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Spire

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Winter 2015

D.C.'s New Dome

A world-famous symbol of democracy is going under cover, as workers start a two-year, $60 million renovation of the U.S. Capitol dome.

By Charles Babington

Curved rows of scaffolds, like Saturn's rings, will encircle it next spring, enabling contractors to strip multiple layers of paint and repair more than 1,000 cracks and broken pieces. The dome will remain illuminated at night and partly visible through the scaffolding and paint-capturing cloths. But the Washington icon -- and portions of the Rotunda's painted ceiling that lies below -- will be significantly obscured for many months.

The project is beginning just as the nearby Washington Monument sheds scaffolding that was used to repair damage from a 2011 earthquake.

Half-completed when Abraham Lincoln stood beneath it to summon "the better angels of our nature" in 1861, the Capitol dome has since towered over Washington, which limits building heights to 130 feet. Time, however, has let water seep through hundreds of cracks. The water attacks cast iron, which "continues to rust and rust and rust," said Stephen T. Ayers, Architect of the Capitol.

This first major renovation in more than 50 years should add decades of structural integrity to the dome, which Ayers calls perhaps "the most recognizable symbol across the globe." The $60 million undertaking will heal inner wounds, he said, without changing the way the dome looks from the ground.

Much of the work will be done at night and on weekends. It won't be as flashy as the 1993 helicopter removal and return of the 19-foot Statue of Freedom from the dome's top.

The Capitol's crowning piece is actually two domes, one nested under the other like Russian dolls, and separated by a web of cast iron braces hidden from view. From the ground it looks like a massive structure that would be too heavy for the building to support if it were indeed made of the solid stone it appears to be.

Instead it is cast iron painted to look like masonry. The lighter material and open space between the inner and outer domes create a physically sustainable structure. But it's by no means puny.

The dome's iron and masonry weigh 14.1 million pounds, said Kevin Hildebrand of the Capitol architect's office. He led reporters up narrow, spiraling stairs that reach the Rotunda's top, and then give access to the in-between world of girders separating the two domes. Ultimately the steps lead outdoors, to a panoramic walkway beneath the 12-columned lantern, or tholos, topped by the Statue of Freedom.

After a 1990 rainstorm left puddles on the Rotunda's stone floor, workers found that bird nests had clogged gutters atop the Capitol, helping water penetrate outer walls and streak interior surfaces. Then they found bigger problems. Hundreds of cracks and pinholes in the cast iron exterior added to the seepage.

Pans now capture the water. Congress finally agreed to spend $60 million for a better, more lasting solution.

"It is the symbol of our country," Hildebrand said. "It is an icon that has to be preserved."

The 150-year-old cast iron is low-quality by today's standards, he said.

"It's an archaic material," Hildebrand said. A dome today probably would be built with glass and steel, he said. But Capitol workers must deal with relatively brittle iron that doesn't respond well to welding.

First they must remove, capture and safely dispose several layers of lead-based paint. When they reach bare iron, they must quickly prime and paint it section by section, Hildebrand said, because it will "flash rust" in eight hours.

To mend cracks, workers will drill and tap damaged areas, and then insert steel pins. "Metal stitching" will complete the process.

Before repairing water damage inside the Rotunda, workers will hang a giant doughnut-shaped drop cloth just below the painted ceiling. Rotunda visitors whose necks can stand the crane will still see "The Apotheosis of Washington" through the doughnut hole. The 4,664 square-foot painting, 180 feet above the Rotunda floor, depicts George Washington becoming god-like, aided by figures from classical mythology.

"If these repairs are not made, the artwork in the Rotunda, including the Apotheosis of Washington and the Frieze of American History, are at great risk of damage due to water leaks," says the Architect of the Capitol's Web site. "There is only one Capitol Dome," it says, and the office "is committed to preserving it for generations to come." ■

133 Years In the Making

The Sagrada Família, inspired by nature and faith, has been under construction since 1882. It's now in the final phase, with just another 11 years until completion.

By Jeremy Berlin

Clock-watchers, take note: The Sagrada Família has entered the home stretch of construction. And it took only 133 years.

Six new towers will soon be added to the (in)famous Roman Catholic basilica in Barcelona, bringing the total to 18 and—at long last—finishing the work begun by Catalan architect Antoni Gaudí in the late 19th century.

The tallest of the new towers will be 564 feet (172 meters) high, making the cathedral the tallest religious structure in Europe, says Jordi Faulí, the current chief architect. The building is now 70 percent complete and on track to be finished in 2026—the centenary of Gaudí's death—though some decorative elements could take up to six additional years to complete.

Consecrated in 2010 by Pope Benedict XVI, the Sagrada Família remains an extravagant work in progress—a fever dream of deliquescent spires and vivid stained glass, ornate facades, and ornamental arches. Rising hundreds of feet above downtown Barcelona, it draws the eyes (and euros) of some three million visitors a year.

It's impossible to say how much money the prolonged construction has cost over the years. Today the annual budget is reportedly $27 million, paid for partially by visitor entrance fees and private donations.

More quantifiable is the time it's taken to build the cathedral. When asked why the project was taking so long, the pious Gaudí was fond of saying, "My client is not in a hurry." He was talking about God.

When the architect died in a trolley accident in 1926, only one façade—and less than a quarter of the exterior—was complete. Since then construction has been waylaid by everything from protests to politics, civil wars to funding woes.

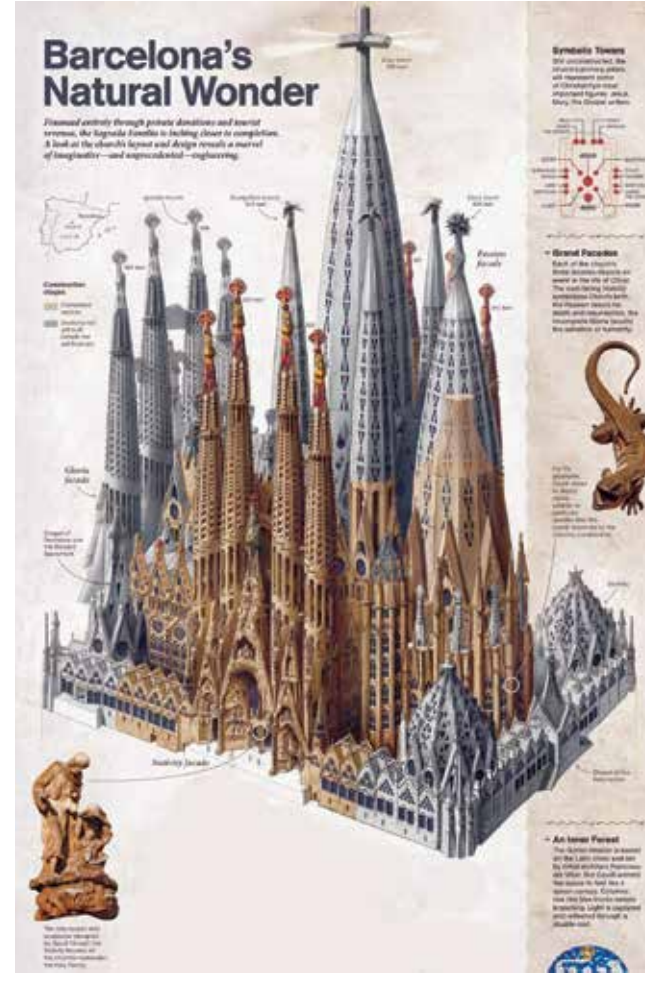
Born in 1852 near the town of Reus, Gaudí grew up fascinated by geometry and the natural wonders of the Catalonian countryside. After studying architecture in school, he eventually forged his own style—a sui generis synthesis of neo-Gothic, art nouveau, and Eastern elements.

