunisia, Egypt, Syria, and Turkey one finds geometric stone pavements, marble fonts and basins, and polychrome mosaics that perpetuate the elements and materials of the ancient gardens that inspired them.

Caesar Augustus supposedly remarked late in life that he'd found Rome in brick and left it in marble. Certainly in the first and second centuries, Roman structures made of brick and concrete and clad in marble – temples, palaces, apartment blocks, theaters, baths, monuments, and public toilets – were ubiquitous. The city's infrastructure (street curbs, aqueducts, public water basins) was of cheap, rough travertine from near Tivoli, whereas finer-grained marble for monuments and architectural detailing came from the Alps near Carrara or from Greece and Asia Minor. Similarly gardens, whether private havens or public precincts (like the ones that accompanied public baths), were furnished with various architectural and sculptural features in marble as use and clients demanded.

Even today one can still see remarkable stone pavements and architectural fragments of poolside pavilions in situ at Hadrian's Villa or Domitian's Palace on the Palatine. Likewise, at Pompeii and Ostia, stone *impluvia* over cisterns in numerous atria and *triclinia*, as well as scattered bits and pieces of worked stone, tell us that these were finely decorated outdoor rooms. There were also fountains, basins, pavements, railings, pavilions, seats, and sculpture of all sizes and sorts. The latter included wild animals, major and minor deities, figures and tableaux from myth and religion, heroes, athletes, and portraits of family members and rulers. Many of these statues were produced in quantity in workshops in Greece and Turkey and shipped throughout the empire to wealthy customers. For centuries to come, these imperial gardens were treated as quarries and treasure chests to be plundered for art objects and materials.

This panoply of stone was revived and repurposed in the Italian Renaissance, in large part by the Church for its structures and by powerful families throughout Italy and beyond for their homes and country residences. One cannot think of Italian gardens without thinking of their terraces and ledges, parapets, railings, urns, colonnades, pavilions, grottos, fountains, basins, and sculpture, all fashioned of, or trimmed with, white marble, the whole of which is set off by dark evergreen hedges and trees. Underfoot are brick and gravel, edged with stone bands. It is a realm of plants, stone, water, and sky, often enhanced by flowers, herbs, and birds. But, along with the grading of the earth, it is stone that establishes the structure, the armature for the rest. Stone provides the frame, the bones of these gardens.

Many of the fundamental structures, whether humble curbs or ambitious grottos, were made of tufa, a volcanic rock formed from deposits of ash and cinders; honeycombed with air bubbles, it is light, cheap, and easy to cut. Basalt, however, another popular volcanic rock, is a product of unimaginable heat and pressure; it is among the densest of stones. Difficult to work but extremely durable, it is split into small cubes and elongated blocks that are ideal for street cover. The glistening, dark grey pavements of the Piazza Navona are grey basalt with white travertine curbs and drains.

Everyone has favorite places that are largely made of local stone. Few compare to the remarkable garden at the Villa Lante in Bagnaia, with its urns, basins, fountains, and statues on multiple levels, including whimsical stone boats with dwarves firing muskets that once served as spouting jets. Above these is a sculpture of Roman river gods and a witty crayfish between diminutive obelisks terminating the *catena d'aqua*, an abstraction of a mountain stream in the form of links in a chain. Nearly all of these fabrications are of a native, locally quarried stone that is mottled both by the nature of its origin and the attractive lichens that favor its chemical makeup, rendering the entire ensemble a perfect counterpoint to the dappled shade and bark of the plane trees framing it. Another favorite stone creation of the late sixteenth century is the valley garden at Bomarzo, with its dreamlike carvings of phantasmagoric creatures, partly cut in situ from ledges of bedrock and partly built on top of them.

In seventeenth-century France, André Le Nôtre did not use less stone in his gardens than the creators of Italian Renaissance gardens, but he created on such a large scale that the basins and ramps and urns and sculptures seem less obtrusive in the bravura sweep of it all. And yet the entry sequences to Versailles and Chantilly are entirely of stone. Stone cobbles, bollards, and walls; crunchy gravel, stone statues, and urns give way to stone buildings, terraces, and overlooks. Beyond, in the parks and gardens, are stone basins, fountains, stairs, and sculptural groups in stone settings. And yet there one's eye is drawn to the blues and greens. Broad sweeps of gravel lead to expanses of turf grass, rows of regimented trees, hedges and fountains, and vast sheets of water.

In numerous instances Le Nôtre built his retaining walls of rough stone or rubble, facing or dressing them with clipped hedges and then adding a crisp, architectural, limestone cap above the green to hide the unsightly walls. (In France one finds that almost all structural stone, whether in a soaring cathedral or a garden stair, is hard limestone; the region is blessed with several particularly handsome varieties.) Likewise he fashioned a number of canal and basin walls of roughly dressed stone with open joints, such as those at Sceaux, to allow ground water to seep in and out of the basin without destroying the walls with lateral pressure. The constructions have worked superbly for the past three centuries, needing very little repair.

Stone and rock have been at the heart of American landscape art and appreciation since the end of the eighteenth century; they are intimately bound up with the aesthetic of the picturesque and sublime. After Thomas Jefferson purchased a parcel of land in Virginia that contained a natural limestone bridge in a gorge, he built a retreat and took guests to see the stone span, describing it as "the most Sublime of nature's works." Paintings by Thomas Cole, Frederick Church, Jasper Cropsey, John F. Kensett, Martin Johnson Heade, Sanford Gifford, Albert Bierstadt and others celebrate equally dramatic cliffs, hills, and rocks in the Hudson River Valley and Appalachian Mountains, and along the New England coast.

A supreme example is Asher Durand's *Kindred Spirits*, which depicts William Cullen Bryant and Thomas Cole standing on a ledge above a precipice, with a waterfall identified by some as Katerskill Falls emerging from the Catskill Mountains in the distance. Cole is gesturing toward a dramatic rock outcrop across the gorge, as if he is presenting this rugged American landscape as an epitome of natural beauty; as a sort of paradise to be studied, preserved, and emulated in art and design.

Certainly such a notion was familiar to Frederick Law Olmsted and Calvert Vaux when designing Central Park and later Prospect Park, both of which exploit natural rock features to maximum dramatic effect. In Central Park, considerable effort was expended to remove soil and glacial alluvium to reveal rock outcrops, and glacial boulders were arranged for dramatic effect throughout the length of the park. The more rugged, northern portion of the park was designed later and, like Prospect Park, shows the powerful influence of Olmsted's stint working for the Mariposa Company near Yosemite in the 1860s. One has only to look at Boulder Bridge and the Ravine to recognize this as a vision of rugged wilderness. Its lithic mood reveals Olmsted's increased appreciation for stone in its rugged, undressed state, a park element he sought to provide as a rustic counterpoint to the surrounding urban architecture of cut and carved stone.

While artificial grottos were not uncommon in English gardens in the late-eighteenth and nineteenth centuries, they were mostly fabrications reminiscent of Italian precedents – themselves inspired by seaside cliffs and caves of rough and eroded tufa, carved by wind and water and encrusted with seashells and coral. There is none of this in the work of Olmsted and Vaux. Instead we see their enthusiasm for the gneiss and schist of Manhattan and the moraine left by the retreating Wisconsin glacier on Long Island, and it is not fanciful to read particular aspects of these pathbreaking parks as evocative of the valleys and mountains of New England.

Throughout the nineteenth and twentieth centuries, photographs and paintings of the American West (by Albert Bierstadt, Thomas Moran, and Carleton Watkins in the Rocky Mountains, Grand Canyon, Yellowstone, and the Sierras) continued to stoke the national appetite for dramatic geologic formations. So did the investigations and writing of John Muir, who realized, after years of climbing about California's heights and valleys, that the spectacular valleys of Hetch Hetchy and Yosemite had in fact been carved by glaciers.

Beyond the pleasure experienced by nearly every child throwing stones – whether as far as possible or merely into water, to see the splash and hear the plunk – I have noticed rocks and stones as far back as I can remember. Still, while playing in gravel pits and ponds near construction sites as a boy and wading through boulder-strewn glacial streams to fish or explore as a teenager, I didn't really ponder the nature of my feelings toward rocks. They were just there wherever I went, in the form of mountains or bluffs or the surface beneath my feet; simply part of the scene.

It was in college, as a design student, that I began to consider rocks and stone as a subject in art and a material for architecture and building. Photographs of Japanese gardens and Frank Lloyd Wright houses put the uses of stone squarely in front of us. Following history classes filled with Doric, Ionic, Corinthian, Romanesque, and Gothic masterpieces – all made of stone that was dressed and worked one way or another – my classmates and I began to scrutinize the monumental works of the nineteenth-century American architect H. H. Richardson, master of the use of rusticated stone in the neo-Romanesque style, and the twentieth-century Finnish modernist architect and designer Alvar Aalto. We weren't directed to study the awesome and intricate work of the Mayans, Aztecs, and Incas – my generation had to find those on its own – but they only added more weight to our sense of stone's profound universality and our need to master, or at least become conversant with, its use and the issues involved in working with it.

Stone was an essential ingredient in many of the creations of the Prairie School – epitomized in Wright's masterpieces at Taliesen and Fallingwater. The horizontal bedding planes of the local limestone formations were recapitulated in his houses by layers of stone coursing, and echoed in pools, basins, and walls by landscape architects Jens Jensen and Alfred Caldwell. These men produced a unique indigenous Midwestern design vocabulary, which grew out of their response to the land itself. With its overtones of Japanese art and architecture, their aesthetic was quite different from the European one that had been adapted by Richardson and the Olmsted firm for their craggy and somewhat heroic rock-faced bridges, retaining walls, and buildings.

All of these designs, however, had one thing in common: their structures were clearly composed of two opposing yet complementary parts. One was from and of the earth, made of carved and stacked stone. It was heavy, a companion to the damp soil and water that often surrounded it. The other was drier and lighter – linear, planar, and more fragile. It was made of wood, metal, cloth, and glass, and sat atop and within the first. There was a yin and yang about these two halves. This tension recalls the traditional architecture of China and Japan, where wooden structures have sat upon stone bases for millennia, and great attention is paid to the moment of meeting, placement, and joining.

Throughout the twentieth century, artists and landscape architects have continued to explore the nature of stone and

its potential relationship to its outdoor surroundings. Constantin Brancusi, arguably the first person to create truly abstract sculpture, used stone extensively in his Endless Column Complex, a First World War memorial he designed for his homeland, Romania, in the 1930s. This monumental outdoor ensemble in Targu-Jiu, which commemorates the soldiers who died defending the capital, includes two enormous pieces carved from travertine: the Table of Silence, which resembles an enormous millstone surrounded by stone stools, and the carved Gate of the Kiss. Barbara Hepworth and Henry Moore, inspired by Brancusi's example and haunted by the Bronze Age megaliths of Brittany and the British Isles, proceeded to create superb works in stone intended for public spaces, plazas, and parks. Moore went so far as to create a work that stands on the moors and is intended solely for sheep to rub themselves against.

Field sketches of a marble boulder to be used in a fountain at the Getty Center in Los Angeles; note the scale figure.

Many of the finest works of a subsequent generation of British artists that includes Andy Goldsworthy and Richard Long are made of fieldstone, slate, and the debris of shattered formations, carefully arranged in the landscape or in art galleries and museums. Goldsworthy openly acknowledges that works such as his superb installation at Storm King Art Center, *The Wall That Went For a Walk*, have grown out of the traditional, dry-laid stone walls and huts of the Cotswolds and the north and west of England. Long, working with thin pieces of broken stone, has repeatedly created beguiling compositions of circles or lines on the floor or ground. It appears as if the stones have drawn together through some force of attraction or gathered instinctively like a flock of birds – with a common purpose that is both natural and cosmic.

The enormously influential sculptor Isamu Noguchi, who fused a thoroughly modernist sensibility with a Japanese aesthetic, approached the art of landscape design largely through the use of stone. Noguchi once remarked, "Stone is the direct link to the heart of the matter – a marvelous link. When I tap it I get an echo of that which we are. Then the whole universe resonates." The primacy of this material for him was already dramatically clear in the first version of his garden for UNESCO in Paris (1956–58). Although enlarged today and softened by the growth of plants and trees, it is a serene and sensual landscape with stone that has been carved, fitted, and arranged alongside natural rocks that the artist carefully selected and brought from Japan. Noguchi would continue to work with the motifs displayed here – stone circles, pyramids, cubes, standing figures, and slabs – for several decades, while developing the ground and shaping the spaces that host them.

From the mid-1950s through the 1960s he received a number of commissions to create garden and courtyard spaces, several from the prominent firm of Skidmore, Owings & Merrill. One of the earliest was the courtyard garden at the Bienecke Rare Book Library at Yale University. This brilliant, sunlit space consists of a pure white Vermont marble floor and three objects: a pyramid, an upright circle of stone, and a cube standing on one of its corners. Noguchi has said that the pyramid represents earth, or matter; the stone circle symbolizes the sun or cycles of "ring energy"; and the dramatically poised cube – carved with mysterious notches and lines and resembling a giant die in mid-tumble – stands for science and art.

