

OUR LOCAL CORRESPONDENTS

THE MANNAHATTA PROJECT

What did New York look like before we arrived?

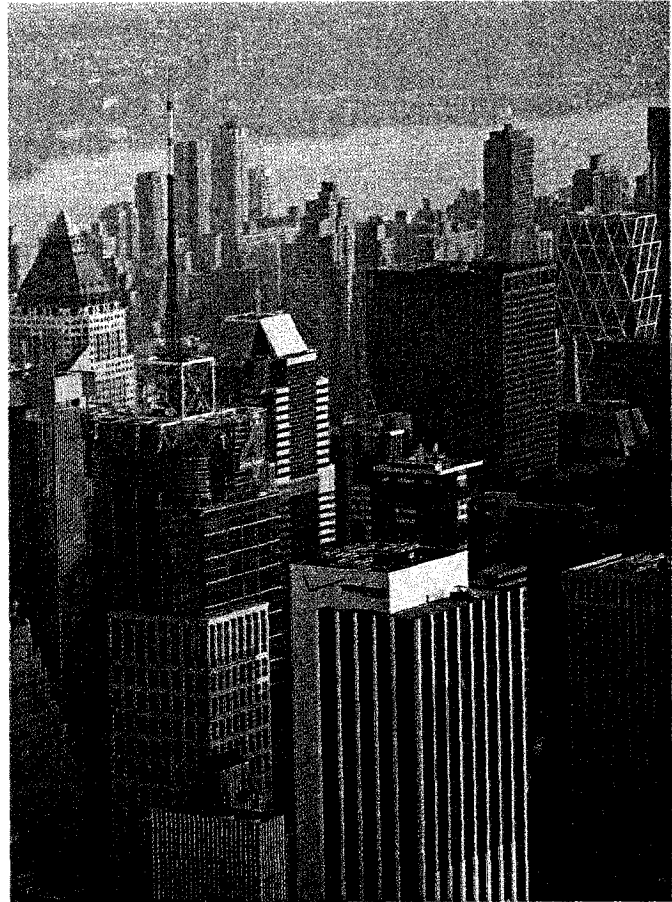
BY NICK PAUMGARTEN

It is remarkable, in the accounts of the earliest European visitors to the North American continent, how little interest some of these explorers seemed to take in the land they had just found. They hardly went ashore. As seamen—and seekers of clear passage to the Orient—they were more interested in the currents, tides, soundings, and shoals. The land, rich as it was, was at first not much more than an impediment. Of course, all that changed soon enough.

In early September, 1609, Henry Hudson and his crew sailed their *jacht*, the Half Moon, through the Narrows at the head of New York's lower bay, the point beyond which, it is generally believed, Giovanni da Verrazzano had

not progressed, eighty-five years before. This likely made the eighteen or so Englishmen and Dutchmen aboard the Half Moon the first Europeans to venture up the Hudson River and therefore the first to get a good look at the island known to the natives as Manna-hatta. The only surviving account of this journey is the diary of one of Hudson's crew, Robert Juet (who, on another voyage, a year later, helped lead a mutiny, stranding Hudson, his young son, and seven others in a small boat near the Arctic Circle). Juet's records of wind directions and river depths are precise, but from his descriptions it's often impossible to decipher where exactly Hudson was on the river. Conjec-

ture abounds, as do chauvinistic claims; various modern interpreters place a September 13th oyster feast at Spuyten Duyvil or Yonkers. At any rate, the crew sailed upriver as far as Albany, where shallow waters forced them to turn back: this wasn't the way to Cathay. On the trip downriver, a crew member shot and killed a native who had sneaked into Juet's quarters and stolen his pillow; in the ensuing melee another native tried to tip over their boat, "but," Juet wrote, "our Cooke tooke a Sword, and cut off one of his hands, and he was drowned." The next day, seven leagues south, the "Sauages" ambushed them. The sailors shot about ten of them, then took refuge in a bay that sounds as though it may have abutted Washington Heights: "Hard by it there was a Cliffe, that looked of the colour of a white greene, as though it were either Copper, or Siluer Myne: and I thinke it to be one of them, by the Trees that grow vpon it. For they be all burned, and the other places are greene as grasse, it is on that side of the Riuer that is called Manna-hata."



Times Square then and now: the area featured a red-maple swamp frequented by beavers, wood ducks, and elk.