For Gaudí, form and function were inseparable: One found aesthetic beauty only after seeking structural efficiency, which rules the natural world. "Nothing is art," he concluded, "if it does not come from nature."

In 1883, Gaudí inherited the Sagrada Família from another architect, who had laid a traditional neo-Gothic base. Gaudí envisioned a soaring visual narrative of Christ's life, but knew that the massive project could not be completed in his lifetime.

So for more than 12 years prior to his death, he rendered his plans as three-dimensional models rather than as conventional drawings. Though many were destroyed by vandals during the Spanish Civil War, those geometric models have been vital to Gaudí's successors.

"They contain the entire building's structural DNA," says Mark Burry, an Australia-based architect who has worked on the Sagrada Família for 36 years, using drawings and computer technology to help translate Gaudí's designs for today's craftsmen. ■



A Concrete Ribbon Through the Clouds

By Joseph Giovannini

Nothing prepares first-time travelers barreling up toward Paris on Autoroute 75 for the Millau Viaduct, a long and towering white apparition that suddenly appears around a bend of the Massif Central. Framed by the windshield, seven lithe, stately masts, each with fanning cables, sail 1½ miles across the Tarn Gorge, holding up a roadbed 885 feet above the Tarn River, above even the cloud line that often shrouds the valley.

From its ribbon cutting in 2004, the viaduct was destined for Guinness: When finished, it had the highest road deck in Europe, the tallest piers and highest bridge tower in the world, and the longest launch of a bridge deck. It even displaced the Eiffel Tower as the country's tallest structure. Engineers took the curvature of the Earth into their calculations. But more than a wonder of epic size and technology, the gracefully curved bridge, supported on needlelike piers, is a masterpiece of daring and majesty. It was clear from the start that this bridge is much more than an expedient path between points A and B.

Millau was infamous as one of France's worst traffic bottlenecks, clogged during the summer holiday migration between Paris and the Mediterranean. In 1993, the French department of public works staged an open competition to build a high bypass bridge between plateaus at the top of the gorge, based on an initial concept by its engineer, Michel Virlogeux, who proposed a multi-span, cable-stayed bridge with a phalanx of seven masts supporting cable fans.

An observation commonly made about engineering is that a structure will be beautiful if it hews closely to the laws of physics, that "elegance" accrues naturally to designs that obey and embody the forces. After the inauguration, Mr. Virlogeux said in an engineering magazine: "The greatest art comes from making things very simple, but very elegant and perfectly adapted."

In fact there are many ways to embody forces in a design, and architect and engineer proceeded component by component to achieve elegance. In an unusual professional arrangement, Mr.

Virlogeux joined the team that won the competition, Foster + Partners Architects. "We were driven by the scale of the idea and a shared passion for the poetic dimension of engineering and its sculptural potential," says Norman Foster in "Millau Viaduct," a slim monograph on the bridge.

The fusion of their efforts meant that Foster did not simply apply architectural motifs to a pre-engineered fact, but worked with the engineer in a feedback loop, each informing the other. Mr. Foster and his associates, including Alistair Lenczner, who led the Foster team from 2001, were involved both with the engineering and the design of the engineering. They designed the parts making up the whole, always guided by a desire to reduce them to their structural and visual essentials.

Mr. Foster set some concrete goals, inking "light & lightness" at the top of sketches published in "Millau Viaduct." He also wrote, "I wanted the structure to look as delicate as possible, almost floating. I wanted motorists to feel as if they were flying their cars."

The designers buried the foundations deeply, so that the piers supporting the bridge would shoot up from the ground like "blades of grass," Mr. Foster said, with no apparent support. From the base, the vector of the bridge is up, aspiring to height like the mighty trunk of a sequoia. The architects turned the pier into a hexagon with faceted sides that catch the light and reduce the apparent visual mass. They tapered the form as it rose, to express lighter structural loads and to minimize the profile. Already thin and minimal, the pier was then slit in its upper reaches to create a vertical groove that allowed the two resulting sides to flex and absorb horizontal deflections from movement of the roadway.

The architects extended the split at the top of the concrete pier beyond the roadway into the steel masts above, forming an A frame. From the valley below, each pier and mast merge to look like a single needle with an elongated eye: Foster's drawings, in fact, depict a thread piercing the eye of a needle.

Because a structural spine runs under the middle of the roadbed, the designers could attach the cable fans to the spine in a single row, rather than securing a double set of cables to beams at either edge of the road. That allowed the architects to taper the edges to a thin line, reducing the overall mass, increasing the sense of lightness. Extending the curve of Route 75 through the hills, they gently bent the bridge on a 12-mile radius, creating a smooth, shallow curve that gives motorists at either end a view of all the masts at the same time. ■

Shanghai's New Crown

By Frank Langfitt

Shanghai is one of the world's most vertical cities, a metropolis where 50-story buildings are routine. At night, the cityscape is so cinematic, it has been featured in both James Bond and Mission Impossible films.

This year, Shanghai Tower, the world's second-tallest building, will open and put an exclamation point on Shanghai's futuristic skyline. The structure, which measures 2,073 feet, is loaded with symbolism.

It rises out of Shanghai's riverside financial district, which as recently as the 1990s was a mix of warehouses and open fields, even home to a dairy farm. The tower twists and tapers like a glass and steel geyser hurtling toward the sky — illustrating both Shanghai's and China's ambitions.

The building is so tall, only the Burj Khalifa (2,717 feet) in Dubai is taller, that the views can be disorienting. From an observation deck on the 120th floor, visitors can stare down about 600 feet to a neighboring skyscraper, the Jinmao Tower. By comparison, the Jinmao, which opened in 1999 and resembles a pagoda, is taller than the Empire State Building.