Sunken Garden, one of the absolute best of Noguchi's commissions, is in a circular court at One Chase Manhattan Plaza, in the financial district of New York (1960–61). An essay in stone and water, he openly referred to it as "my Ryoan-ji." Viewed from either the plaza above or from the banking hall adjacent to it, this work consists of pale granite setts in an undulating plane, with languid, curving joints that vaguely conjure force fields and notations of longitude and latitude on a globe. A number of jagged, handsomely eroded boulders from the bottom of the Uji River in Kyoto are arranged on this circular plane's highest points: in summer, when the garden becomes a fountain, these rocks suggest islands; in winter, planets. It is a genuine masterpiece – evoking, as its creator intended, one of Japan's most profound works of art and landscape. I don't know a landscape architect who has seen it and not admired its greatness.

In 1995, when I was working on the Getty Center in Los Angeles with Richard Meier, I had forgotten many of these associations; they had settled down into the depths of my memory like some sedimentary deposit, waiting to be brought unexpectedly to the surface by an underground stream. I was, however, thinking vaguely of Nicola Salvi's Trevi Fountain and Bernini's work at the Piazza Navona, because we were developing a number of fountains and each was to have a different character, depending on its situation within the complex.

The buildings were to be clad in white travertine from the quarries near Tivoli and Hadrian's Villa. For the pavement, it was decided to use some of the stone referred to as barco, which was being rejected for the facades due to the occasional presence of minerals that gave it a rosy or light tan tint. The basins were to be made of both the white stone and barco. For one large central basin that was to be circular, I decided that it would be nice to incorporate natural boulders amid some vertical jets – in part, simply for the contrast and, in part, because of the long tradition of rustication associated with fountains in classical and baroque Rome.

After a year-long search, we finally located a source of native marble boulders in the foothills of the Sierras near

Columbia, California. This stone had originally been created by the collision of two tectonic plates – the Pacific plate and the one containing the American continents – a slow-moving but intense event that uplifted the great chain of mountains running from southern Alaska into northern Mexico and melted portions of the ancient seabed. Far more recently, the marble had been brought to the surface by local mining during California's Gold Rush, which produced gigantic piles of waste rock. The stash of travertine boulders in the woods of Columbia was essentially a boneyard left behind by the forty-niners, well over a century earlier.

I went to examine them. Some of the boulders had been taken to a local stone yard; others were still in the woods. They were marvelous – stream-washed and fantastically eroded. I was overjoyed. I also learned that the mining camp that had unearthed them had experienced one of the first terrible race riots in the West, between its Anglo and its Chinese laborers. In sum, these rocks represented both the natural and cultural history of the place. They seemed perfect.

I made a number of sketches of the most interesting stones while there and began composing an arrangement on the plane ride back to Los Angeles. A few weeks later, we returned to create a full-size mock-up in the woods, moving and adjusting the stones with a small crane on the back of a truck. After taking Meier, the contractor, and the Getty's director John Walsh to see this grouping in a driving rainstorm, the design was approved and the entire ensemble was moved and reassembled in the museum's courtyard.

I was surprised, after the museum opened, when a newspaper critic wrote that the fountain was based upon oriental art. The paintings of China and Japan and the rock work of Suzhou weren't on my mind at all when I was making it. And yet, of course, it was all there in my unconscious, waiting to be disturbed – the scrolls, the gardens, my experiences in the mountains and bays of the Northwest, my fondness for Noguchi. This experience also served as a powerful reminder of the potential stimulus for the creative imagination that unfiltered contact with primal phenomena can offer.

For me, today, the fountain has many connotations. Metaphorically, it is as if the top of the mountain upon which the institution sits pokes up through the circle of the fountain's basin – like a bill spike fixing the architecture in place. It also evokes, for those who know it, the history of California. Even more importantly, however, the dramatically shaped boulders represent the raw material from which the architecture is made – Nature, from which all of life comes. – Laurie Olin

Bedrock, Sand, and Water: The Geological Landscape of New York City

Sometimes I am asked what my favorite place in Central Park is, a question to which there is really no answer. The park is about circuitous movement through a sequence of scenes orchestrated by its designers, Frederick Law Olmsted and Calvert Vaux. The modeling of the park's terrain into gently swelling hills and broad, flat meadows; the creation of its beautiful artificial lakes, streams, and ponds; and the construction of its infrastructure of transverse roads, pathways, and bridle trails provide an unparalleled demonstration of the sophistication of nineteenth-century engineering technology put in the service of a naturalistic landscape ideal.

But not all of Central Park is manmade. Nature played a singular role, too, one that Olmsted and Vaux were wise enough to take into account. The ingenuity of their plan, with its imaginative orchestration of scenically varied parts, capitalizes on a powerful natural feature: bold outcrops of Manhattan schist bedrock. Elsewhere, outside the park, bedrock protrusions were blasted away to make the ground plane an almost level surface able to accommodate a grid of streets and avenues; however, within the park, the rock outcrops were treated as important design elements in the landscape.

I love these great elephantine protrusions. Some define the shoreline of the Lake; others guide the alignment of a path or provide a vantage point for viewing the surrounding landscape – as names such as Vista Rock and Summit Rock suggest. Unlike rugged escarpments elsewhere, the outcrops in Central Park are mostly smooth and inviting to climb. In fact, Olmsted and Vaux catered to this urge by cutting steps into some of their surfaces. It is wonderful, really, to claim one of these massive chunks and stretch out for a nap in the sun with exposed flesh touching warm stone.

Thus are these bold presences of nature tamed by comfortable familiarity. They are *our* rocks – rooted, immoveable, and unchanging in their mass and outlines. But are they? A vastly different perspective, in which time is measured by the geological rather than historical clock, tells otherwise. From our own much more immediate viewpoint, which is based on the calendrical computation of dates, this is a story as fantastic as science fiction, only it deals not with the future but a past so deep as to seem inconceivable to anyone other than an earth scientist.

Overview

Long before New York became real estate, divided and occupied in accordance with political and economic dictates; long before it became imprinted with human occupation; in fact, long before the human species even existed, there were the land and the sea. And just as the New York of real estate and urban planning is dynamic – a city constantly erasing and rebuilding itself – the New York of bedrock, sand, and water is mobile and forever altering in response to the forces of geology and climate. Difficult as it is for us to realize in our own

A Central Park wedding beside a rock outcrop on the Hernshead promontory at the edge of the Lake.

lifetimes that the only real permanence is change, we instinctively resist the notion that Earth is anything but fixed in its place in the universe and its geography something mutable. To carry this notion to a contemporary and local level, the fact that the new Freedom Tower may one distant day be drowned beneath hundreds of feet of seawater or its steel and concrete incorporated into the mineral structure of some future geological formation is unfathomable.

The latest topographical configuration of New York City, the one we know at present, is essentially the product of two forces. The first was an ancient tectonic event

Relaxing on a rock in Central Park.

known as the Taconic orogeny, which occurred some 495 to 440 million years ago as the Iapetus Ocean, the precursor of the Atlantic, shrank during the collision of the North American continental plate and the neighboring oceanic plate. With the subduction of the latter as it moved sideways and downward beneath the earth's mantle, the folding and elevation of the eastern portion of North American landmass occurred, giving birth to what are now the Appalachian Mountains. Eons of erosion caused their towering peaks to disappear until the continent's crustal subsurface was squeezed and uplifted once more by another tectonic episode, the Acadian orogeny, occurring between approximately 375 and 325 million years ago.

A much more recent landscape transformation occurred during the late Pleistocene Epoch, when a series of ice ages ensued. The last of these took place during the Wisconsin glaciation, 85,000 to 11,000 years ago, when a wall of ice approximately two miles in height covered what are now Canada and the northern United States. This ponderous moving force, with its load of rocks, gravel, and other abrasive debris, scoured and polished the eroded stumps of the ancient mountain range. As it retreated, it left in its wake a morainal landscape of hills, random boulders, an alluvial outwash plain, and numerous lakes and ponds, where large chunks of melting ice had been trapped in the glacial till.

The Kinderberg, a glacially polished Central Park outcrop into which steps have been cut.

Think about this when you are relaxing on your favorite rock in Central Park: there were once lofty peaks of Alpine proportions where you sit today. Equally astonishing, little more than ten thousand years ago, your spot in the sun lay buried beneath a thousand feet of ice.

Central Park, of course, is not the only New York City landscape upon which to read earth history. There are several other large parks that are exceptionally well endowed with evidence of the dynamic forces that account for the configuration of their current landscapes. Mine is a very partial and site-specific knowledge of geology, gleaned mainly from exploration of a handful of these unbuilt urban places – in particular, Inwood Hill Park, Pelham Bay Park, and the Staten Island Greenbelt – with American Museum of Natural History geologist Sidney Horenstein and New York City Department of Parks naturalist Michael Feller. Here are some of the things I have learned from them.

New York City Geology 101

Seven hundred million years ago the piece of geography now occupied by the city lay far below sea level, accumulating sediments of mud and seawater precipitates that subsequently became strata of shale and limestone. Then, some 300 million years later, during the Taconic orogeny, the pressure and intense heat produced by continental drift and the collision of two continental plates turned these once-solid strata, which had subsided under the weight of thousands of feet of subsequent sedimentation, into a mobile crustal mass capable of mineral transformation. Over more millions of years – again we are talking about what is to most of us an incomprehensible time scale – the mineral content of these original sedimentary strata changed as their ions reordered and recrystallized, hardening into much tougher, more coarsely grained formations as they reached a new and thermodynamically stable equilibrium. During this process the malleable material was slowly shoved into mountain-building folds.

Because of their mineral transformation, such rock formations are called metamorphic and given names other than those of their parent sedimentary strata. For example – to choose the rocks principally composing New York City – metamorphosed shale becomes gneiss and schist, whereas limestone turns into marble.

Around a hundred and twenty million years after the Taconic orogeny, the Acadian orogeny further metamorphosed formations whose minerals could still be traced to their parent sedimentary layers. The Earth's intense internal pressure caused these formations to fracture. This allowed injections of igneous origin to permeate the existing bedrock where there was a fault zone – a place where the earth's crust had fractured and slipped, creating a displacement and discontinuity between two strata that left space for an intrusion of molten, subterranean material. When cooled, crystallized, and solidified, such a vertical igneous intrusion is called a dike. In similar fashion, magma filling a fracture cutting more or less horizontally across strata is called a sill. For instance, the New Jersey Palisades is a sill, a solid wall whose tough igneous stone confines the west bank of the Hudson River. On a smaller scale, mineral intrusions derived from

igneous material appear as bands or contorted stipes that have been squeezed into fissures and cracks of older rocks.

Not surprisingly, mineralogists find New York City an optimal ground for study. Their extensive excavations of its bedrock have yielded over one hundred seventy of the earth's two thousand known minerals, many of spectacular size and quite a few of gem quality. Amateur geologists who visit the city's parks and other places where there are exposed rock faces sometimes find granite pegmatites (a coarse-grained, crystalline granite with large mineral grains indicative of a slow cooling process) that are studded with gemlike crystals – garnets, tourmalines, beryl, and other semiprecious stones.

Another igneous rock, serpentine, forms the hilly spine running down the center of Staten Island. Capping this ridge is Todt Hill, 410 feet above sea level, the highest landmark along the entire eastern coastline south of Massachusetts. This serpentine, like the metamorphic rocks discussed above, has undergone alteration far below the earth's surface. Unlike them, however, it was formed of igneous rather than sedimentary material.

The Big Three

New York City's most ubiquitous geological formations are three metamorphic ones: Fordham gneiss, Inwood marble, and Manhattan schist. The most ancient of these bedrock strata is the Fordham gneiss, an extremely contorted, metamorphosed sandstone characterized by wavy, black-and-white bands. This is the underlying bedrock of the New York City area. Surface exposures of it appear mainly in the Bronx – in the New York Botanical Garden, for instance. A durable stone resistant to erosion, it forms an elevated ridge in Riverdale. The names Fordham Heights, Morris Heights, and Highbridge signify another prominent elevation of gneiss immediately to the east, where a two-pronged ridge is found. This formation slopes downward into the earth at a southeasterly angle, making its final surface appearance in Astoria, Queens.

Roosevelt Island in the East River is a spit of Fordham gneiss, too. Its stone – quarried by convict labor in the last century, when the place was still known as Blackwell's Island – was used to build not only the island's almshouse but also a now-demolished, gray, fortresslike prison and some of the hospitals in which the mentally ill or patients with infectious diseases were quarantined.

The rock formation lying on top of the Fordham gneiss is called Inwood marble. It takes its name from the Inwood section of Manhattan, where it can be seen in a few exposed surfaces. Because marble is a soft stone, it is easily eroded. It is natural, therefore, that the Harlem and Hudson rivers cut their beds into this formation rather than into the more resistant, neighboring gneiss. The northeastern section of Manhattan upon which Harlem was built is also underlain with Inwood marble, as are parts of the Bronx. In colonial times, large portions of these flat low-lying areas were covered with extensive salt marshes. In several places, long, continuous bands of Inwood marble lie between "heights" of tougher, less-erodable stone. These marble valleys were the most accessible transportation routes in the city's early days, and in time became its major thoroughfares. Broadway in Manhattan and its continuation in the Bronx, along with Jerome, Webster, and Tremont avenues, also in the Bronx, are underlain with the soft, whitish stone.