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This is Juet's sole explicit mention of the island. We can only speculate now about what impression it made. Whoever drew the night watch may have observed an ill wind shifting from northwest to east, carrying the smell of early-autumn rot, or the faltering racket of crickets and katydids. (New York has always been noisy; Peter Kalm, a Swedish botanist, visiting in 1748, noted, "Tree frogs . . . are so loud it is difficult for a man to make himself heard." Poor Kalm: he was also so disfigured by mosquito bites while here that he couldn't appear in public.) It may have seemed a menacing place; Hudson and his crew fled from it. Two days later, the Half Moon was beating back to England, and then eventually on to Holland, which had originally sent Hudson forth. In the coming years, the Dutch dispatched more ships and, in 1614, established the colony of New Netherland, with New Amsterdam, at Manhattan's southern tip, soon to be its teeming gateway and hub. The island began its accelerated transformation into a manipulated forest of asphalt and steel. Never again would it be so wild and raw, or so under-chronicled. The new inhabitants, once they got rid of the old ones, spilled far more ink than blood.

To Eric Sanderson, a landscape ecologist with the Wildlife Conservation Society, the proliferation of documentation has been of great but not limitless use. The more people there were to do the observing, the less of the natural landscape there was to observe. Sanderson is in charge of a W.C.S. project called the Human Footprint, which seeks to assess and map the human race's impact on the surface of the earth. New York, perhaps, is the ultimate case. "It's hard to think of any place in the world with as heavy a footprint, in so short a time, as New York," he said recently. "It's probably the fastest, biggest land-coverage swing in history." For nearly a decade, he has been trying to determine exactly how Manhattan would have appeared to Hudson and his men in 1609 had they disembarked and explored the place—to summon and depict the island as it was, just before it came under the shadow of that foot. He has christened this effort the Mannahatta Project. Sanderson intends to complete it in time for the quadricen-

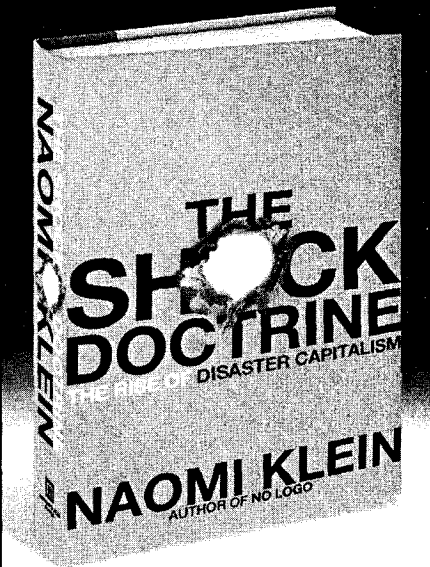
MARKIEV BOYER/WILDLIFE CONSERVATION SOCIETY; MICHAEL S. YAMASHITA/IPN

ennial, two years hence, of Hudson's landfall. It will include a lavish book; a Web site; an exhibit, he hopes, at the American Museum of Natural History; and, niftiest of all, a virtual re-creation—a three-dimensional computer map—in which you will be able to fly, as it were, above the island, land wherever you want, and have a look around. In place of your local cell-phone shop or O.T.B. parlor, you may see a trout stream, or a black bear browsing amid blueberry patches.

The Mannahatta Project aspires to minute verisimilitude, down to the varieties of moss, and will facilitate a kind of naturalist's version of George-Washington-slept-here. Eventually, Sanderson would like to put up plaques around town calling attention to this or that bygone pond or dune, or even to post recreations of 1609 vistas on the city's next generation of bus shelters. A visitor to Times Square, standing alongside the Naked Cowboy on the traffic island at Forty-fifth Street and Broadway, might be encouraged to see a convergence, under what is now the Marriott Marquis, of two freshwater creeks, one flowing out of a marsh beneath the headquarters of the *New York Post*, and the other from under the Jacqueline Kennedy Onassis High School. The creeks were dammed by beavers to create a red-maple swamp, frequented by wood ducks and elk. The idea of all this, of course, is to get us to appreciate the remnants of the natural world, even in this degraded place, and then to work harder to preserve them, here and everywhere else. Still, although Sanderson might not admit it, such visions also have a way of helping us to savor our particular range of degradations. We've made a fine mess.