On a clear day, you can see more than 30 miles from Shanghai Tower to the East China Sea, says Jun Xia, a Shanghai native and regional design director for Gensler, the American firm that designed the building.

To prevent the building from swaying in heavy winds, workers used a crane to stack steel plates and build a 1,200-ton, tuned-mass damper near the top of the tower. The damper is computerized and surrounded by pistons, which push it in the direction of strong winds to counterbalance their force. Without a damper, the top of the building could sway as much as 5 feet during typhoons, says Daniel Winey, Gensler's managing principal for the Asia-Pacific region.

"If you don't have something like this in a building of this height, you can actually get nauseous," says Winey.

Beyond its height, what distinguishes the structure is its design.

Shanghai Tower is a building within a building. The interior — where offices and a hotel will be located — is a cylinder wrapped in a skin of glass and steel, which creates a

series of atriums that run up the sides of the structure. An atrium on the eighth floor is a dozen stories tall and has palm trees, granite benches and a panoramic view of the city.

"It creates what we call a vertical, urban community," says Xia.

Once the building is completely open, 20,000 to 30,000 people will pass through each day, says Winey. People can have lunch, grab a coffee or hold meetings in the atriums, called sky lobbies. Winey says the sky lobbies should offer enough amenities that some people won't feel compelled to leave the building during the workday, which will save on elevator rides and electricity.

"It's really more a study in urbanism than anything else," says Winey. "It's taking the ideas of Shanghai, where you have all these little parks and neighborhoods, and (turning it) from a horizontal plane to a vertical plane."

In all, there are 21 sky lobbies — that's not a typo — which are mostly public space that can't be rented out to make money. Winey says these sorts of design elements ensure a building like this would never be constructed in the United States, because the return on investment would be a long way off.

"From an economic standpoint, it would never pencil out," he says. "I don't think there would be any U.S. developers who would make that kind of investment."

Shanghai Tower, though, isn't a conventional investment. It was built for about $3 billion by the Shanghai Tower Construction and Development Co., a state-owned enterprise. The company declined an interview request from NPR.

The structure, which is ultimately owned by the city, is more than a building. It's a statement, an anchor for Shanghai's showcase skyline and a symbol of China's economic rise. From the government's perspective, given the message it's trying to send to Chinese people and the world, the money is probably worth it.

Shanghai Tower's reign as the world's second-tallest building, though, won't last long. Ping An Financial Center in the southern Chinese city of Shenzhen will surpass it when it opens next year.

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NYC's Tallest, Fairest Tower

By Matt Chaban

Along a stretch of New York City's Park Avenue, between 56th and 57th Street, soars a tower so jaw-droppingly altitudinous that King Kong himself would likely think twice before scaling it.

Its rooftop, roughly a quarter of a mile high, makes it the tallest building in New York and the highest residential tower in the western hemisphere.

At 96 stories (1,396 feet), it has no company in the space it occupies atop Manhattan's skyline. The Empire State Building tops out some 150 feet below that. Absent its spire, the newly built World Financial Center—itself a giant—is 28 feet shorter than this new cathedral to uber-wealth. 432 Park Avenue can be seen from all five boroughs of New York City, from inbound Metro-North trains coming in along the Harlem River, from the Meadowlands in New Jersey, and from several vantage points on Long Island. Its lone silhouette dominates the skyline from every angle. It demands your attention in a way that no residential building ever has.

The most remarkable thing about 432 Park, however, is not just its sheer size. It is the fact that, in a building so tall and imposing, with over 400,000 square feet of usable interior space, there are only 104 units for people to live in. 432 Park Avenue is, in short, a monument to the epic rise of the glob-

al super-wealthy. It is the house that historic inequality built.

Our story begins in 2009 with a little-known Los Angeles-based private equity firm called CIM. The firm's three managing partners, a former Drexel Burnham banker and a pair of former Israeli paratroopers, quietly dropped in on Manhattan's punch drunk post-financial crisis real estate market with money to spend. CIM moved quickly, writing checks to bail out some of the city's most prestigious real estate families and firms, as projects were stalling and financing had all but dried up. The outsiders became Manhattan power players overnight.

Strong relationships with investment organizations like Blackstone and Calpers put the west coast-based firm in a position to capitalize on a once-in-a-generation opportunity in a city where the incumbents were largely overleveraged from the prior boom. They acted as the bank behind the resurrection of several high-profile distressed properties, and allowed the original developers to stay involved with each deal as their partners.

By 2011, CIM was everywhere. The economy was slowly improving, the financial firmament was beginning to thaw, and institutional investors were cutting checks again. It is in this recovering environment that a project as ambitious as 432 Park Avenue can even be dreamed of, let alone funded.

Harry Macklowe is one of the real estate industry's most famous and colorful characters, with a massive portfolio of properties and projects to go along with his outsize personality. No stranger to gambles and calculated risks, Macklowe found himself in a bit of a squeeze in 2008, as the seams of the property market began to tear and the bills from New York's decade of excess came due. A highly leveraged real estate transaction backed by a $5.8 billion loan from Deutsche Bank kept his name in the news, and his stake in several trophy properties, like the General Motors Building, were said to have been in jeopardy.

CIM stepped into the breach, providing financing for several of Macklowe's troubled projects, and a partnership was born that would lead to the groundbreaking at 432 Park. By August 2011, their incredible plans for the tower—which would occupy the land where the Macklowe-owned Drake Hotel had been demolished—began to leak onto real estate news sites like Curbed and The New York Observer. The idea of a "fifth-act" survivor like Harry Macklowe partnering with a "mysterious" developer from out of town proved to be an irresistible storyline to the chattering classes.

Within a year, we began to get a sense of what 432 Park Avenue would come to represent. First, we learned that the number of condo units built would be closer to 100 than the originally planned 140. Next came details about the building's sales efforts. Notably, while Macklowe Properties had kept 432 Park Avenue's units off of popular broker databases like StreetEasy and the Residential Listing Service (RLS), the firm was going full-throttle in its attempt to court the Russian oligarchy. A kind of traveling sales office was set up at the Ritz-Carlton Hotel on Moscow's Tverskaya Street, where dozens of billionaires pass through the lobby each day.

By May 2013, Macklowe had announced that the top-floor penthouse was already sold for an astonishing $95 million. Half of the building's apartments were under contract, with projections of $3 billion in total sales. This February, Manhattan realtor Douglas Elliman was brought on as the exclusive co-sales agent to help move the rest of the units.