The youngest formation is called Manhattan schist, often referred to as Manhattan mica schist because of the sparkling scales of mica that are frequently seen on its surface. This is the bedrock of Central Park. It is also the bedrock that supports the city's towering skyscrapers. The division of Manhattan into two zones of tall buildings – downtown and midtown – is not accidental. South of Thirtieth Street the bedrock dips several feet beneath the earth but is still accessible for building foundations until it reaches the north side of Washington Square, where it plunges more than a hundred feet below the surface. Greenwich Village and the loft district to the south form the "valley," a region of low buildings set on top of glacial sediments and artificial landfill. Near Chambers Street, however, the schist comes back to within fewer than one hundred feet of street level, giving sufficient anchor to the towers of the financial district. The zoning code of Manhattan is thus written as much by geology as by city planners.

During the eons that these bedrock strata still lay far beneath the earth's surface, submerged under the crushing weight of the mountains above, the ocean periodically advanced and then retreated, leaving behind sedimentary deposits. As these eroded over time, the pressure on the weighty land mass below was lightened, and the metamorphic rocks that had existed as the roots of ancient mountains responded by rising slowly. During the ensuing eons they became layered with additional sedimentary deposits. Subsequent earth movements folded and pushed these into mountainous ridges and fractured the old metamorphic formations beneath them, creating fault zones. Once more all the sedimentary strata were almost entirely eroded, leaving only the ancient, metamorphic gneiss and marble and schist with their later contortions and mineral intrusions. This is what we see today when we examine the protruding bedrocks and stone fragments that lie on the ground.

Valleys often mark the lines of the major geologic faults that occurred during the eons in which all this dynamic activity was taking place. Trending in a generally east-west direction, they became the courses of streambeds and later the logical routes for crosstown streets. At the northern end of Manhattan, the Dyckman Street fault bisects the Fort Washington ridge of Manhattan schist, separating Fort Tryon Park and the Cloisters from Inwood Hill Park. A little farther south, 155th Street is aligned along another fault zone. The deepest and most conspicuous of the fault valleys extends from the Hudson River across 125th Street, bending

Indian Cave, Inwood Hill Park.

diagonally south to enter the East River at Ninety-sixth Street. Following Broadway from Seventy-second Street to Columbus Circle, another fault zone continues south to enter the East River at Twenty-third Street.

These glacial grooves in Umpire Rock in Central Park were created by glacial movement in a southeasterly direction.

Burnished by Ice

It is important to emphasize that today's surface exposures of gneiss, marble, and schist are mere remnants of towering mountain peaks that were created by repeated cycles of sedimentation followed by metamorphic deformation. It was only after hundreds of millions of years that the ranges were leveled by erosion and their subsurfaces exposed as the immense overburden gradually washed away. Their subsequent cracking into fault zones and the erasure of most of the sedimentary deposits from their surfaces set the stage for a new act in New York City's long and continuing geologic drama: the age of glaciation.

In all, four huge ice sheets pushed down from the north to cover portions of Europe and North America. The last and most important, whose passage is imprinted on the landscape of the modern city, was the Wisconsin advance, beginning less than one hundred thousand years ago, a very small unit on the geologic clock, which for the most part measures time in millions of years rather than mere millennia. As the earth's climate became colder, winters lengthened and accumulated snows packed together into a frozen ice mass. At an estimated rate of a foot a day, the great ice sheet moved ponderously southward. In the process the gathered fragments it contained scoured and polished exposed surfaces of bedrock. Today glacial striations – grooves running northeast to southwest – mark its passage over the outcroppings of many rock surfaces in New York City. Finally, some seventeen thousand years ago, the ice stabilized, its southern edge tracing a line midway along the length of Long Island and the central spine of part of Staten Island. Manhattan and the Bronx lay deeply buried under a thousand feet of ice and frozen glacial debris.

When the winters became warmer, however, the ice sheet retreated, and its meltwaters deposited their load of sand and rocks and boulders. At its southernmost edge it left a ridgy mass of till marking the final stage of its advance. Known as a terminal moraine, this till forms the hilly parts of Staten Island, Brooklyn, and Queens. Where it traversed the mouth of the Hudson River, it constricted New York Bay into the Narrows, leaving an elevated bracket of defense outposts (Fort Hamilton in Brooklyn and Fort Wadsworth on Staten Island). Not only was this an ideal geographical configuration from a military perspective but it also provided for a harbor with an ample, protected shoreline for numerous docks. Thus, geology is the foundation of New York's status as one of the great port cities of the world.

The postglacial landscape of these portions of New York is what geologists call knob and kettle country, featuring depressions alternating with low, moundlike hills. The depressed areas, often boggy or water filled, are kettle holes, formed by fragments of ice trapped in the moraine. As the chunks of ice melted, they left basins of varying dimensions in their place, which served as containers for melted glacial ice and rainwater. All are shrunken from their original size, for as the land became once again covered by green and living things, plants encroached upon their still waters, and year by year leaves and eroded debris from the surrounding slopes have layered their depths with organic and mineral deposits.

Other evidence of glacial visitation is found in the form of large boulders, or erratics, which can be seen in all five boroughs. The often precariously perched erratics of Central Park and the New York Botanical Garden in the Bronx are, for the most part, chunks of igneous diabase plucked by the glacier from the New Jersey Palisades or lumps of metamorphic rock yanked from the Hudson Highlands. On Long Island erratics more frequently resemble metamorphic rocks of Connecticut origin.

The unglaciated portions of New York City – the southern tip of Staten Island and southern Brooklyn and Queens – became part of a vast outwash plain. Carried by coursing glacial meltwaters, deposits of sand and gravel spread out to form the flat alluvial landscape that would later remind early Dutch settlers of Holland. Postglacial movements of morainal sands from east to west along the Long Island coastline created a chain of barrier beaches. In New York City the Rockaway Peninsula, the barrier beach for Jamaica Bay, continues to push westward an estimated two hundred feet per year, or one mile every twenty-three years.

Here and Now

During the past three hundred years – the last fraction of a second on the geologic clock – human beings have undoubtedly been the major ecological agents and sculptors of the New York City landscape, chopping down forests of trees to make way for a forest of buildings; dredging rivers and bays, and spanning them with beautifully engineered suspension bridges; filling in marshy inlets and rechanneling streams into a network of sewers; and blasting away bedrock to create the world's largest system of underground transportation tunnels.

Still, though encrusted with pavements and buildings, the old landforms can be discerned: the gneiss and schist escarpments of the Bronx and Manhattan rearing above the flat valleys and plains of Inwood marble; the rolling morainal hills of northern Brooklyn and Queens; the flat, alluvial, glacial-outwash plain fanning out to embrace Jamaica Bay; the Narrows marking the place where the terminal moraine crosses the harbor; and, protruding here and there from beneath its cover of glacial till, the greenish serpentine, the firm core that pushes Staten Island up out of the sea.

Tantalizing transitory glimpses of the geology of the city are offered to sidewalk superintendents by new building excavations. For more extended field exploration, there are the parks. In Pelham Bay Park you will find the most southerly segments of the rocky coastline characteristic of New England and eastern Canada. This is a glaciated or "drowned" coast, different in appearance from the mature, alluvial, unglaciated barrier-beach coastlines of Long Island and New Jersey. The origin of these Pelham Bay rocks is still something of an enigma; geology students attack them with ham-

mers because their relationship to the rest of the New York City formations has not yet been scientifically established, making them an ideal subject for doctoral dissertations. In Central Park you can study bedrock outcroppings of mica schist, ribboned with granite intrusions and grooved with glacial scratches – evidence of the northeast-to-southwest movement of the Wisconsin ice sheet. Here and in the New York Botanical Garden you will also find curiously poised erratics, left behind when the ice that carried them melted.

Morningside Park in Manhattan has a high, vertical wall of schist once used by mountain climbers for rock-scaling practice. Inwood Hill Park and Fort Tryon Park – twin elevations of Manhattan schist bisected by the Dyckman Street fault valley – form the northerly extension of the Fort Washington ridge, of which Morningside Park is a part. In Inwood Hill Park you can find glacial potholes: bowl-like depressions scoured out of the bedrock by the gravel-laden meltwaters of the glacier.

Glacial action can be seen also in the rolling terrain of Prospect Park in Brooklyn, which was modeled by the lumpy gravels of the terminal moraine. Kettle-hole ponds are found at High Rock Conservation Center on Staten Island, Highland Park in Brooklyn, and Alley Pond Park and Cunningham Park in Queens. A green mantle of duckweed floats on their placid surfaces, and skunk cabbages and swamp maples fringe their spongy, peaty borders. Jamaica Bay and the Rockaways present more volatile scenes as coastal geology, abetted by climate change, gnaws at the city's marine landscapes.

The geological clock is forever ticking, and while the slow erosion of the city's bedrock is hard to perceive, the dynamics of change are more starkly evident along the city's shoreline. This is especially true today when nature, like an angry God, appears to be meting out punishment for human indifference to the welfare of the planet. While drought parches other parts of the country, devastating coastal storms have battered the Atlantic coastline. This brings into question our impulse to fly in the face of the predictions of climatologists, meteorologists, and oceanographers, and rely instead almost entirely on technology to protect heavily populated existing shorelines. It is important to realize that nature itself is sublimely indifferent to such remedial action and that, given New York City's current geological status, its fringe of wetlands will shrink, its marshes disappear, its islands inch toward submersion, and its beaches be periodically ravaged.

This is not an excuse for inaction with regard to saving as much of the current landscape as possible. Nevertheless, the process of doing so should be one of partnership with nature, rather than reliance solely on human intervention. We live in historical time rather than geological time, and we cannot control planetary fate in the long term. Still, appreciating New York City's extraordinary geology and the forces that continue to shape its topography is a start towards a more responsible alignment of human actions with the here and now of nature's independent dynamic.

– Elizabeth Barlow Rogers

Pelham Bay Park's rocky coastline, a geological enigma.

To view additional images related to this article, visit www.foundationforlandscapestudies.org/gallery.

House of Stone and Time: The Grand Canyon as Home

When I first moved to northern Arizona, I was so delighted to live within ninety minutes of the Grand Canyon that I would often jump in my car to go visit the canyon for an hour or two before starting my day. One morning I was sitting below the overlook at Grandview Point, dangling my feet off the rim, when an older couple strolled to the wall above me. They didn't see me sitting below them, and after a short silence, the woman shook her head and said in a bemused tone, "I just don't get it." Then they turned and walked away.

To this day I am not sure whether the woman was announcing her confusion over what all the fuss regarding the Grand Canyon was about or that she just couldn't begin to comprehend the panorama spread before her. I've always chosen to believe the latter, and I still use this story as a starting point for my geology classes at the canyon.

It *is* challenging to comprehend the Grand Canyon. Statistics about length, depth, and width serve only to make the listener's eyes glaze over. Declarations of age in geologic time numb the mind. To stand at the rim is to view a canyon fully formed in all its color, size, and character – already an almost-incomprehensible spectacle. Trying to understand the geology of the canyon only adds more bewildering information, so most people settle for memorizing names and figures.

The River-Carved Canyon Landscape

In this bed of marble . . . carvings are seen which suggest architectural forms, though on a scale so grand that architectural terms belittle them.
– John Wesley Powell[1]

It goes without saying that in order to build a home, one must have materials with which to build. Likewise to carve a canyon, there must be something from which to carve it. Seen from the rim, the layers that make up the canyon walls blend together in a jumble of color, light, and shadow. Up close, though, they have form, texture, and personality. Up close, one comes to know them and thus understand something of the span of time and processes that formed them. Up close, the canyon walls become home, with deep time and the patient fingers of weathering and erosion their builder. The best way I know of to really become familiar with this home is to take a river trip through its very heart.

At Lees Ferry, fifteen miles downstream of Glen Canyon Dam and the Utah-Arizona border, there is no Grand Canyon.

[1] In 1869, Powell led the first recorded expedition down the Colorado River through the Grand Canyon.

The Colorado River has just exited the sandstone confines of Glen Canyon. The river flows wide and slow as it carves an enormous bowl from the soft, painted mudstones of the Chinle Formation. The Vermilion and Echo Cliffs rise to either side, but they are set far enough back from the river that a road has been built straight to the water, along the enormous bench of the Marble Platform at the base of the cliffs. It is here that river journeys into the Grand Canyon begin, and it is here that the Grand Canyon is born.