The citizen's urge to know his city is a strong one, and perhaps nowhere more so than in New York, where cosmopolitanism refracts into a kind of a superheated parochial self-regard. New Yorkers can hardly fathom how you could come into New York Harbor and not immediately see that this island, to borrow the writer Russell Shorto's phrase, would soon be at the center of the world. Hudson's men didn't even seem to recognize that it was an island, much less a special one. It would have been harder, certainly, for them to imag-

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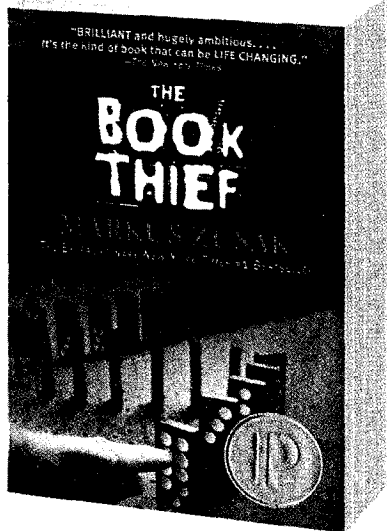
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ine the place's future than it is for us to summon its past.

They must have noticed, though, that the harbor was as deep and fair as they come, and that the river at its head was a significant one. Even though the Hudson didn't lead to the Orient, it did reach deep into the heart of beaver-pelt country, and, eventually, it provided access to the Great Lakes and the territory west of the Appalachians, by way, first, of the Mohawk River, and, later, of the Erie Canal. Geography determined the city's destiny, to a certain degree. But what of its ecology? Manhattan was at the center of a web of tidal estuaries—a ripe marine environment, a major stop on the eastern flyway for migrating birds. Its temperate seasons, dense hardwood forests, ample freshwater, great diversity of habitats—fifty-four "ecological communities" in all, according to Sanderson, from pitch-pine barrens to peatlands to eelgrass meadows—made it an unusually abundant corner of the continent. Without the city astride it, the island might still be

one of the hemisphere's marvels. Manhattan was a superstar, even before its settlers made it one.

"You could do the same thing for downtown Cleveland, but it wouldn't have the same impact," Sanderson said of his project. "New York is the archetypal city, so in some ways the nature that underlies it is also archetypal."

The attempt to strip one layer from the other, and to see where they match up, seems to stimulate some as yet undiscovered cerebral nodes devoted to before-and-after visualization. The fantasy of depopulation, whether retroactive or futuristic, appeals to our sense of vanity and self-loathing. It may help explain the success of the book "The World Without Us," in which the author, Alan Weisman, describes what would happen to the earth if humans were no longer around. (In short, it would both bounce back and go to hell, in interesting ways.) It's Mannahatta in reverse. Weisman devotes a few pages to Sanderson's project, surmising that its findings will give us a clue as to what

Manhattan would become in our absence. But, of course, the Manhattan of 1609 is lost. The city is far more than a flesh wound.

Sanderson caught his first glimpse of prelapsarian Manhattan in a map that had been prepared by the British during the Revolutionary War. It is called the British Headquarters Map, and it depicts, in meticulous detail, at a scale of six and a half inches to a mile, the island's contours and topographical features, its streams and swamps, so as to aid the British in defending it against General Washington's Continental Army. The map emphasizes marchability. In 1782, when the map was likely completed, most of the island's pre-Hudson topography and hydrology, if not its ecology (the Dutch and English had already introduced dozens of species, and chased away a few, too), was largely intact—although the map does not show, for example, that the British, cut off from the rest of the continent during the war, had chopped down all the trees. ("The island is totally stripped," George Washington observed in 1781.) After the Revolution, and especially after the adoption of the grid system, in 1811, the island's surface, and even its innards, were irrevocably altered.

The grid ran roughshod over the landscape. In 1808, John Randel was dispatched to survey the entire island, for the purpose of laying out the grid. A decade later, he began a series of ninety-two maps, called the Farm Maps—meticulous closeups, with an elevation reading for the northwest corner of every intersection on the new grid. Sanderson pieced these together and also found Randel's notebooks at the New-York Historical Society, which contained even more detail. Then Sanderson, along with some colleagues, went out into the field with an altimeter and a G.P.S. locator and squared Randel's findings with their own and with the British Headquarters Map. Finally, they created a new contour map, drawn by hand—a template for the restoration of 1609.