It is widely believed that the building will only be one-quarter occupied at all times, even though it will be completely sold out. Keep in mind that these are pied-a-terres that begin at $7 million each and include several full-floor parcels in the $75 million range. More than anything else, this speaks to the insatiable appetite of the world's greatly expanded billionaire class. Middle Eastern oil magnates, Chinese billionaires, Russian oligarchs, and the Latin American aristocracy all have one thing in common: More money than they know what to do with and a desperation to get as much of it out of their home countries as possible. New York real estate works very well as both a facilitator of this as well as a store of value.

Along a stretch of New York City's Park Avenue, between 56th and 57th Street, soars a tower so jaw-droppingly altitudinous that King Kong himself would likely think twice before scaling it. ●

Back Bay's Beacon

At 61 stories and 699 feet, One Dalton Street is set to be the tallest building constructed in New England in decades.

By Olivia Rassow

Lights beamed from the Back Bay last night in celebration of the groundbreaking of a new neighbor for the Pru and the Hancock Tower—the much-anticipated Four Seasons Hotel & Four Seasons Private Residences at One Dalton Street. The triangular tower will be built on land at the edge of the Christian Science Plaza. At 61 stories and 699 feet, it's set to be the tallest building constructed in New England since the early 1970s, and the third tallest on the Boston skyline.

Developed by Carpenter & Company, Henry Cobb of Pei Cobb Freed, known for his design of the John Hancock Tower, and Gary Johnson of Cambridge 7 Associates are the lead designers behind the $750 million project.

On the lower 23 floors, the new Four Seasons Hotel will include 211 luxury rooms, two restaurants, two lounges, and a health club and spa. With that, Boston will join an exclusive list of cities—including London, Shanghai, Singapore, Los Angeles, Chicago and Istanbul—that are home to more than one Four Seasons hotel.

Accessible through a separate entrance, floors 25-61 will include 180 private residences with unobstructed views in all directions. Residences will feature 11-foot ceilings, bay windows, concierge and doorman services, and a private restaurant club on the 50th floor. Campion & Company will serve as the sales agent for the private residences, with pricing set to be announced this spring.

Mayor Martin J. Walsh called One Dalton Street a signature project for Boston—not only will it be the tallest building in decades, but it redefines high-end residential living and will have a positive impact on the economy, with 1,500 construction jobs, 450 permanent jobs, and increased tax revenue to the city.

The general contractor for the project is Suffolk Construction Company, and construction is expected to last two-and-a-half years.

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8 Staggering Skyscrapers

Spire surveys some of the most anticipated towers from unique destinations throughout the world.

By Nick Mafi

Mirrored Skyscraper in the Alps

The 1,250-foot hotel will offer 107 guest rooms as well as other resort amenities, including a sky bar, a gallery, and several spas. With a reflective surface and slender shape, the tower is meant to blend into its natural landscape.

Tour Triangle

The Paris city council has approved plans to construct Herzog & de Meuron's controversial triangle-shaped glass building. The 42-story tower will top out at 590 feet, well below the 1,062-foot Eiffel Tower.

3 Hudson Boulevard

3 Hudson Boulevard is a cornerstone of the Hudson Yards District. The building, designed to achieve LEED Platinum certification, will stand 1,050 feet tall, delivering unprecedented and unobstructed views of Manhattan.

Pyramid Tower

This 344-foot mixed-use Pyramid Tower will be located in the heart of Jerusalem next to the historic Mahane Yehuda market, and will be the second-tallest building in the city (Holyland Tower 1 is only 52 feet taller). When complete, the tower will house 200 apartments, a boutique hotel and restaurant, and a rooftop observatory.

Shadowless tower in London

This "shadowless" skyscraper calls for two towers, with one strategically reflecting sunlight onto the street-level shadow cast by the other, effectively eliminating that shadow. While the reflecting tower would still leave a dark footprint, the public space between the two skyscrapers would be illuminated throughout the day.

United Tower

The United Tower in the Kingdom of Bahrain has been designed as a unique, twirling structure, which extends up to fifty stories. It will be completed in 2016 and will be the centerpiece of the waterfront real estate development, known as Bahrain Bay.

Premier Tower

The curvaceous new Premier Tower, located in Melbourne, Australia, was modeled after Beyoncé's famous form as seen in her music video *Ghost*.

160 Folsom Street

A reinterpretation of the city's fabled bay windows, San Francisco's newest water-front tower will be clad in masonry tiles, with stacks of 45-degree-angle bays and balconies snaking back and forth across the tall, relatively slender shaft.

Vertigo-Inducing Panoramas

New York City churches are given a different meaning from a new and dizzying perspective.

By Kate Sierzputowski

Photos by Richard Silver

Most tourists walk away from a grand cathedral like Notre Dame with a lousy iPhone pic that utterly fails the capture the majesty of the place. But Richard Silver's panoramic photographs capture every detail, conveying the awe and wonder that inspires us to whip out our smartphones.

Silver started the project one crisp fall day in 2011, when he was strolling down Bleecker Street in Manhattan and decided to visit Our Lady of Pompeii Church. "I was enamored at the beauty of the ceiling," he says. It inspired him to try a vertical panorama to capture the scene. "The output wasn't perfect my first few tries, but now I think I have it mastered."