Most of the year, Lees Ferry is a busy place. Bewildered passengers don awkward life jackets while boatmen lug heavy gear onto rafts and dories, and the engines of fishing boats cough and sputter. Few people here contemplate their surroundings, other than to comment on the temperature of the river or express concern about sunscreen. But it is worth considering the confluence of geologic forces that brought Lees Ferry into being. Here a massive fold in the Earth's crust brought soft shale to the surface, shale that could be easily eroded to form a wide basin – historically the only place in more than five hundred miles where a vehicle could reach the river for a crossing. Below this shale the layers of the Grand Canyon lie, waiting to be exposed.

Although it may go unnoticed in the excitement of one's first moments on the river, a marled, beige rock layer begins to rise from the river a few hundred yards downstream from the launch ramp. Within minutes this unassuming stratum has formed an impressive wall. This is the Kaibab Formation, 270 million years old and the rim rock of the Grand Canyon. This is the layer a visitor stands on when peering into the depths from Grand Canyon Village, searching for the river a mile below. The door has opened, and you have just entered the Grand Canyon – welcome!

For the first thirty miles or so of such a river trip, the walls rise out of the river at a rate of about a hundred feet per mile. This is due largely to the tilt of the land rather than the gradient of the river. The southwestward-trending Colorado River flows against the grain of the land, which tilts down to the northeast, so for the first few days of a river trip the walls grow quickly. Every few miles a new rock layer comes to the surface, and the character of the canyon changes. At first, river travelers spend time worrying about the rapids and how to pack their bags, as well as inevitably fretting about the toilet. But within a few days people begin to sink into the place, and the concerns of the modern world slough away like so much sand into the river. Time slows and eyes open. Now the geology begins to mean something.

The youngest rock layer in the Grand Canyon – the Kaibab Formation – formed in a shallow, near-equatorial sea that sloshed over the edge of the continent millions of years before the dinosaurs appeared. Below this are older sedimentary layers, each one representing a single chapter in the building of our continent. Each stratum has its own unique character, color, grain size, shape, weathering pattern, and fossils. These features are the result of the environment in which the sediment was originally deposited. Sedimentary rocks form in environments such as oceans, rivers, beaches, and deserts. Any place you find sediments today – such as sand, mud, gravel, or lime – is a potential environment of deposition, a potential nursery for sedimentary rocks. If conditions are right, the soft sediment will be compacted and cemented together with minerals in groundwater and – millions of years later – exhumed by erosion.

As the canyon walls rise, the layers begin to take on meaning. At first, these meanings are associated with one's experience of the river: this rock hurts if you scrape against it; that rock forms good ledges on which to put your things; another rock is slippery when wet. But soon recognition sets in: sandstones and limestones are hard and form cliffs. Shales and mudstones are softer and weather to slopes. Red rocks indicate oxidized iron in the sediment, and some color is simply a thin veneer, a stain over a true interior color. The Coconino Sandstone contains tracks of arthropods and reptiles that marched over ancient sand dunes and left their footprints behind in the desert.

Dories at rest along the Colorado River in the Grand Canyon.

The Redwall Limestone contains fossils of corals, crinoids, and brachiopods that indicate warm tropical conditions in a sea that once stretched across the continent. The Muav Limestone looks different from the Redwall, because 500 million years ago the ocean was closer to the ancient continent, and any mud and sand that washed off the land mixed in with the lime, making it crumbly and yellow. The Tapeats Sandstone is ledgy and coarse-grained and still carries echoes from the waves hitting that ancient, sandy beach. The great challenge of geology is to see what is no longer there, to understand what is no longer happening. In the Grand Canyon, that is easy.

A Geological Textbook

All about me are interesting geologic records. The book is open and I can read as I run.
– John Wesley Powell

Sixty-two miles into a river trip, a group has already traveled through 500 million years of Earth history and lived among rocks that began their lives when this part of the world was the assembling supercontinent known as Pangaea. Half a billion years of Earth history seems like an enormous amount of time, but the canyon shares even older secrets just around the corner.

Soon the river meanders into a wide bend of bright red sandstone and shale called the Dox Formation. This layer is more than a billion years old, yet is still soft enough that the river has been able to carve through it laterally and wear a huge valley out of the canyon's walls. This is one of the layers of a series collectively known as the Grand Canyon Supergroup – layers that have been faulted and tilted, making the river look as though it is careening downhill in places.

The tilted layers of the Grand Canyon Supergroup were mostly eroded hundreds of millions of years ago. What was once *thirteen thousand feet* of sedimentary layers, ranging in age from 700 million to 1200 million years old, now can only be seen in patches along the river. These layers tell the story of the assemblage and breakup of a previous supercontinent known as Rodinia, and in the shales and limestones of some Supergroup strata we see the earliest life-forms in the Grand Canyon: crenulated, cabbagelike heads of stromatolites – algal mats that grew in shallow, sunlit areas along the coastline. But most of this record is gone, and much of the story must be pieced together from what remains.

The absence of rock in the walls of the Grand Canyon is as important as what is there. Absences of rock, called "unconformities," exist between almost every layer in the canyon

The Grand Wash Cliffs in northwestern Arizona mark the end of the Grand Canyon.

walls. These absences tell us that the land was subject to erosion for long periods of time – long enough to erode thousands of feet of sediment from the surface of the Earth, leaving a slate for the deposition of more sediment at a later time. In the timeline of Earth history represented by the rocks of the Grand Canyon, more is gone than exists, and yet it is still one of the best records of geologic history in the world.

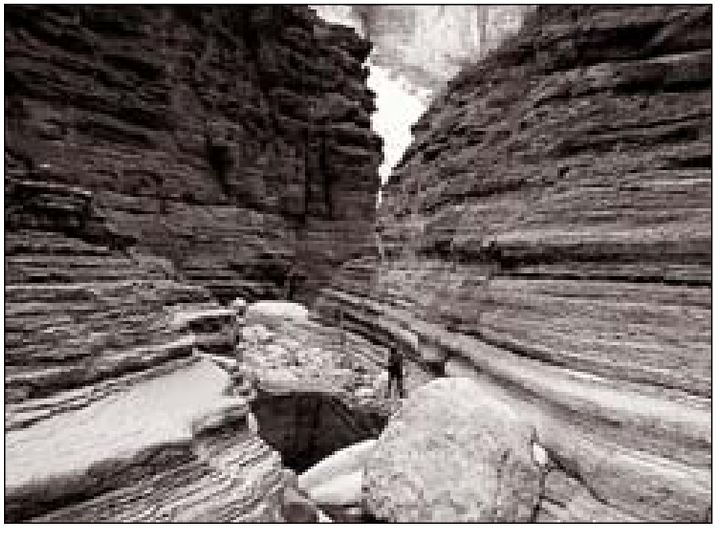
The river continues slicing deeper into the Earth. It is aided in its efforts by the fact that across its path lies an uplifted blister of crust known as the Kaibab Upwarp that brings deeply buried rocks closer to the surface. When the river enters the canyon's deepest and oldest rocks in the Inner Gorge, things get dramatic. The canyon narrows, the water picks up speed, and rapids growl with a throaty bass. Beaches are few and small, and the dark walls are sharp and sheer.

Running the River

Heretofore, hard rocks have given us bad river; soft rocks, smooth water; and a series of rocks harder than any we have experienced sets in. We can see but a little way into the granite gorge, but it looks threatening.
– John Wesley Powell

The walls in the Inner Gorge are made of black schist shot through with silver mica and pebbled with garnets, polished to ebony smoothness by the waters of the river. In places the walls are marbled gneiss in streaked pink and black. These metamorphic rocks began life almost 2 billion years ago as sediments and volcanic rocks on the floor of an ancient ocean. When heated and compressed during subduction under ancestral North America, they metamorphosed into hard schist and gneiss. At the same time, deeper molten magma squeezed its way towards the surface, intruding into the still metamorphosing rock and solidifying to form spider webs of pink granite veins. All this happened as much as nine miles below the surface of the Earth. These rocks have literally been through hell.

Geologists call these "basement" rocks, because there is nothing but more of the same beneath them. All the layers above this – the red sandstone, golden limestone, and variegated shale – are but a thin veneer on what turns out to be an extraordinarily thick crust.



Limestone walls of Tuckup Canyon, a tributary to the Colorado River in the Grand Canyon.

The crust of the Earth here on the Colorado Plateau is as much as forty or fifty kilometers thick, the lion's share of it made of rocks just like these. There is no more limestone, no more sandstone beneath these rocks. Just more hard and twisted metamorphic and igneous rock. Pretty much the entire continent is built on top of rocks such as these.

At this point in a river trip, many people feel as though they are becoming part of the canyon. They are a little gritty; sand has worked its way inexorably into the tiniest folds of their gear; many are becoming the lovely red brown of the rocks themselves. Deep time finally means something. It begins to feel as though mountains can thrust upwards and be worn down, that continents can be built and canyons eroded – all within the span of a river trip. The voice of the river is the soundtrack of one's days, and it is clearer now how water can shape the land with its persistence.

As they journey further into the canyon, people become familiar enough with the walls of their home that they begin to notice differences from the first days of their trip. The Muav Limestone now forms a sheer grey cliff, because this part of the formation was laid down further away from the influence of the mud and sand washing off that ancient continent. Here the Supai Group and Hermit Shale are thicker than further east. The Esplanade appears on top of the Supai – a massive bench that erodes to strange goblin shapes on the inner rim of the canyon. The schist dips below the river once again, reappears briefly; then drops away until much further west. Old friends like the Tapeats Sandstone, Bright Angel Shale, and Muav Limestone reappear at river level. You haven't seen them for more than fifty miles. They look familiar – welcome, even – after that dark chasm.

Further down, black basalt appears near Lava Falls Rapid, frozen in place on the walls of the canyon, festooning the older rocks with starburst patterns of hexagonal columns from the cooling and shrinking of these ancient lavas.

The river dives once more into the dark metamorphics and swirling eddies of the Lower Granite Gorge and then back into the limestone

for good. The canyon walls are broken and shattered with fault lines in the western Grand Canyon. The whole place is being pulled apart, yet the walls still rise thousands of feet above the river. Two hundred seventy-seven miles from Lees Ferry and the beginning of your trip, you come around the corner and the walls are suddenly gone as though they never existed; before you lies the open desert. The Grand Canyon and the entire Colorado Plateau end at Grand Wash Cliffs and Grand Wash Fault. What began and deepened slowly across the land culminates suddenly, with little warning. It is a shock to be so abruptly removed from the comforting walls that have surrounded you for days. Some people feel uneasy out there in all that sky, as though suddenly they had been spirited away from everything familiar. This is one of the beauties of a Grand Canyon river trip: that the unknown and unknowable can become comfortable. You have watched the canyon be born and mature; now you see it end.

The metamorphic and igneous rocks of the Inner Gorge are the Grand Canyon's oldest (even though they are not even half the age of Earth). The basalt flows in the western Grand Canyon are the canyon's toddlers, a mere half million years old or even less. These lavas poured into a fully formed canyon, damming the river and creating lakes that exploded when the dams failed catastrophically, piling debris six hundred feet above the river. Massive landslides have wracked the canyon within the past few hundred thousand years, in one place literally forcing the river to move and carve a new channel. Debris from these landslides sloshed up several hundred feet onto the opposite side of the river. Huge floods have coursed through the canyon in the past, floods large enough to leave debris well above the river.

Yet all of this drama is not really what created the canyon. Although geologists still disagree about the timing, and which river(s) played the greatest role, we do know that the Grand Canyon, in all its vastness and beauty, was formed for the most part through small processes, things unnoticed. Like the small nails holding the walls of a home together, it was the droplets of water, the grains of sand moving downslope and downstream, the plant roots wedging their way into the rocks, the inexorable play of gravity on the land that combined with an unimaginable amount of time to form this landscape. In 1921 poet Alfred Bryan called this sublime excavation "ten thousand cathedrals rolled into one." But for me, and for many others in the world, it is simply home.
– Christa Sadler

Designed and Written in Stone: Four Freedoms Park and the FDR Memorial

The story of how Four Freedoms Park came to be has all the qualities of a legend in the making. A four-acre memorial to Franklin Delano Roosevelt, situated on the tapering, southern tip of Roosevelt Island in New York City's East River, the park was announced in 1973 but not completed until 2012, nearly forty years later. Designed by Louis Kahn, its conception was nearly complete when the architect died suddenly of a heart attack in a Penn Station men's room in 1974, making the memorial his last creation. Subsequently New York slid into near-bankruptcy and the project foundered. Thirty years later it was revived, inspired in part by Kahn's son Nathaniel's touching 2003 film *My Architect* and in part by an exhibition of the design studies, models, and construction documents for the project at the Cooper Union in 2005, sponsored by the Reed Foundation and co-curated by architect and archivist Gina Pollara. The Franklin and Eleanor Roosevelt Institute announced its commitment to raise the funds necessary for construction; over the next several years, significant donations came from the Arthur Ross, Kaplan, and Alphawood Foundations, among others, and the project was back on the boards.