Sanderson's map depicts a more slender and sundered Manhattan than the one we know. The coast is notched with coves, streams, and tidal marshes. There are stretches of sandy beach, including a four-mile strand from the Battery to

West Thirty-third Street. Over the centuries, the island has fattened up. The Dutch started it by dumping their refuse into the coves and wetlands and bays. By 1782, the shoreline had already expanded two blocks east (Pearl Street to Water, Water to Front), thanks to a steady diet of excavated earth, garbage, and sewage. Since then, the shoreline has been straightened and filled, and girdled by highways; it seems weird even to use the word "shore." The old coast would have cut Ground Zero in half. (The terrestrial half would have consisted of thirty-foot hills, rising quickly from the shore, dense with oak and chestnut trees—so cry not for Radio Row.) Many of the city's hills, especially those on the southern half of the island, have been levelled, and its dells and creeks have been filled. Murray Hill, for example, used to be a prominent ridge, running from present-day Forty-sixth Street and Sixth Avenue southeast to its high point on East Thirty-seventh. Approaching it from the north, you would have seen a steep hemlock forest. Now you hardly notice any incline at all, heading downtown on Fifth Avenue, unless you are on Rollerblades, skating into the wind.

One day, I went to visit Sanderson in the W.C.S. offices, which occupy a cluster of trailers in a parking lot at the Bronx Zoo. He greeted me in bare feet: a morning of torrential rain had caught him mid-commute, from his home on City Island, and soaked him to the knees. His trailer was a paradise of field guides and cool maps. Sanderson is forty, with a gentle manner and a soft voice but the intense eyes of a functional obsessive. He grew up in (and on) Walnut Creek, California—the East Bay. He recalls that his driveway was always full of frogs. In the early seventies, Sanderson remembers, the Army Corps of Engineers converted the creek into a concrete ditch. The frogs disappeared. Once, when he was a Boy Scout, a counsellor told him to sit next to the Stanislaus River for three hours without moving. "I thought I was done after fifteen minutes," he said. "After thirty minutes, I was totally bored. And then things got interesting. I began to notice things."

Nine years ago, he moved to New

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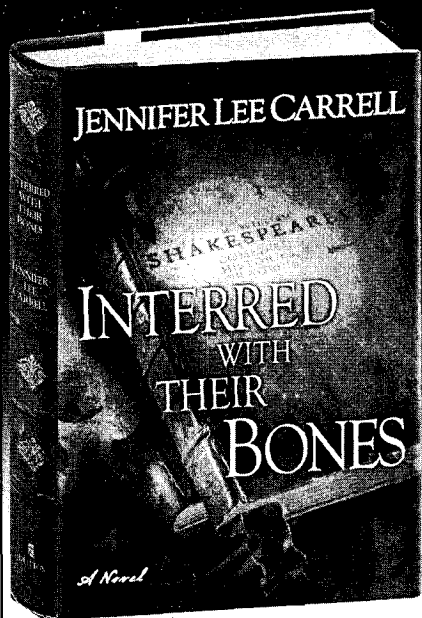
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York, to work for the W.C.S.—a hard-luck deployment for a nature boy. The city has, somewhat ironically, long been a major nexus for naturalists, both amateur and professional, who, congregating here out of institutional or commercial necessity, sought an outlet for their Linnaean inclinations. The ratio of field notes to actual field may be higher in New York than anywhere else. Sanderson, anyway, began to notice things.

Sanderson has devised a systematic way of recording and representing an ecosystem. He calls it the Muir web, after John Muir, the pioneering American naturalist. In the Muir web, each species of plant or animal, and each characteristic of habitat, has a full set of needs and associations, which, taken together, form a tangle of connection and dependency. If you have a particular bird, it means that you'll have a particular tree bark, or nut, or bug, and so on. To evoke 1609 Manhattan, he throws out the non-native species—such as the cardinal, which didn't expand its range this far north until the twentieth century—and adds those he can fairly presume were here. He must catalogue the conditions under which, say, white pines exist—shallow, sandy, sterile soil—and make an educated guess as to where they may have been. He said, “I may be going out on a limb, but at least I'm trying to document whose limb I'm out on.” By the time he's done, he expects to have four thousand elements in his Muir web. He then plugs them all into his customized modelling software, which places them on the map, as nature, or a creator, might have. The software mimics that of social-networking sites. His son, who is six years old, once asked him to explain it, and he said, “This program writes programs that tell the mapping program to make the maps that predict where all the species were.”