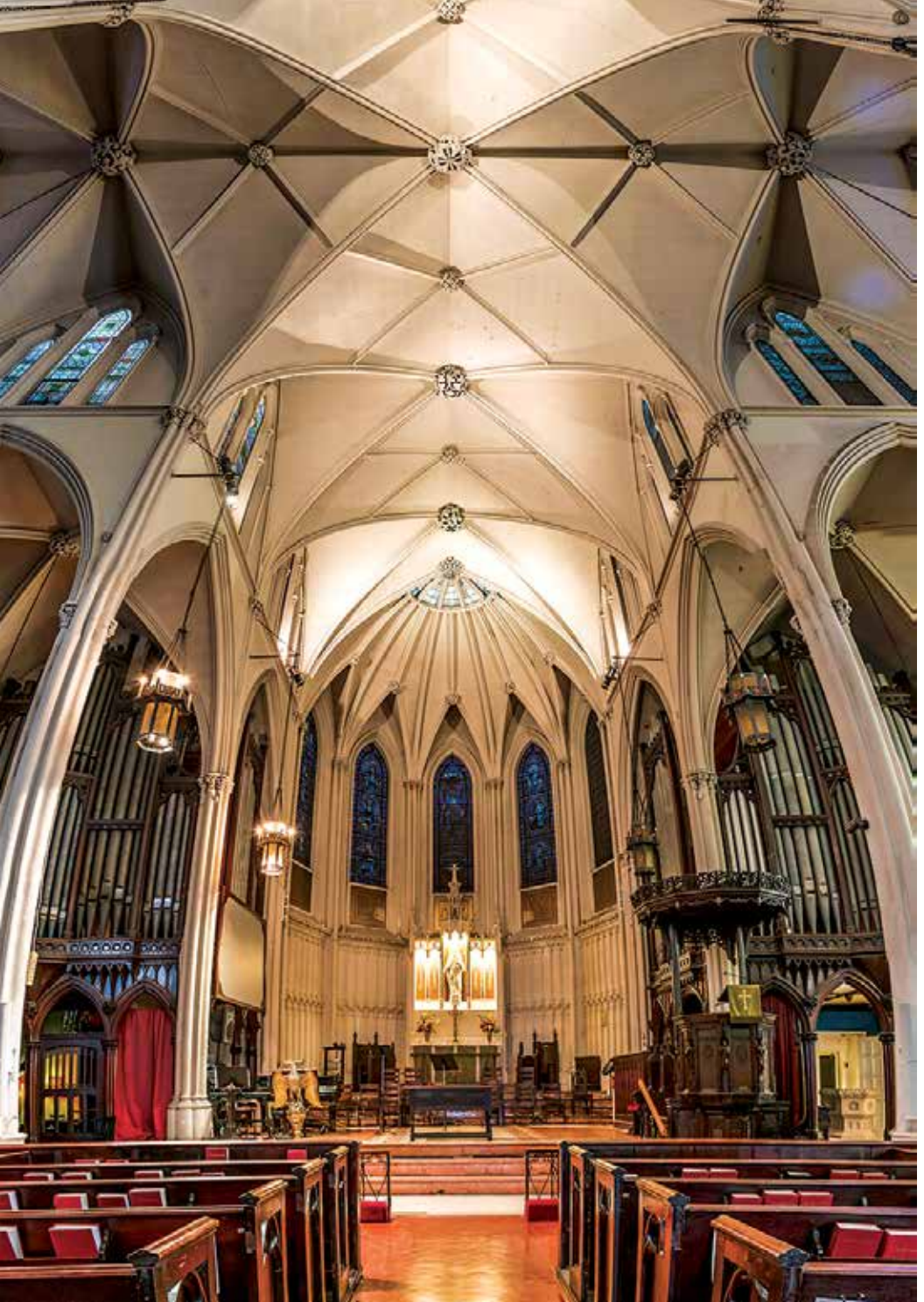
> "Churches are notoriously dark, with deep shadows. But they also have huge stained glass windows that provide tremendous light. The contrast is striking to see but difficult to photograph."

He's since honed his technique and has made beautiful panoramas of churches in 32 countries. Silver usually visits during the day and claims a spot in right in the center of the main aisle. He sets up his tripod at pew level, and waits. When people clear out of the frame, he focuses his Nikon D800, fitted with a super-wide 14-24 mm lens, on the altar. Silver shoots multiple frames, rotating the camera in an arc up toward the ceiling and down the other side. The result is a perfect 3:1 panorama with a 180-degree view.

It sounds simple, but you couldn't make the same images on your iPhone. Churches are notoriously dark, with deep shadows. But they also have huge stained glass windows that provide tremendous light. The contrast is striking to see but difficult to photograph. Silver compensates by taking each photo twice at slightly different exposures. The final panorama consists of anywhere from five to nine shots, all painstakingly aligned in Photoshop.

The work stems from Silver's love of architecture, which grew from his childhood in Brooklyn—the Borough of Churches—and deepened as he explored Manhattan. "Even as a young kid I remember how it felt to go to the city from Brooklyn and start to see all of the skyscrapers appearing as we got closer," he says. "It was electric."

The series lets Silver share his deep appreciation for church architecture with others. Even if you're



not the type that gets excited by Gothic arches or gilded altarpieces, you'll still find yourself getting lost in the remarkable details of his photos. The soaring ribbed vaults of Salisbury Cathedral, built in the 13th century, resemble flowers, while the stained glass at Christ the King in Johannesburg, South Africa, is a kaleidoscopic delight. Seen in two dimensions, these stunning architectural features become mesmerizing abstractions.

"Some people tell me the images look like the inside of a boat, an insect's body, or like turtles," Silver says. "I only see the absolute beauty of the churches themselves."

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He's since honed his technique and has made beautiful panoramas of churches in 32 countries. Silver usually visits during the day and claims a spot in right in the center of the main aisle. He sets up his tripod at pew level, and waits. When people clear out of the frame, he focuses his Nikon D800, fitted with a super-wide 14-24 mm lens, on the altar. Silver shoots multiple frames, rotating the camera in an arc up toward the ceiling and down the other side. The result is a perfect 3:1 panorama with a 180-degree view.

It sounds simple, but you couldn't make the same images on your iPhone. Churches are notoriously dark, with deep shadows. But they also have huge stained glass windows that provide tremendous light. The contrast is striking to see but difficult to photograph. Silver compensates by taking each photo twice at slightly different exposures. The final panorama consists of anywhere from five to nine shots, all painstakingly aligned in Photoshop.

The work stems from Silver's love of architecture, which grew from his childhood in Brooklyn—the Borough of Churches—and deepened as he explored Manhattan. "Even as a young kid I remember how it felt to go to the city from Brooklyn and

start to see all of the skyscrapers appearing as we got closer," he says. "It was electric."

The series lets Silver share his deep appreciation for church architecture with others. Even if you're not the type that gets excited by Gothic arches or gilded altarpieces, you'll still find yourself getting lost in the remarkable details of his photos. The soaring ribbed vaults of Salisbury Cathedral, built in the 13th century, resemble flowers, while the stained glass at Christ the King in Johannesburg, South Africa, is a kaleidoscopic delight. Seen in two dimensions, these stunning architectural features become mesmerizing abstractions.