Mitchell/Giurgola Architects, who had completed the construction documents for the project in the mid-70s, returned as architects of record; Pollara was named project director on behalf of the New York State Urban Development Corporation. A whole team of advisors, including Kahn family members, former Kahn employees, and architectural historians – among them Bill Whitaker, curator of the Architectural Archives of the University of Pennsylvania, where Kahn's papers are on permanent loan from the Pennsylvania Historical and Museum Commission – were called upon to be sure the project stayed as true as possible to Kahn's intentions. Construction began in 2010 and the park opened to the public on October 24, 2012.

But there are other narratives to tell here – more subtle, perhaps, but no less interesting. The park is a serenely, even sublimely, simple composition of just three materials – granite, grass, and trees, with a strong emphasis on the stone. As might be expected, this choice of material confers monumentality on the memorial, but also has less-expected effects. Some of the park's most compelling details and most interesting experiential qualities can be attributed to the unusual ways the stone was cut and finished.

Four Freedoms Park is approached from the north along either the east or west sides of the island. An entry court is dominated by imposing stairs, one hundred feet wide and twelve feet high, centered in steeply canted granite-faced walls. From here visitors can proceed up the steps or along sloping paths that hug the shorelines. The stairs are enticing – what lies at the top is obscured from view. Climbing up, you reach a narrow,

At Four Freedoms Park in New York's East River, a grand entry stair leads to a sloped and tapering lawn framed by littleleaf lindens.

level platform of stone, from which a long, rectangular panel of grass slopes away, flanked by double rows of littleleaf lindens – 120 in all – framed by low stone parapets. In addition to a twelve-foot grade change, the lawn features a forced perspective, created by a sharp narrowing of the rows of trees. The vista ends with a tall stone niche, which contains a bronze bust of FDR enlarged from a life portrait created by Jo Davidson in 1934. Behind this lies a sixty-by-sixty-foot chamber, defined on three sides by granite piers, six by six by twelve feet, spaced about one inch apart. This room is open on the fourth side (to the south). It is separated from the water by a stone trench – a ha-ha of sorts – in front of a final, low parapet wall facing the river.

At the south end of the park, a stone-walled room is empty but for an inscribed quotation from FDR about the four freedoms he considered essential to a just society.

The room was designed for public gatherings but also for contemplation – the city all but disappears from the space. It is unembellished, save for an inscribed quotation from FDR's State of the Union address on January 4, 1941, in which he enumerated the four freedoms he considered the foundation of a just society: freedom of speech and expression, freedom of worship, freedom from want, and freedom from fear. Not coincidentally, if you stand at the open end of the room, the United Nations is visible – an institution Roosevelt helped to build, which enshrines the four freedoms in its charter.

The size of this room is just about perfect: large enough to feel ceremonial, but small enough to be human in scale. "It is public, but intimate and comfortable," says Michael A. Rubenstein, who was project architect for Mitchell/Giurgola until the UDC ran short of funds in 1975 and returned as an unpaid consultant when the project was revived. The room also features one of the memorial's most intriguing design details, which apparently dates back to Kahn's original conception for the space: the massive piers are finished with saw-cut matte surfaces, except in the hidden spaces between them, which are polished. This has the effect of amplifying both sound and light from outside the chamber. Reflected light radiates from these narrow apertures, and if you put your ear to them, you get the concentrated sound of passing ships and water. The "floor " of the chamber is as carefully engineered as the rest of the space: the pavers actually float on pedestals, and have small gaps between them to facilitate drainage.

As seems to be so often the case these days – think of the recently completed parks over the Big Dig in Boston – the new public space on Roosevelt Island was in part the by-product of an infrastructure upgrade. New York's water authority wanted to build redundancy into its system against the day that century-old supply lines had to be repaired, so it dug a new supply tunnel, City Tunnel No. 3, that runs partly under the East River. The fill from this section of the tunnel, begun in the 1970s and completed in 1993, was deposited at the southern tip of Roosevelt Island; it provided a portion of the physical platform for the memorial. As early as 1994, when the project was still in limbo, the fill was graded, compacted, and shaped to Kahn's specifications.

Over the years the design went through several iterations. The first changes were made by Kahn himself, in collaboration with landscape architect Harriet Pattison, his colleague and the mother of Nathaniel. Initially, for instance, the room featured sixty-foot-high walls of brushed stainless steel. As this was well beyond the project's budget, the chamber was quickly reimagined as a scaled-down structure made of concrete, which Kahn had used successfully in projects such as the Salk Center in San Diego. But then Edward Logue, head of the New York State Urban Development Corporation, in consultation with the Roosevelt family, made the decision that the room should be of stone, believing it a material more appropriate for a memorial.

Thirty years later, other changes were made by Mitchell/Giurgola, some mandated by new accessibility standards, others for improved seismic protection and flood control. Decisions on the size, spacing, and species of trees were made, and soils engineered for the different species. The tree grid was enlarged from ten by ten to twelve by fifteen feet; littleleaf lindens were specified, although European hornbeams had also been considered in Kahn's day. Copper beeches were chosen for the entry space. Plant material was selected for hardiness, according to Pollara: "It's a tough environment, with a lot of wind and salt spray." Notwithstanding the many changes over the years, the basic outlines of the original design remained: monumental stairs, sloping grass plinth, allées of trees, walled chamber – and the stone.[1]

The stone, a very pale, reflective grey, was selected from a source in Mount Airy, North Carolina, said to be the world's largest open-face granite quarry – so large, in fact, at about a half a square mile, that the stone is quarried horizontally rather than vertically. In operation since 1743, it once supplied Works Progress Administration building projects across the country. The granite was then cut to exacting specifications. In addition to the saw-cut and smooth finishes of the piers, the walls feature "knuckle stones" where either the slope changes or the angle of the wall narrows. Edges and corners throughout are sharp rather than beveled, which the stone masons originally worried would chip – but they were per-

[1] The narrative of the design's development is told deftly and in detail by Samuel Hughes in "Constructing a New Kahn," *Penn Gazette* (March/April 2103), accessed at http://www.upenn.edu/gazette/0313/feature2_1.html.

The granite piers of the room are separated by narrow polished slots, which amplify sound and light off the river.

suaded by the designers to make them work.[2] Indeed, Rubenstein reports that one of the most rewarding experiences of the construction process was inspired by Kahn's commitment to the highest possible standards of workmanship, which was embraced by the builders.

There are other, more familiar uses of the Mount Airy stone in the park. Cobblestones are used in the entry plaza, and crushed granite, dispersed under the allées, resembles the pea gravel beneath trees in many European parks. Set in resin to make the paths ADA-accessible, the granite chips don't make the satisfying sound of gravel shifting underfoot, but the resin-set stone requires less maintenance, in addition to improving accessibility. Some minor flaws in the memorial are also related to stone. The sloping surfaces that flank the entry stair are veneered rather than solid and have a blank look to them; moisture behind them has already started to discolor the stone. At the other end of the park, the open-air granite chamber with its southern exposure is bound to be hot and blindingly bright on summer days (although on a cloudy, breezy spring day, it was sheltered and serene).

There are some deeply satisfying and less obvious attributes of the memorial that relate to the native stone of the island. The park is adjacent to the old Smallpox Hospital, designed by James Renwick and built of dark local granite in 1856. Kahn specified that the same local granite be used to form the riprap edge that protects the park from the erosive effects of the river. Looking down at this stone – eleven thousand cubic yards of it, sixty-five percent recycled from the site, all carefully hand set by stone masons – is in some ways as evocative as the experience of the memorial itself. The dark grey stone locates you in this particular place, even as it signifies the power of the passing water.

Still more compelling is the view over the water from the southern end of the memorial onto a shoal that is said to be the southernmost piece of exposed bedrock on the eastern seaboard. Tidal fluctuations in the river cause water to surge back and forth across this outcrop nearly all the time. The restless water creates an effective, if inadvertent, contrast with the serenity of the chamber, along with a dialogue between worked stone and found stone. The shoal is hard evidence of nature in an otherwise entirely constructed site. The effect is distinctly nautical, as if you were on the prow of a ship slicing through the water – but it is the river moving in this instance, not the vessel.

It is easy to get transfixed by the technologies of the memorial: how the thirty-six-ton stones that make up the room were too heavy for the bridge to Roosevelt Island and had to be sent by barge; how the foundations were built to bear their weight; how they had to be "tripped" in large sand pits to prevent damage when they were shifted from horizontal to vertical positions. While these construction details are fascinating, so are the scale and material qualities of the place. In this, granite has a major role. It has all the monumentality and gravitas the patrons wanted. It has archaic qualities: the memorial's mastaba shape, most evident from the entry plaza, evokes Egyptian tombs, which Kahn saw on visits to Egypt in 1951 and 1959. The stone enclosure of the room is like an open-air classical temple, albeit in a stripped-down, modernist idiom. It is an austere and solemn place, this memorial, fitting to the memory of a wartime president and the freedoms his generation secured. In less capable hands, allusions to the Pyramids and ancient temples might seem pretentious, even preposterous. But the team that created Four Freedoms Park – Kahn and his later interlocutors and interpreters – got them just about right. – John Beardsley

[2] Technical and construction details, particularly regarding the stone quarrying, fabrication, transportation, and setting can be found in *Four Freedoms Park*, eds. Gina Pollara and Stephen Martin (New York: Four Freedoms Park Conservancy, 2013).

Place Maker

The Stones of the Spirit

Tucked away in a remote corner of the property, a footpath of ten stone steps curves upward from the lower pasture to the highest point of the ground. Etched into each stone is a single word: a distillation of a concept that directed the transformation of a twenty-two-acre farm from a tangle of neglected woodland into a joyous hymn of thanksgiving.

You could say that these ten words trace the entire process, from the initial creative impulse to the ultimate composition. They are also crystallizations of my evolving relationship with the spirit of the place – that ancient notion of the *genius loci*. In that sense, the words on the stones operate the way ornaments of Baroque music do: as condensations of surrounding melody, suggesting, not dictating, interpretation.

The spirit of the place began its elusive ministration the first day I saw the property. Even in its pathetic state of untended chaos, it exuded an atmosphere of freedom and lightness of heart. I knew at once that no escape would be possible, for there was an unmistakable invitation to join something intensely real; a summons from the pervading spirit. The call was to produce a living, consequential work in concert with this place. The call was addressed to me.

For two years, I simply breathed in the spirit of my new surroundings. Every day I spent hours walking around the ground, greeting the dawn over the innocent front pasture, feeling the tingle of fresh country air on my skin, bathing in the total rural darkness at night, inhaling the herbal fragrance of tall grasses. I had no prefabricated landscape in my mind; rather I felt a desire to give clarity to what was already there. I trusted the ground to hint to me what it needed.

It was immediately obvious that a great amount of clearing and cleaning would be necessary, and my three local helpers charged into the two-year project of removing tangles of scrub trees, draperies of dead vines, skinny fruit bushes, miles of rusted barbed wire, even an abandoned refrigerator. While they worked their way around the great swath of lower pasture, I explored the perimeter, which is bounded by a thirty-foot-wide stream lined with handsome old maples and sycamores.

Gradually the land revealed itself to me. Its basic topography is unusual. The lower level is in the shape of an elongated oval. Rising out of the center is a substantial mound, which

supports the buildings. Its plateau is also ovoid. One side is forested; the other opens out into a serene, parklike area.

The stream, the trees, the ground. Everything I could possibly need was there on the property, waiting to be rearranged into a more coherent statement. Any stones needed for building trim could be carried from the streambed. The trees were a natural symphony of greens. Even the terracotta Virginia soil was distinct. And while I inventoried the natural potential of the site, I was developing a profound affection – even reverence – for the place.

By the third year, I was ready to enter into an actual working relationship with the land. I believed I could tactfully borrow just enough from the French classic landscape tradition to enhance its natural loveliness. I would straighten the road to create a central connecting axis and define a number of garden compartments around a taut, geometrical center. This would give sufficient shape to allow the ground to proclaim its resplendent beauty. Moving out centrifugally, the land would gradually drift off into the negligent charm of the countryside.

Slowly and surely, in the course of the next three years, my land and I produced a serene and measured little world where there is no ostentation, where everything is handled with an extremely light touch, all parts seamlessly fused into an individualized whole that can now be perceived as a cohesive totality, unique in its own manifest existence. The final act was the placement of the staircase of ten stones, marrying the graceful expanse of the upper plateau with the pasture below.

The idea of composing the list of words occurred to me sometime during my fifth year at the farm. When locating trees or benches, selecting materials, or scoring paths on the surface of ground, I often found myself referring to principles that were embedded in my mind. Some came from art history, others from music.

My choice of the word "Character" – an homage to a vanished age – denoted historical associations that provided my style referents. "Simplicity" referred to elemental materials and qualities available on the site; "Discipline" summarized the order necessary to assemble the garden's elements into a visual unity, a new being in its own right. "Harmony" metaphorically mediated this new entity with its poetic, musical, and spiritual environment. The complementarity of "Restraint" and "Boldness" energized the entire creative process, while "Solidity" contributed ballast, Vitruvius's notion of *firmitas*. And upon that base, the irrepressible spirit of "Délicatesse" embellished with touches of exquisite care, even gilding the lily.