Eighty per cent of the work is building the data sets. The glory part is turning that data into 3-D pictures. This is the bailiwick of Markley Boyer, a digital-photography entrepreneur who heard about the Mannahatta Project while working with the W.C.S. in Gabon, and volunteered to help. For example, using line drawings from books, and photographs of bark, seeds, and leaves, Boyer creates computer images

of trees—several varieties of each species. “Then the software will start placing trees semi-intelligently,” Sanderson said. He is predicting accuracy down to one block.

For every element of the Mannahatta project, Sanderson has consulted dozens of sources: “Catalogue of Plants Growing Spontaneously within Thirty Miles of the City of New York” (1817); “The Moss Flora of New York City and Vicinity” (1916); various soil guides, which describe much of the city's soil as “coarse anthropogenic material,” also known as garbage. As far as phantom water is concerned, a favorite is James Reuel Smith's “Springs and Wells of Manhattan and the Bronx, New York City,” which Smith researched, beginning in 1897, by riding a bicycle around town and taking photographs of springs and wells (an approach unavailable to him in the preparation of his “Springs and Wells in Greek and Roman Literature”). So far, the only funding Sanderson has received is thirty-five thousand dollars from the Hudson River Estuary Program, which is underwritten by New York's Department of Environmental Conservation, plus the book deal, which is from Harry N. Abrams. The president of the W.C.S., Steven Sanderson (no relation), has allowed him to devote a great portion of his time to Mannahatta. Steven Sanderson told me recently, with a note of admiration, if not quite impatience, “It will be wonderful, finally, to get all of this squeezed out of Eric's head into some available format.”

“Show him your ephemeral creeks,” Sanderson said to Amanda Huron, a City University graduate student, who was busy modelling tidal levels on a computer. As Sanderson and Boyer looked on, she pulled up a representation of the Collect Pond, the site of a Lenape settlement, and later of Five Points, an infamous slum, and now of Foley Square, home to several government buildings. The pond supplied the city with drinking water into the nineteenth century, until it was polluted by tanneries and slaughterhouses; it was then filled with dirt and garbage that settled and moldered and stank—which is one reason that the neighborhood built over it was a slum. Huron's diagram showed

that a pair of streams pouring out of the Collect Pond, one heading east and the other west, joined tidal creeks that meandered, in turn, into the East and Hudson Rivers. At high tide, Sanderson thinks, the Lenape could paddle a canoe from one side of the island to the other. "It's like the L train," Boyer said.

According to the 1782 map, Manhattan had more than seventy miles of streams and at least twenty-one ponds. The longest stream was the Saw Kill; it flowed from present-day Central Park to what is now the Seventy-first Street exit off the F.D.R. Drive. The Great Kill went from Times Square to the Hudson, near the entrance to the Lincoln Tunnel. The soggy ground of the Lispenard Meadows, under what is now SoHo and the northern part of Tribeca, is responsible for the dearth of skyscrapers in that part of the city and the dip in the skyline between downtown and midtown. (It's no obstacle to today's engineers, who can reach the bedrock deep below the muck. Witness, if you must,

the forty-six-story Trump SoHo hotel rising above Spring Street.) There was a pebbly brook on Maiden Lane, where the Dutch girls would do their washing. There are still stories of streams running through the kitchens of fancy restaurants or the basements of schools. Best known, perhaps, is Minetta Brook, a creek whose burbling waters supposedly surface, after storms, in the lobby of an apartment building on lower Fifth Avenue, into a bonglike contraption of clear tubing.

At Astor Place, a series of sand hills—*zandbergen*—supported pitch-pine and scrub-oak barrens, like those you see in southern New Jersey or eastern Long Island. The Upper West Side was a plateau of upland forest and meadow, abloom with asters (not Astors), cardinal flowers, monkey flowers, red columbine, and black snakeroot. For this reason, the Dutch called it Bloemendael, which became Bloomingdale, a name that stuck until the mid-nineteenth century. Broadway, parts of which were for-

merly Bloomingdale Road, had followed the course of an old Lenape trail up the spine of the island. The Lenape had likely followed the game; Broadway belonged to cougar and deer.