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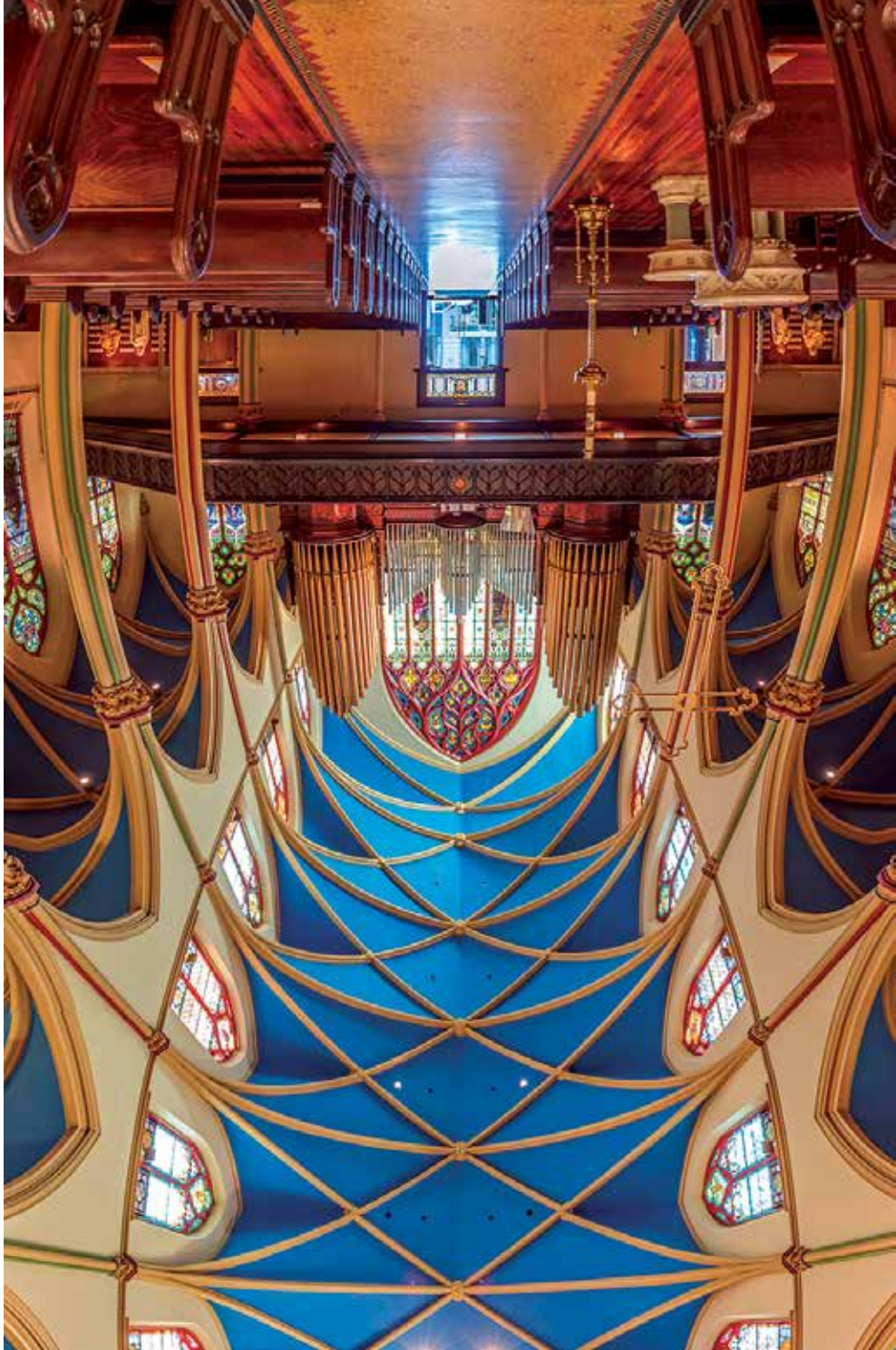