One term required careful consideration, as it carried religious overtones. Originally I had been shy of using "Consecration." But as I pondered the list of words, I recognized that I had accepted the relationship with the land as a sacred trust and the work had been a sacrament.

These became oracle words for me, collectively presenting a synopsis of every step of my work with the ground. They were not abbreviations. They were concentrations. It then felt inevitable that they would be etched in stone.

In a letter to another painter, Cezanne described his reaction to the rock outcrops on Mont Sainte-Victoire. "These masses are made of fire," he wrote. His paintings investigate their weight, density, and solidity – "the absolute internal power" of the substance of those forms. Similarly I believed that the compressed strength of the stones was the instrumentality that could best express the voice of the spirit. Their highly concentrated energies would amplify the tightly bound contents of the words. Together they would emanate their vibrations into the atmosphere.

My next venture was to visit a tombstone company in a neighboring village. When I asked how it would be possible to collect ten stones of different types and colors for my words, I was directed to the refuse pile behind the workshop. After many afternoons investigating this scrap heap, I arranged my row of ten marble and granite remnants on the ground. Some were polished and smoothly edged. Others were raw, with rough edges and irregular sides. "Harmony," for instance, would be represented on a thick slab of polished pink and grey granite that reminded me of Baudelaire's line (or Debussy's appropriation of it), "Les sons et les parfums tournent dans l'air du soir." "Restraint" fit onto a chunk of granite that contracted in the middle. "Délicatesse" would leisurely unfold on a large smooth rectangle of pure white marble, gold lettering winking in the sunlight. Seen together, they were simply beautiful.

The following spring, as soon as all the snow had melted and the ground was sufficiently dry, four men carrying shovels gathered at the site I had meticulously measured and staked for the path of these stones. The scene that April day brought to mind the charming episode in Cao Xuegin's eighteenth-century classic, *The Story of the Stone*, in which a precocious boy and his father and retinue of scholars are challenged to create verses for stones – already identified and polished – in their new garden. As they proceed around the garden, thoughtfully debating legends to represent notable places or constructions, several principles are enunciated. It is preferable, they announce, to select lines from old poetry rather than improvise new rhymes. Texts may operate as allusions, but must nevertheless accurately describe.

In Cao Xuegin's story, the emphasis is on the texts to be engraved. The lines are to be added to stones existing naturally in the garden, and those stones are scarcely described. In this sense, the Chinese program differs significantly from my own. Not only was I incising texts into the earth, I was implanting stones into its surface.

It could be argued that the planting of the stones is the more significant act. One might dismiss our concluding activity as dislodging nothing more than mere soil, but I knew that in so doing I was disturbing entire systems of microscopic living creatures. While I had consistently endeavored to make the minimal intervention to achieve my ends, I knew that all along I had been interfering with the land's natural state. For this – as for the entire program I had engineered on the land – I bore a heavy responsibility.

Retracing the origins of mankind, archaeologist Richard Bradley, in *Altering the Earth*, reminds us of a time when the arranging of stones into recognizable form was a major, irreversible act that "must have required the overcoming of feelings of sacrilege: these early peoples were 'altering the Earth' for the first time." This is not to claim that to position ten stepping-stones into a path compares to the immensity of

Neolithic man's monuments, but the arranging of stones into discrete forms is not frivolous. Nor is it disinterested.

The ten stone steps were my signature: they at once commemorated my relationship with the land and declared it a work of art. They also gently captured and held the spirit of the place that had directed every step I had taken. Perhaps placing the stones was not as dramatic as moving the road or clearing away hundreds of scrub trees. But the compactness of the stones gave the steps a formal dignity and a finality.

Of course I recognized that without my constant efforts to brush away leaves or twigs that had settled onto them, the stones would quickly be lost in a field of native grasses and wildflowers. Merely a year or two of soil shifting across their surfaces would be enough to bury them gracefully in the earth or, at the least, to obliterate the carved letters. Nonetheless, to me they represented durability, and I took them as a verified restatement of my entire encounter with this ground.

Go ahead. Stand on one of the stones. Better yet, walk the entire footpath. Then you may ask, What is the purpose of this staircase? Where do these steps lead?

Ah, but that is up to you.

Although the words on the steps are profoundly personal to me, they are also intentionally ordinary. Thus they are similar to my landscape. It, too, is intensely intimate – even autobiographical – and yet my story is told on the ground with such reserve that a viewer can spend time there and feel the freedom to fashion his own story around it. Anyone who has eyes to see how the themes were developed – indeed anyone who takes the time to contemplate the words written there – can transpose these ideas into his own patterns of experience, whether he is laying out a garden or pondering his philosophy of being.

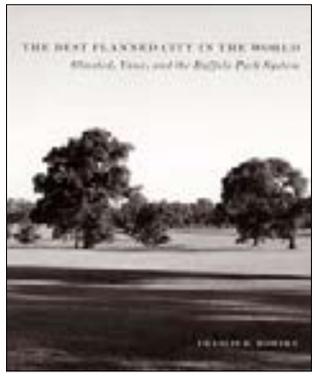
Ultimately, the actual words become less significant than the steps themselves. Through their humble presence on the ground, the stones deliver their message in some preverbal form of discourse.

Stand back with me and observe the scene. These stone pieces are laid in a perfectly modulated semicircle, rising from a low point to a high overlook. They are open, as though ready to embrace. You could go further and say they are raised "to lift up the heart in a spirit of praise and thankfulness," as Gertrude Jekyll described the consummate achievement of a garden.

This is a site of high concentration. Before you are ten stones, which delicately hold (not contain) the spirit of the place. They are steps to something beyond. Or simply to behold. – Carole George

Book Reviews

The Best Planned City in the World: Olmsted, Vaux, and the Buffalo Park System
By Francis R. Kowsky
Amherst: University of Massachusetts Press, 2013.



On the occasion of the Centennial International Exhibition in Philadelphia in 1876, Frederick Law Olmsted described a certain American city as "the best planned city, as to its streets, public places and grounds, in the United States, if not the world." Surprisingly he was writing about Buffalo, New York, today a city more renowned for urban blight, chicken wings, and snow than for landscaped thoroughfares and expansive parks.

Nonetheless, when Buffalo's business leaders invited Olmsted to the city in 1868 to advise on possible parks, Buffalo was among the wealthiest and most important cities in America, its harbor one of the busiest in the world. With its pivotal location – at the easternmost point of Lake Erie and terminus of the Erie Canal – and its growing railroad facilities, Buffalo was the conduit for goods from America's interior to the eastern seaboard and abroad. Grain, lumber, cattle, and coal flowed through the city, and industry and commerce flourished. Farsighted businessmen, flush with prosperity and civic pride, decided that Buffalo needed parks worthy of its national prominence.

Olmsted and his firm worked in Buffalo for over thirty years, and his plan for the city entailed much more than scattered urban parks; instead, he envisioned a cohesive, citywide system of parks, boulevards, and public spaces. He wanted to create, as Buffalo's present-day Olmsted fans are fond of quoting, "a city within a park."

The realization of this concept was not his alone. Calvert Vaux collaborated on the early projects, until the Olmsted/Vaux partnership dissolved in 1872; and in the 1880s the two joined forces again to create the Reservation at nearby Niagara Falls, which was the country's first state park. During their decades of work in Buffalo, Olmsted, Vaux, and the Olmsted firm designed and built (I am using their modern names): Delaware, Front, Martin Luther King Jr., South, Cazenovia, and Riverside Parks; Bidwell, Lincoln, Chapin, and Humboldt Parkways; Gates Circle, Soldier's Place, Colonial Circle, and Symphony Circle; the extensive landscape of the Buffalo Psychiatric Center and the grounds of the Old County Hall; the Parkside neighborhood, Richmond Avenue, Niagara Square, Prospect Place, and more.

Calvert Vaux's collaboration was pivotal for Delaware Park, Martin Luther King, Jr. Park, and the Buffalo Psychiatric Center. He filled the two parks with whimsical structures that included covered benches, a spired gazebo, and a wooden boathouse. His vast Parade House, located in what is now Martin Luther King Jr. Park, provided a gathering place for such festivities as dancing, dining, music, and theater. Alas, the Parade House, one of Vaux's greatest creations, was destroyed by fire in 1877.

When I grew up in Buffalo during the 1960s and early 1970s, the names of Frederick Law Olmsted and Calvert Vaux were rarely heard. In those days, few in Buffalo seemed to value or even remember the city's past glories. The scenic lake in Delaware Park had become an oozing dumping ground. Front Park, with its breathtaking view of Lake Erie, was lost amid a confusion of highways and entry ramps. Much of Vaux's work had been lost, not only to fire but also to civic disregard.

But enough remained of the Olmsted and Vaux legacy that when I remember the Buffalo of my childhood, I see myself walking within the landscape they created: the alluring residential boulevards lined with rows of mature elm trees, their branches meeting in a sun-dappled roof above my head; the rustic paths through Delaware Park, where I rode my bike or walked with friends; the tranquil Parkside neighborhood with its curving streets, where I went each week for my piano lesson; the meadow vistas stretching into the distance. All this gave me a sense not simply of natural beauty, but also of exhilaration and renewal. Even though I didn't know their names, I lived within Olmsted's and Vaux's imaginations every day of my Buffalo youth.

Their vision shaped the world I grew up in, and so shaped my life.

Francis R. Kowsky, the author of *The Best Planned City in the World*, has also known daily life within the imaginations of Frederick Law Olmsted and Calvert Vaux, and he credits his firsthand experiences as an inspiration for this book. Kowsky spent his teaching career at Buffalo State College – where he is now SUNY Distinguished Professor of Fine Arts (Emeritus) – one block from Olmsted and Vaux's Delaware Park and next door to the Buffalo Psychiatric Center, with its Olmsted and Vaux-designed landscape. "This book," he writes, "commemorates my personal journey through the early history of the Olmsted cityscape." Kowsky is steeped in the Olmsted and Vaux legacies, and his earlier writings include the landmark study, *Country, Park & City: The Architecture and Life of Calvert Vaux* (Oxford University Press, 2003).

In his magnificent new book, with its lucid prose and deft organization, Kowsky follows the evolution of Olmsted and Vaux's astonishing creations in Buffalo – those "landscapes of recreation, residence, memory, and healing," as he so gracefully describes them – from their initial design and their growth into maturity through their heartbreaking decline and, in recent times, tentative rebirth. An extraordinary variety and abundance of illustrations fill the book, including photographs new and old, maps, diagrams, paintings, and lithographs. As a physical object, *The Best Planned City in the World* has a beauty worthy of its subject.

Kowsky begins by examining the origins and development of the American park movement, reviewing its British and French antecedents. He explains the philosophy that led to Olmsted and Vaux's proposal for Central Park and shows how the two men transformed their ideals into reality. Having thus set the stage, Kowsky turns to Buffalo.

Before Olmsted's arrival, Buffalo had one notable designed landscape: Forest Lawn Cemetery, dedicated in 1866 and still one of the jewels of the city. Olmsted decided to build his park, now called Delaware Park, on land adjacent to the cemetery.

Kowsky examines first this project and then each of the Olmsted/Vaux and Olmsted firm's designs for Buffalo. The author's ability to look at projects from a seedlings-in-the-ground to a citywide perspective is one of the great achievements of this book. Quotations from Olmsted's letters and other documents reveal his and his colleagues' thought processes over years of work. Local newspaper commentaries show how the citizens of Buffalo reacted to their new landscapes – enthusiastically and otherwise. Kowsky is especially eloquent in his description of Calvert Vaux's Parade House, which he calls a "double-storied towered chalet [that] summoned visitors to revelries simply by its wondrous appearance." The illustrations of the lost Parade House more than justify this claim, and the author's detailed descriptions of its planning are fascinating.

Kowsky interrupts his narrative on Buffalo to provide a fascinating examination of the forces brought to bear in Olmsted's campaign to preserve Niagara Falls, roughly seventeen miles from the city. When Olmsted began his work in Buffalo, the area around the American Falls was literally a carnival, rife with hucksterism and criminality. The islands in the rapids had become a manufacturing center. A paper mill, tannery, foundry, even a laundry, exploited the water power of the Niagara rapids.

Olmsted conceived the idea to turn the area into a "reservation" owned by the State of New York. The details of his campaign, with its complex political maneuvering, private dinners among power brokers, and attempts to influence public opinion, read like a suspense story. In 1886, the Niagara Reservation became a reality. No longer, writes Kowsky, was the area immediately around the falls "in danger of being overrun by the unchecked forces of commerce, manufacturing, and hucksterism." At this point, Olmsted and Vaux's labors truly began at Niagara, as they reclaimed and redesigned the landscape to bring it back to a more natural state.

Kowsky believes that the years have not been kind to Olmsted and Vaux's work at Niagara. He particularly laments the current conditions on Goat Island, with its extensive surface parking, large restaurant, souvenir shop, and fast-food concessions. And yet . . . on the adjoining Three Sisters Islands, visitors can still walk through peaceful glades amid lush vegetation, bathed by sparkling, misty light, and experience Olmsted and Vaux's original vision for this remarkable place.