One day this summer, I met Sanderson and Boyer at the entrance to Inwood Hill Park, on Isham and Seaman Streets, near the northern tip of Manhattan, where the woods are as near as anything in town to an original state. (The term "original" is tricky, since twenty thousand years ago the island lay under a thirty-stories-deep sheet of ice.) Boyer said, "This is one of the few parts of Manhattan where you can get around successfully with a 1782 map." The idea was to start our field trip as far back in time as possible. The further uptown you go, the more traces you'll find of 1609, as if a multigenerational campaign to obliterate them lost steam as it advanced north. For this reason, Inwood is Sanderson's favorite part of Manhattan.

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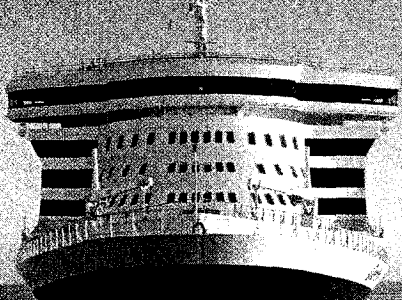
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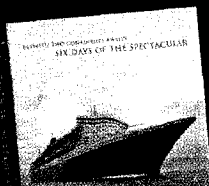
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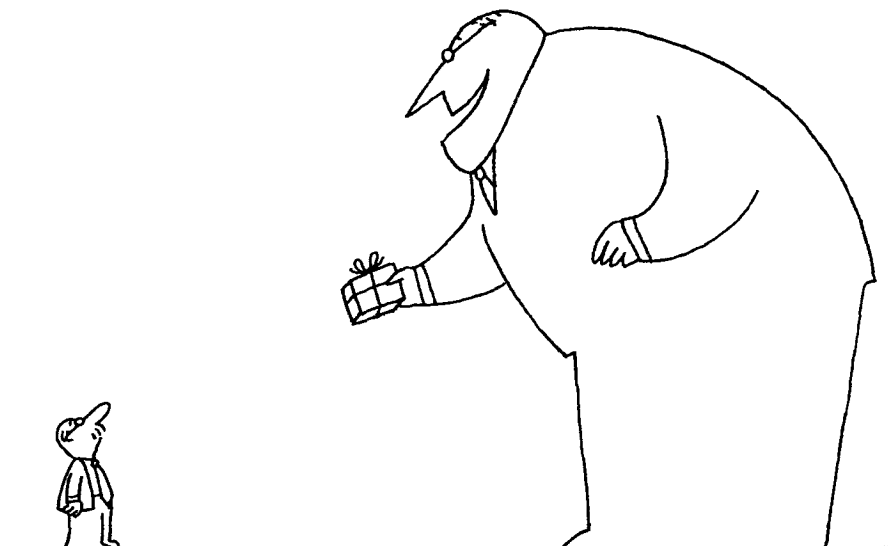
stretch of uncut grass between some handball courts and a row of tenements trawling denim-strewn laundry lines. Well-trod paths cut through an adjoining thicket. Boyer said, "One thing we've found is that the places we like to go are places where gay cruisers like to go." Sanderson was wearing a panama hat and navy-colored bushwhacking clothes. Boyer, lean and bright-eyed, had on black jeans and a white shirt. They had a G.P.S. and an enlarged printout of a portion of the British Headquarters Map, on which they'd superimposed the street grid—an oddly thrilling document, as endlessly scrutinizable as the cover of "Led Zeppelin IV."

Sanderson's hybrid map indicated that there had been a creek a few blocks south. We hopped down off the grass onto a sidewalk, and then over an old stone wall and into the woods. There were wild raspberries, and empty Bacardi bottles, and a sign saying, "Do Not Feed Pigeons." We came into a slight clearing and an almost imperceptible depression in the earth, which Boyer and Sanderson thought could be a sign of the stream. From the phantom creek bed, we headed north along a path of crumbling asphalt, which seemed to follow the course of an old road on the map. Up here, there were giant, healthy oaks. "We think that this is more or less what it looked like," Boyer said. A parks-department employee sped by in a golf cart; we passed

a leopard-skin umbrella and a guy (my guess was Senegalese) in a Che Guevara T-shirt talking on his cell phone. From a promontory, we followed the path down into a gulch and the oaks gave way to immense tulip poplars, many of them as old as the British Headquarters Map. "There were Lenape living in here," Sanderson said. He pointed to some caves on a talus slope, which were largely sealed off about seventy years ago. "The ridge gave them protection against the prevailing winter winds," he said. We came out of the woods at the spot where, as a plaque explained, Peter Minuit supposedly bought Manhattan from the Lenape for trinkets worth sixty guilders. Acres of landfill now separated it from the waters of Spuyten Duyvil. A pair of tourists were standing there, trying to make sense of their map. They looked at ours and said, "You guys have a good map."