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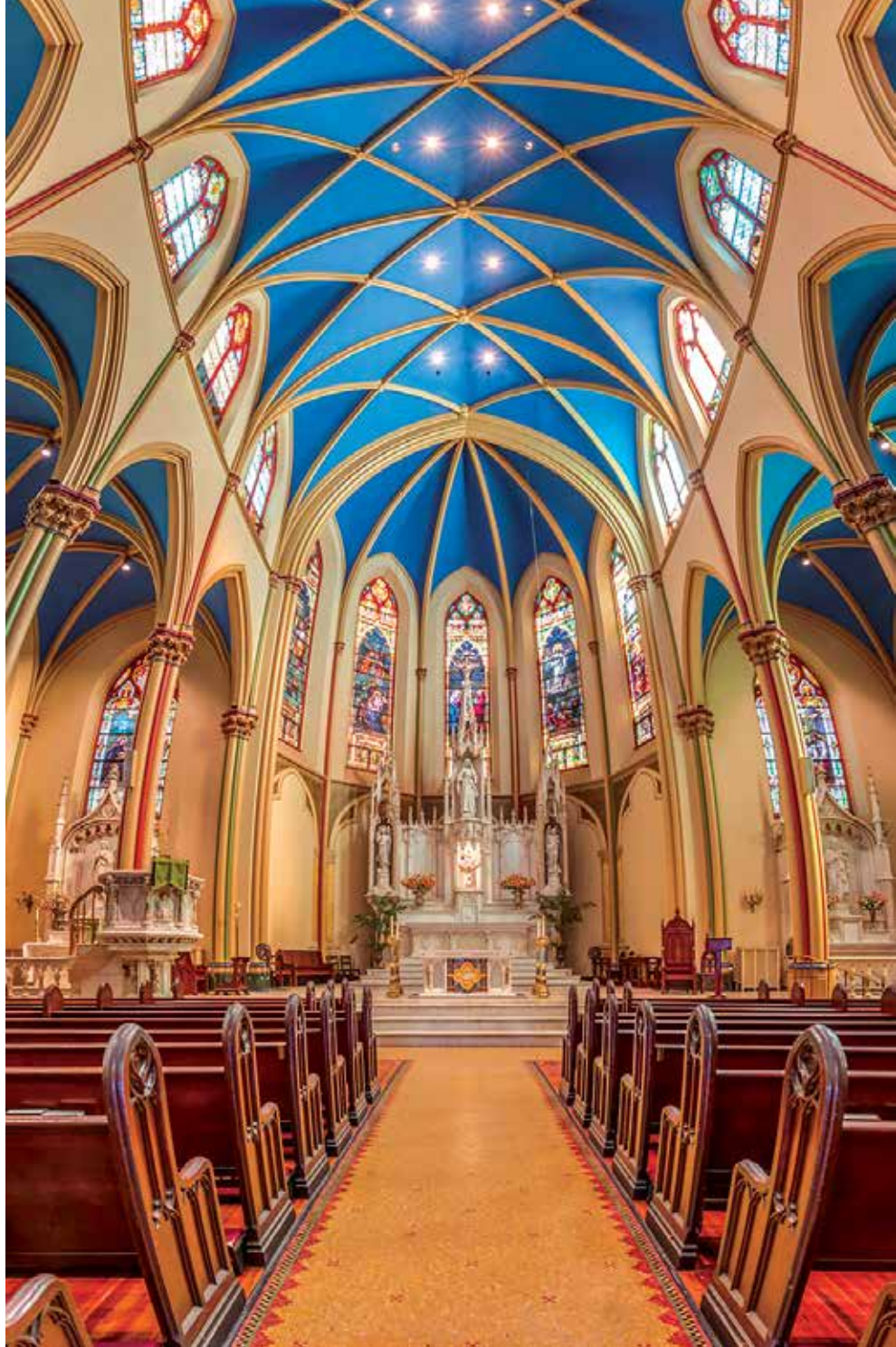
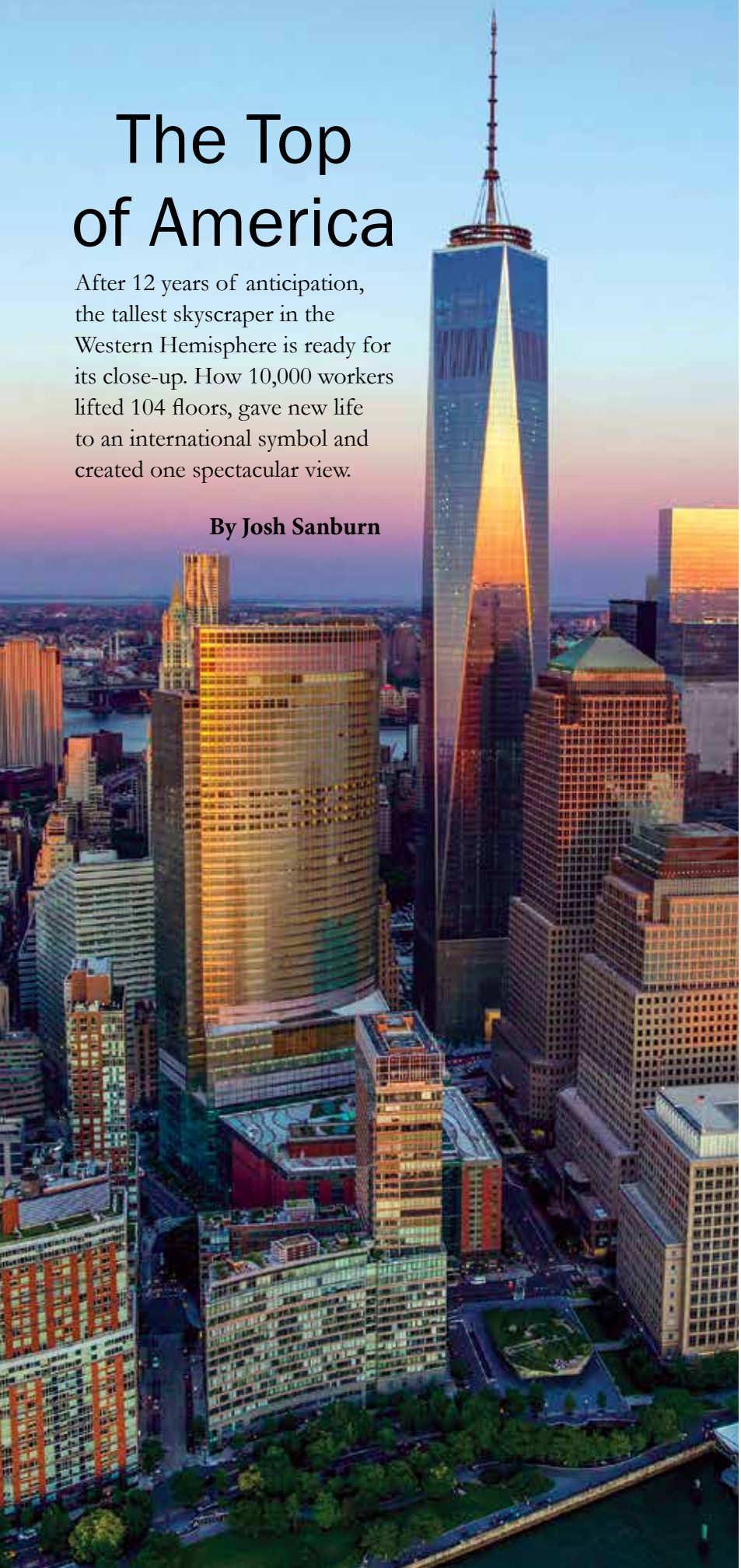


The Top of America

After 12 years of anticipation, the tallest skyscraper in the Western Hemisphere is ready for its close-up. How 10,000 workers lifted 104 floors, gave new life to an international symbol and created one spectacular view.

By Josh Sanburn



For years after the 9/11 attacks, nearly all the activity at Ground Zero was downward—digging through the piles of debris, excavating a vast pit to restore the ruined transit lines, preparing the foundations for the new buildings that would emerge there. Even the memorial that opened in 2011 was an exercise in the poetics of descent—two vast cubic voids, each with water cascading down all four sides, carrying grief to some underground resting place.

The memorial has turned out to be a lovely thing, but what the site still needed was something that climbed, something that spoke to the idea that emotional burdens might not only be lowered into the ground but also released into the air. Now we have it: One World Trade Center, the glass-and-steel exclamation point, all 1,776 feet of it, is nearing completion close to where the Twin Towers once stood. No doubt the new building's official dedication will open the way to a necessary debate over its merits as architecture and urbanism, its turbulent design history and the compromises made over the long years it took to get the thing built. But in one important respect, One World Trade Center has already succeeded. It has reclaimed the sky. And this is the view from there.

Kevin Murphy says he has the best office in America, and I'm not arguing, not here, 1,250 ft. above New York City, from a vantage point so high that the Statue of Liberty looks like a toy and the Brooklyn Bridge seems so small and close, we could reach down and scoop it out of the East River. Not when lower Manhattan, once as quiet as a Quaker meeting, hums like a well-oiled engine more than 100 stories below our feet.

Murphy works at the top of a building that is so much more than four walls and a roof: One World Trade

Center is a statement of hope and defiance written in steel and glass, a marvel of persistence, a miracle of logistics. It is the tangible expression of a people forced quite literally to dig deep for new footings after an unspeakable blow, and there were many dark moments when it was hard to believe that anyone would stand here again.

"I'm like everybody else, looking at this place in amazement," says Murphy, who leads the team of ironworkers that has pieced together the skeleton of this skyscraper. "This is going to define New York."

For the past 12 years, it sometimes seemed as if New York's defining feature would be a 16-acre gash that wouldn't heal. Tangled in political power struggles and red tape, the site cleared by the terrorist attacks on Sept. 11, 2001, long ago lost any luster of post-9/11 unity. Nine governors, two mayors, multiple architects, a headstrong developer, thousands of victims' families and tens of thousands of neighborhood residents fought over this tiny patch of real estate as if every clod were holy and every windswept acre held the fate of the Western world.