By the late nineteenth century, politics and patronage were beginning to diminish the purity of Olmsted's vision in Buffalo. William McMillan, superintendent of the Buffalo parks for over twenty-five years and a stalwart defender of Olmsted's principles, was fired in 1897, apparently because he opposed discordant construction within the park. Soon two monumental museums, both Neoclassical in design, were built on promontories overlooking Delaware Park's lake. Calvert Vaux's fanciful wooden boathouse was replaced by what Kowsky calls "a bulky masonry building reminiscent of Pompeian villas." In 1905 a life-size reproduction of Michelangelo's statue of David was donated by a wealthy park patron and placed in a prominent position on a bluff overlooking the water, where it remains a startling sight. As time passed, the park's meadow became a golf course and its Deer Paddock a zoo with surface parking. Tennis courts and baseball diamonds joined the mix. Later generations might say that the museums and their classical-revival grandeur at least contributed to the cultural life of the city and perhaps added to the beauty of Delaware Park, even though they went against Olmsted's sylvan ideal. But these depredations were nothing, compared with what was to come.

In the late 1950s an expressway replaced Delaware Park's North Meadow carriage drive. Access to the park lake from the north became a pedestrian overpass. And then in the 1960s, as Kowsky says of Humboldt Parkway, "city leaders decided . . . that the distinguished boulevard and its surrounding neighborhood" – home to a strong middle-class African-American community – "were expendable. As in many other places, a sense of history and an appreciation for urban life were absent from the city's political circles. Transportation, one of the major forces that built the city, would now begin to destroy it." For Buffalo residents, photographs of healthy, mature trees being cut down by the dozen on Humboldt Parkway are searing to this day. The replacement of the astonishing urban landscape that was Olmsted's grand creation – almost two miles long, two hundred feet wide, six rows of trees across – with a hideous and, some in Buffalo would say now, unnecessary expressway was one of the tragedies of the city's twentieth-century history and a loss to the nation itself.

Nature, too, took its toll on Buffalo. Olmsted favored the use of the elm tree on

the city's boulevards and streets, and thousands of elms were planted in Buffalo at his direction. As a result of Dutch elm disease, at its worst in the 1960s, entire neighborhoods lost their glorious trees. Before long the whole city was stripped bare. Ironically Olmsted and Vaux had opted to plant Humboldt Parkway with linden and tulip trees, which presumably would have survived the devastation of Dutch elm disease, if they hadn't been destroyed to make way for a multilane highway.

Finally, when Buffalo's heritage seemed all but lost, new visionaries stepped forward to take responsibility for their city's future. Money was raised to replant the parkways. Local groups organized to fight to place Olmsted's park and parkway system, as well as the Parkside neighborhood, onto the National Register of Historic Places. Preservationists successfully fought for National Historic Landmark status for the Buffalo Psychiatric Center. The Buffalo Olmsted Parks Conservancy, modeled on the Central Park Conservancy, became the manager of the Olmsted parks and parkways on behalf of the city. The conservancy's overall plan includes the goal of dismantling the expressway and rebuilding Humboldt Parkway as it used to be. This option would have been inconceivable not so long ago.

On a recent trip to Buffalo, I decided to walk to Delaware Park from my mother's home. I went down Chapin Parkway, two hundred feet wide, with its six rows of replanted trees leading me along the boulevard as if through a stately forest. The trees didn't yet meet in a cathedral-like arch above my head, but they were tall and shapely. I rounded the traffic circle at Soldier's Place and turned onto Lincoln Parkway, with its own six rows of trees to lead me onward. The park beckoned in the distance. The sun was out after a rainstorm, and the damp leaves shimmered and shone as the dazzling light filtered among them. With a sense of exaltation, I walked through Frederick Law Olmsted's vision of what a city could, and should, be.

"Buffalo (including Niagara)," writes Kowsky, "was the client for which Olmsted exercised the fullest measure of his genius." In this essential and remarkable book, the author shows us what the fullest measure of Frederick Law Olmsted's genius looked like.
– Lauren Belfer

Ginkgo
By Peter Crane
New Haven: Yale University Press, 2013

Ginkgo comes from a place so distant, so deep in time, that it appears as a botanical alien that might almost have come from another planet. We assign numbers, such as 240 million years ago, to position the oldest ginkgo fossils in the sequence of geological ages, and it is hard to reckon with the fact that this curious tree is from a world in which North America, South America, Africa, Antarctica, and Australia were welded together into one vast continent. This was a world in which primitive mammals were first appearing, a world that existed more than 85 billion sunsets ago.

Ginkgo is a tree that has persisted, little changed, for these unimaginable eons, and its history is an extraordinary tale of survival against great odds. Nevertheless, Peter Crane – who is the Carl W. Knobloch Jr. Dean of the School of Forestry & Environmental Studies at Yale University, a professor of botany at the same institution, and a former director of the Royal Botanic Garden, Kew – has managed in *Ginkgo* to tell it better than anyone else to date.

"Ginkgo is one of the world's most distinctive plants," Crane writes, "and has one of the longest pedigrees; there is no other living tree with a prehistory so deeply intertwined with that of our planet." In his amazingly detailed, painstakingly researched yet eminently readable book, Crane thoroughly examines ginkgo's ancient history, physiology, anatomy, and cultural history, leavening his account with illuminating anecdotes about the paleobotanists, plant explorers, and collectors connected in one way or another with the tree. Some of these men, such as the eminent Chinese paleobotanist Zhou Zhiyan, Crane knew personally during his early academic career at the University of Reading. "More than anyone else," Crane says, "in his own gentle and understated way, Zhou Zhiyan has helped make sense of the fossil ginkgolike leaves . . . and has illuminated what they tell us about the evolution of the single living species."

One of the most striking fossils pictured in *Ginkgo* is a slab from Afghanistan with seven or eight ginkgo leaves, each consisting of some six bilobed segments. This slab, thought to be roughly 190 million years old, is not the oldest ginkgo fossil, however. Older examples have been found in Arctic Canada, eastern North America, and northwestern Mexico, and those dating back 240 million years come from the Karoo Basin of South Africa. Indeed ginkgo fossils have turned up in many different parts of the world – not only in North America, Africa, and Asia but also in Europe, Greenland, and Australia. According to Crane, this geological evidence demonstrates that between 100 million and 225 million years ago there was great diversity among ginkgo and its relatives, but that it was followed over time by the gradual emergence of "a single winner and many losers."

Crane speculates that one reason the number of ginkgo species began to decline 100 million years ago may have been competition from flowering plants, which were rapidly becoming dominant in the Middle Cretaceous. Another cause was probably a speed up in continental drift, which created new geographical configurations and climactic patterns. A possible third cause might have been the extinction of the dinosaurs and marsupial-like mammals that ate and dispersed its nuts. Whatever the causes, ginkgo eventually vanished from almost all the many places around the world where it had once thrived, only managing to survive "the Pleistocene glaciations in two Asian refuges: one in Tianmu Mountain not far from the Chinese coast and the other farther inland in the protected valleys along the southern margin of the Sichuan Basin." Very big living ginkgo trees can still be found in these areas today.

So this very odd tree made it, if just barely, into historical times, when human beings became interested in its welfare and propagation. People love its deltoid-shaped leaf, with a fan of fine veins so different from the leaf of any other plant.

One of the most impressive living ginkgos in China is the grand Ginkgo King near Li Jiawan, a small hamlet in Guizhou in southern China. It is nearly one hundred feet tall, with a trunk nineteen feet across; size alone suggests that it is "among the most ancient of all living ginkgo trees." Altogether, about a hundred

great trees spread around China, some near temples, appear to be a thousand years old or more. Legends about ancient ginkgos in Korea and Japan assert ages of over eleven hundred years, but the tree was cultivated in these countries following its spread from China, so it is more likely that the oldest trees do not exceed seven or eight hundred years in age.

Englebert Kaempfer, a German-born physician-botanist, was the first European to introduce ginkgo to Western science. When he arrived in 1690 at Deshima Island, the headquarters of the Dutch East India Company in Nagasaki Harbor, the ginkgo had already been assimilated into Japanese culture for two or three centuries and, as Kaempfer observed, was being grown almost everywhere in Japan. His account of his travels to Persia and Southeast Asia, *Amoenitatum Exoticarum* (1712), contains the first Western illustration of a ginkgo, and it was likely drawn by Kaempfer himself. Kaempfer was also responsible for the word *ginkgo*, which he probably found in a seventeenth-century Japanese pictorial dictionary, *Kinmo Zui*, which listed a Japanese phonetic spelling, or *kana*, along with each Chinese character.

Kaempfer was succeeded by two other distinguished botanist-physicians in the employ of the Dutch, Carl Peter Thunberg and Philipp Franz von Siebold. According to Crane, Deshima became the primary route through which Western science first learned about the plants of East Asia. He imagines that "Kaempfer, Thunberg, and Siebold may all have eaten ginkgo nuts during their time at Deshima, perhaps in traditional dishes little different from those of today."

Although Kaempfer was the first Western scientist to describe ginkgo, he apparently did not introduce seeds or living plants to Europe. Linnaeus, the great Swedish botanist, may have known about ginkgo, but he did not include a description of this plant in his monumental *Species Plantarum*, published in 1753, perhaps because he did not have a specimen to study. A British gardener, James Gordon, did supply Linnaeus with a living plant, but not until 1769. Apparently Gordon was receiving plants from China as early as the 1750s, although his suppliers are not documented. Crane thinks it likely that Gordon was the source of the great Old Lion ginkgo at Kew.

Toward the close of the eighteenth century, many botanical gardens throughout the Continent had ginkgo in their collections. By 1784 it had crossed the Atlantic, perhaps having been sent to wealthy Philadelphia plant collector William Hamilton by Peter Collinson, the London linen draper and plant enthusiast long associated with the American botanist John Bartram. Hamilton then gave a male ginkgo to Bartram, which still stands in Bartram's garden by the Schuykill River and is the oldest ginkgo in the Western Hemisphere.

During the nineteenth century ginkgo traveled across America. Henry Clay helped to spread it in the South. The Missouri Botanical Garden had ginkgo trees by 1859; Harvard's Arnold Arboretum by 1890; the New York Botanical Garden by 1891; and the University of California, Berkeley, and City University of New York by the turn of the twentieth century.

Crane explains that botanists have long marveled at ginkgo's peculiar process of reproduction. Sakugoro Hirase, a Japanese scientist, created a sensation in 1896 when he discovered what happens when pollen grains from a male ginkgo tree hit a pollination drop exuded from a stalked ovule of a female tree: the sperm cells released into a cavity in the ovule swim a short distance to fertilize the egg, propelled by the synchronized movements of thousands of tiny hairs. "Swimming sperm," Crane notes, "were well known in ferns, mosses, and similar plants but had never been observed in any seed-producing plant." Soon after Hirase's discovery, motile sperm were also seen in the reproduction of the Sago Cycad, proving that reproduction in both ginkgo and cycads harks back to an earlier evolutionary stage when plant reproduction was more reliant on water.

Also around 1896, there were reports that occasionally ginkgo leaves produced seeds and pollen sacs on the margins of otherwise normal-looking leaves. These observations, combined with the discovery of motile sperm cells, strongly suggested that ginkgo evolved from fernlike ancestors, but the exact relationship is far from settled. Crane queries, "Is ginkgo more closely related to cycads than it is to conifers, or vice versa?" Then he proposes that DNA sequences and fossil evidence support the view that ginkgo seems to be more closely related to conifers than to any other group of living seed plants. Nevertheless, he ends his discussion of plant relationships without a firm conclusion.

Crane refers to the recent history of the ginkgo as "a good news story: a tree that people saved." Today, he tells us, it is among the most widely planted street trees in the world. Over sixteen thousand ginkgo trees line New York City's streets – the largest number of ginkgo trees in any North American city. Most are male trees because New York City's Department of Parks and Recreation avoids the problem of the malodorous fruit from female trees dropping on sidewalks by planting only male trees.

Some statistics: according to Crane, in Manhattan ginkgo accounts for 10 percent of the urban forest and is the third-most-common of all street trees. In Japan, ginkgo accounts for around 11 percent of all street trees and is the most widely planted tree in the country. One of the reasons that ginkgo is so common in urban settings, Crane explains, is that it can withstand root compaction better than most trees.

Crane also treats the commercial uses of ginkgo in great detail. Some eight hundred thousand ginkgo trees are cultivated in China for an average annual crop of seven thousand tons of dried fruit. He explains that besides eating ginkgo nuts in traditional dishes, Chinese and other Asian people use the nut as an antitussive, expectorant, and antiasthmatic, as well as in the treatment of bladder infections. In the West, however, the ginkgo is best known for its leaves, which are promoted as having memory-enhancing properties. He adds that although ginkgo has become a top-selling herbal medicine in the United States, neuroscientists believe more information is needed before they can conclude whether or not it improves cognition.