"Ours is a little old," Boyer said.

We made our way back to where Boyer had parked his Subaru, which had a Segway in the back. We took Dyckman Street to the Harlem River Drive and drove down to East 106th Street, where another F.D.R. exit follows the course of a vanished tidal creek. This one, called Pension's Creek, ran west from the East River all the way past Fifth Avenue to the current shore of the Harlem Meer, in Central Park, before turning north. The island had



"Your hopes and dreams—we saved them for you."

been nearly bisected here by water. Harlem was, first and foremost, defined by this creek. (It is odd, in this sense, that Ninety-sixth Street, and not 106th, became the de-facto boundary between East Harlem and the Upper East Side.) The Dutch called the south bank Otterspoor, owing to a preponderance of river otters. On the British Headquarters Map, a thin strip of dry land between Pension's Creek and a rocky hill, in what is now the Park, was called McGowan's Pass, in honor of the family that owned a nearby tavern. It's the Karbala Gap of the Upper East Side. Washington shot through the pass prior to the Battle of Harlem, and during the War of 1812 the locals built a fort there as a defense against the British, who had attacked Connecticut.

Nowadays, McGowan's Pass is defended by Knish Nosh, a snack bar next to the Conservatory Garden. On the day we visited, it was manned by a young Russian who claimed to have pumpkin bagels (he meant muffins). The patrons, that morning, consisted of a group of summer campers engaged in a scavenger hunt, and a fleet of hospital patients in wheelchairs, attended by a few nurses. A man drifted by on a bicycle, with "Brick House" playing from a boom box. As tempting as it was to rue the absence of otters, egrets, and acres upon acres of spartina grass waving in the breeze, there was something beguiling about this assemblage in the Park on a summer weekday morning.

We climbed up onto the hill over the pass, and looked north and east out over the barrio. In place of the brownstones and bodegas, there would have been a vast grassy plain. There would have been heath hen, now extinct. The ground was flatter than in most of Manhattan, because the rock there is marble (called Inwood marble), rather than the schist that undergirds, and occasionally juts out of, the soil in most of Manhattan; it is softer, and so it had been ground down by the ice during the last ice age. The Lenape had probably burned the plain every ten years or so, to keep it clear, for better farming and hunting.

As for the Harlem Meer, directly below us, it is, like most of the waterways of Central Park, man-made. "I was talking to a palynologist," Sanderson

said. "I was thinking that maybe we could get some salt-marsh core samples from beneath the Meer. But it turns out it's lined with cement."

Later, we drove down Fifth Avenue, along the edge of what used to be hilly, boggy wilderness, the intransigence of which helped preserve it long enough for it to be viable as a park (although it gave the Park's landscapers fits). Likewise, the other parks, to the north—such as Morningside, Fort Tryon, and Mount Morris—are on land too steep and rocky to be easily developed. We emerged into the blinding mayhem of midtown, parked in a garage on West Forty-eighth Street, and walked down a block to the Diamond District, into what was once a pond-pocked hemlock forest. Five blocks to our south, on the ridge of Murray Hill, there had been stands of white pine, ten to fifteen stories tall—which, ideal for ships' masts, were doomed, well before any Coliseum Books could sprout up, and then close, in their place. Looking down Sixth Avenue, Sanderson gestured toward the herds of pedestrians stretching away from us and said, "You see all those heads, and you think that the six hundred Lenape who used to live on Manhattan could have fit on that one block."

We stood on the north side of Forty-seventh, looking across the street at the row of jewelry shops—the Futurama Diamond Exchange—and tried to picture a cool, shady forest. The citizens of the world streamed past, intent on making deals. A Chinese-restaurant deliveryman asked us to move so that he could unlock his bike. Boyer had his G.P.S. out. We were searching for the site of an ancient pond, which they had seen on the 1782 map. Gradually, we closed in on it. "Right here," Boyer said. The pond's shore stretched from David S. Diamonds to the National Jewelry Exchange. It occurred to me that the stall where I'd purchased an engagement ring ten years earlier was right on top of it. We decided to stop by. The dealer, recognizing me, said, "What are *you* doing here?" We tried to explain. He said that he knew nothing about any pond and then gave us a look suggesting we'd better just move along. ♦

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