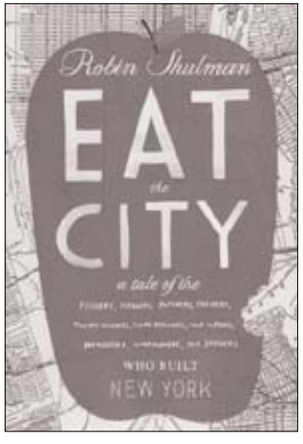
In *Ginkgo*'s concluding sections Crane celebrates the plant's good fortune, noting that through its association with people, the population of ginkgo trees growing around the world has been vastly increased. He cautions that "letting species go extinct when we have the power to intervene is like letting the library burn just as we are learning how to read the books."

Crane's own book is a remarkable achievement. In its preface he writes, "my reach may have exceeded my grasp, but the challenge of trying to balance my scientific inclination for depth with the need for breadth has brought its own rewards." Certainly I know of no other book on a single tree species that can compare with it for readability and thoroughness. It is a milestone in the botanical canon and will remain the most authoritative account of this fascinating species for many years to come.
– Edward Barnard

Eat the City: A Tale of the Fishers, Foragers, Butchers, Farmers, Poultry Minders, Sugar Refiners, Cane Cutters, Beekeepers, Winemakers, and Brewers Who Built New York

By Robin Shulman

New York:
Crown Publishing, 2012



Homogenization is the one thing that all students of place stand against – homogenization of the natural and built environment and the corresponding homogenization of the experience of human beings in it. If fast food is both a symptom and partial cause of the homogenization of place, then the concept of *terroir* – the unique, organoleptic qualities associated with food and drink from a specific place – is surely a powerful antidote.

We most often associate *terroir* with the way in which the physical characteristics of soil and climate influence the flavor of foods grown there: a distinctive blend of mineralization, soil chemistry, moisture, temperature, altitude, slope, and light. But Robin Shulman's highly readable and entertaining book, *Eat the City: A Tale of the Fishers, Foragers, Butchers, Farmers, Poultry Minders, Sugar Refiners, Cane Cutters, Beekeepers, Winemakers, and Brewers Who Built New York*, invites us to consider the broader notion of *cultural* terroir: how the history, ethnicity, culture, and psychology of distinctive neighborhoods within America's greatest metropolis manifest themselves in an array of food-making activities as diverse as the city's inhabitants.

Once primarily the province of oenophiles, the concept of terroir is enjoying a renaissance. Rowan Jacobsen, whose *American Terroir: Savoring the Flavors of Our Woods, Waters, and Fields* preceded Shulman's book by a couple of years, embraced, as Shuman does, an expansive definition, calling it "a partnership between person, plant, and environment to bring something unique into the world." It may be true, as Jacobsen cautions, that regionalism, tradition, and terroir are not the same thing, but certainly it is their synergistic interplay that produces the people and products Shulman encounters.

Amy Trubek, another proponent of a broader cultural view of terroir, uses the metaphor of a double helix to describe the many intertwining strands that link taste and place: "spiraling, interdependent, and universal." Her book, *The Taste of Place: A Cultural Journey into Terroir*, asserts that terroir is not just a simple matter of physical causes affecting taste but rather is strongly influenced by cultural factors that drive discernment, such as economics, politics, and aesthetics. Their significance is illustrated most vividly in France, which gives legal imprimatur to taste of place through its *appellation d'origine contrôlée* system. As one of her sources puts it, "Terroir . . . is the triumph of diversity over homogeneity."

The proponents of terroir can sometimes be a bit overblown in their claims for seeing place through the lens of culinary culture. Jacobsen, for example, calls it "a whole new way of reading the American landscape." But Shulman cannot be accused of this sort of ambition. Hers is not a book of theory and makes no such grand claims. Instead, she is simply a clear-eyed observer who takes her book's subjects as she finds them and resists the urge to spin their many and sometimes chaotic motivations into some grand thesis about the urban food movement. Instead she celebrates their particularities as dreamers, thrill seekers, spendthrifts, sentimentalists, health nuts, artisans, and philosophers.

Her observations are often incisive, as in this riff on a young Brooklynite obsessed with butchering, who teaches a class on the pairing of meat and gin (yes, gin): "Once upon a time, the fantasy of the rock star meant sex and debauchery – the reckless freedom a generation wanted to taste. Now, apparently, rock star status includes the domestic fantasy of a married butcher in a flannel shirt who works in a store full of kitchen gadgets and likes to talk about environmental issues while he cuts meat for dinner." She delights in the fact that that an Iraqi immigrant from Basra, Latif JiJi, now settled on East Ninety-second Street and tending an enormous, fifty-foot-tall grape vine, labels his homemade wine Chateau Latif.

Although Shulman has fun with her subject, she also takes it seriously. She understands that food is elemental. She argues that "every human being is a museum piece. Along with DNA, we inherit the language, knowledge, and values of the people who raised us, and those who raised them. Among the most profound and unshakable parts of our inheritance is food." Moreover, she observes, "We eat what we miss and what we want to become, the foods of our childhoods and the symbols of the lives we hope to lead." At the deepest level, these are the desires that drive the food-obsessed people whose lives she chronicles.

Eat the City joins a long and distinguished literature about the natural resources of New York and the people who are attracted by them. Because the author casts her net so widely, the book's individual chapters do not approach the depth of, say, Mark Kurlansky's *The Big Oyster: History on the Half Shell*, or the subtlety and literary quality of Joseph Mitchell's *The Bottom of the Harbor*. Nonetheless, Shulman gives us enough about the city's food history to provide context for her profiles of contemporary urban foodies. She reminds us that, at various times, New York City led the country in the production of oysters, coffee, sugar, vegetables, milk, yogurt, ice cream, margarine, beer, and kosher wine. We learn that, by 1842, roughly ten thousand stray pigs wandered city streets, prompting "hog riots" throughout the 1820s and 1830s. And as late at the 1880s, Brooklyn and Queens were the country's major vegetable-producing counties, thriving on the remarkable symbiosis (offered by the Hudson Valley today) between prime farmland and proximity to a dynamic and growing market.

Shulman describes the decline of once-vibrant and essential food-related industries like fishing, sugar refining, and beer making, but one is surprised to learn just how brief the most recent ebb tide of urban agriculture has been. Beekeeping was only banned between 1999 and 2010. The city lost its last brewery in the mid-1970s, but this drought lasted only until 1988 when the Brooklyn Brewery set up shop. And every time New York was beset by crisis, New Yorkers returned to home-scale agriculture. When the bottom dropped out of the city's economy in the 1970s, urban pioneers reacted by pushing drug dealers out of the mushrooming stock of vacant lots and cultivating the abandoned earth. It is no accident that the first community garden lease was offered by the city in the dark days of 1974.

The history that emerges from *Eat the City* includes trivia that doesn't necessarily drive the story forward, but is delightful nonetheless. We learn that the charter of Trinity Church includes perpetual rights to any whales that strand themselves on the beaches of lower Manhattan; that the cloyingly sweet Sidecar,

Old-fashioned, and Manhattan cocktails were created to mask the unpleasant taste of Prohibition-era bootleg whiskey; and that the country's densest city still boasts 240 varieties of wild bees. In one of her most endearing chapters, Shulman details how urban beekeepers work their alchemical magic by literally transforming the urban environment into something we can eat.

So what are we to take away from this artful weaving of urban food history, explications of neighborhood terroir, and profiles of contemporary foodies? In her review, Alice Waters says that Shulman "convinces us that in order to live and eat in a city, we must understand where our food comes from and how it is made." I don't think that is it. Will everyone – whether urban, suburban, or rural – eat better if they understand more about the *provenance* of their food? Of course. But Shulman's book is about the city in particular. And a particular city at a particular time – when urban agriculture and locavore eating are raging trends, and most thoughtful people don't quite know what to make of them.

Reading *Eat the City* forces you to ask yourself whether the 2010s' flavor of urban agriculture is anything more than a fad. Isn't it folly to think the contemporary city can feed itself, or that it would want to, even if it could? Shulman does not answer these questions directly but instead offers valuable psychological, cultural, and historical context for thinking about the answer. Her stories illustrate that growing and making food in the city is about more than feeding oneself – it is an outlet for the creative impulse, a call to community, and an assertion of identity. Specific acts of agriculture are deeply connected to broader expressions of ethnic and national culture. This is not, we understand after putting the book down, about the carbon footprint of tomatoes from Florida or blueberries from Chile; it is not about insulating rooftops, buffering storm water, fighting childhood obesity, or alleviating poverty. These may be the happy consequences of an urban food revival, but they are not its animating force.

This is a valuable lesson. And for those of us who celebrate the power of place, Shulman's book is a welcome reminder that food and taste have always been important layers in the great palimpsest that defines this extraordinary city. Their embrace by today's popular culture gives us great hope that diversity will indeed triumph over homogeneity – and that New York will never become like anything other than itself.

– Frederic C. Rich

Contributors

Edward S. Barnard was senior staff editor and managing editor of Reader's Digest General Books for seventeen years and project editor of *Our Living World of Nature*, a fifteen-volume ecology series published by McGraw-Hill and World Book Encyclopedia. Recently he co-produced, with Ken Chaya, *Central Park Entire*, the most detailed map of Central Park available. He is keenly interested in old-growth trees and has volunteered as a tree-ring technician at the Lamont-Doherty Earth Observatory's Tree Ring Research Laboratory. His current writing projects include a book on Central Park's trees and a field guide to Philadelphia's trees.

John Beardsley is director of the Garden and Landscape Studies program at Dumbarton Oaks in Washington, D.C. Trained as an art historian at Harvard and the University of Virginia, he has written numerous books on contemporary art and design, including *Earthworks and Beyond: Contemporary Art in the Landscape* (4th ed. 2006) and *Gardens of Revelation: Environments by Visionary Artists* (1995). He has also organized many exhibitions, including "Human Nature: Art and Landscape in Charleston and the Low Country" for the Spoleto Festival U.S.A. (1997), and "The Quilts of Gee's Bend" for the Museum of Fine Arts, Houston (2002). He has taught history and theory in landscape-architecture programs at the Universities of Virginia and Pennsylvania and was on the faculty at the Harvard Graduate School of Design from 1998 to 2013.

Lauren Belfer's first novel, *City of Light* (1999), is a portrait of Buffalo during its glory days at the turn of the last century. *City of Light* was a *New York Times* Notable Book as well as a *New York Times* bestseller. Her second novel, *A Fierce Radiance* (2010), takes place in New York City during World War II and focuses on how the development of antibiotics affected individuals and families. *A Fierce Radiance* was a *Washington Post* Best Novel of the Year and an NPR Best Mystery of the Year.

Carole George is the author of *The Spirit of the Stones*, a philosophical treatise describing her creation of a pastoral landscape on her Virginia farm. The book is in production and will be available from Incline Press in early 2014. She is currently writing the story of her twelve years with a flock of pet Karakul sheep.

Laurie Olin is a professor of landscape architecture at the University of Pennsylvania and founding partner of OLIN, a landscape architectural firm in Philadelphia. He is the author of *Across the Open Field: Essays Drawn from English Landscapes* (1999) and coauthor of *La Foce: A Garden and Landscape in Tuscany* (2001) and *Vizcaya: An American Villa and its Makers* (2006). The designer for the transformation of Bryant Park and Columbus Circle in New York City, the grounds of the Washington Monument in Washington, D.C., and the new Getty Center in Los Angeles, he received the American Society of Landscape Architects Medal for Lifetime Achievement in 2011.

Frederic C. Rich, chairman of the Foundation for Landscape Studies and a dedicated gardener, is a partner of Sullivan & Cromwell LLP in New York. He was co-head of the corporate practice and currently heads the Global Project Finance Group. Active in many environmental organizations, Mr. Rich is a director of the Land Trust Alliance, a national land-conservation group, and a longtime director and former board chairman of Scenic Hudson, a fifty-year-old organization dedicated to land conservation and environmental quality in the Hudson River Valley. A writer on diverse subjects, including garden history, international finance, and a permanent site for the Olympic Games, he is the author of the recently published *Christian Nation*, a dystopian political novel (2013).

Christa Sadler has a master's degree in earth sciences and works throughout the Southwest, Alaska, and Baja California as a geology educator, writer, and backpacking, river, and sea-kayak guide. She has been a river guide in the Grand Canyon since 1988, and although she has a passion for every wild place where she has worked, the canyon is her one true love. When not away on wilderness expeditions, she is a resident of Flagstaff, Arizona, where she tends a two-acre landscape of native plants and cinder cones, home to several boisterous piñon jays.

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Editor:
Elizabeth Barlow Rogers

Associate Editor:
Alice Truax

Assistant Editor:
Margaret Sullivan

Copy Editor:
Margaret Oppenheimer

Designer:
Skeggs Design

Contributors:
Edward S. Barnard
John Beardsley
Lauren Belfer
Carole George
Laurie Olin
Frederic C. Rich
Christa Sadler

For more information about the Foundation for Landscape Studies, visit www.foundationforlandscapestudies.org., or contact info@foundationforlandscapestudies.org