Progress came in fits and starts. A forced marriage between two architects with divergent ideas for the building — the site's master planner, Daniel Libeskind, and David Childs, 1 WTC's lead architect — slowed the pace. Three years passed after 9/11 before the symbolic cornerstone signaling the beginning of construction was laid. Two more went by before a design for the memorial was finalized. All the while, 1 WTC, the only building on the site that would reach the heights of the Twin Towers, was little more than a gaping hole in the ground. As the years passed and the delays mounted, it was impossible not to wonder, What's taking so long? And worse, Have we lost the capacity to rebuild?

The answer, in part, was just beneath the surface: 10,000 workers attempting one of the most complicated construction projects ever in one of the most densely populated places on the planet. The design, almost entirely Childs', called for a 104-story tower that includes a bomb-resistant 20-story base set on 70-ton shafts of steel and pilings sunk some 200 ft. into the earth. This unseen subterranean structure would support 48,000 tons of steel — the equivalent of 22,500 full-size cars — and almost 13,000 exterior glass panels sheathing a concrete core crowned by a 408-ft. spire whose beacon would glow at the symbolic height of 1,776 ft. (eclipsing Chicago's Willis Tower as the tallest building in the western hemisphere). The structure includes enough concrete to lay a sidewalk from Manhattan to Chicago. And that was just one part of a 16-acre project that was the equivalent of building five Empire State Buildings on a plot of land the size of a suburban shopping mall — while tens of thousands of commuters traveled under the work zone each day.

But the long wait was also the result of a nearly impossible mandate: One World Trade Center needed to be a public response to 9/11 while providing valuable commercial real estate for its private owners, to be open to its neighbors yet safe for its occupants. It needed to acknowledge the tragedy

from which it was born while serving as a triumphant affirmation of the nation's resilience in the face of it.

"It was meant to be all things to all people," says Christopher Ward, who helped manage the rebuilding as executive director of the Port Authority of New York and New Jersey. "It was going to answer every question that it raised. Was it an answer to the terrorists? Was the market back? Was New York going to be strong? That's what was really holding up progress."

Almost 13 years later, many of those questions remain unanswered. The market has roared and slumbered, though financial firms have returned to lower Manhattan and the surrounding neighborhoods are buzzing with energy. The nation remains on perpetual terrorism alert, though this fact no longer hampers us from going about our daily lives. But at least one answer is known. While 1 WTC may not be all things to all people, its completion signals that America's brawny, soaring ambition — the drive that sent pioneers west, launched rockets to the moon and led us to build steel-and-glass towers that pierced the clouds — is intact. Reaching 1,776 ft. has ensured it.

Getting there, says Childs, has been "the most complicated manufacturing event which is never to be repeated. I mean, it's a onetime event."

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One World Trade Center shares its 16-acre site with other massive projects built at more or less the same time: the transportation hub, which links a series of underground trains that need to operate as work goes on around and above them; a subterranean vehicle-security center, atop which a park and church will eventually sit; the 9/11 Memorial, designed to be the site's central gathering point while doubling as the roof of the vast below-ground 9/11 Museum; and three other large office buildings.

In response to its crowded neighborhood, Childs believed 1 WTC needed to be distinctive and concise — as if the site's complexity called for the opposite in the design of its landmark building. "Ask an 8-year-old who spent her spring vacation in Washington to draw something she remembers," he says. "She can get the Washington Monument dead right. There's something powerful about that, at the heart of the city, organizing it all."

> One World Trade Center is a statement of hope and defiance written in steel and glass, a marvel of persistence, a miracle of logistics.

The building's exterior is made up of eight isosceles triangles, and as it rises, it morphs from a square into an octagon and then into another square, turned 45 degrees from the first. It gives the appearance of twisting, with the glass triangles meeting in the sky. "This has a clear, logical, geometrical ending to it all," Childs says.

But before anyone could think of reaching that ending, it was necessary to build down into the thick bedrock that underlies Manhattan to plant the structures that would support the 3.5 million-sq.-ft. tower. Construction began on April 27, 2006 — four years and 228 days after the 9/11 attacks. The early work was time-consuming and labor-intensive. One challenge was to build around the PATH train, a major artery linking New York to New Jersey, without disturbing the infrastructure. The solution, requiring 18 months of planning, was to proceed by hand, without heavy machinery. "You had people down there with picks and shovels and mini-excavators, maybe digging a foot a night," says Dan Tishman, chairman of Tishman Construction, which manages construction at the site. "It was a surgical approach."

Throughout 2006, workers beat and battered the earth, using precisely calibrated explosives to make room for 27 steel columns and a series of massive concrete footings that reached more than 200 ft. below street level. As they dug into the ground, the crew often came across reminders of why they were there.

"Literally the first thing — and I don't exaggerate by saying the first thing — we were digging and we found human remains that were missed," recalls Steve Plate, the Port Authority's director of construction for the site. The remains had been hidden for almost five years, packed inside buried sewer pipes by the force of the collapsing towers. Over the years, some workers found shoes. Others unearthed wallets. Medical examiners became a regular presence on the site, sifting through debris and isolating material that appeared to contain human DNA. In the early days of excavation, such grim discoveries happened almost daily.

Other findings were less somber. Timber, struck when workers were digging the foundation of the vehicle-security center, turned out to be an 18th century boat that had been encased in landfill when that part of lower Manhattan was developed in the 1800s. The Hudson River once flowed through the site, and the area that became the original World Trade Center had been a slip. Archaeologists couldn't identify the ship's origins, but they did find a clue to its provenance: a button from a British soldier's Revolutionary War coat. Other discoveries included cattle bones from a 19th century slaughterhouse and a 40-ft. pothole about 110 ft. below sea level, which geologists determined was carved some 20,000 years ago by glaciers that had picked up shale and sandstone from the Palisades in what is now New Jersey. The ice-age terrain had to be filled in with concrete, covered or blasted away to ensure a level foundation for 4 World Trade Center.

As the crew toiled underground, 805 tons of steel was being produced at a Luxembourg plant known for creating the heaviest I-beams in the world. Once they reached the U.S., the 30-to-56-ft. slabs were strengthened with steel plates that increased their weight to 70 tons each. By the end of 2007, workers had placed a ring of steel columns around the perimeter of 1 WTC. By then, the massive concrete footings and foundation were nearly done. But to passersby on the street, the site appeared unchanged.

"The thing that most frustrated me in the early years was when people would say, 'They're not doing anything,'" says Marc Becker, Tishman's deputy general superintendent. "No one knew the magnitude of the below-grade structure."

Below street level sits a formidable building in its own right. The 500,000-sq.-ft. structure supporting 1 WTC is one-third the size of the 1,046-ft. Chrysler Building, which gleams in Art Deco splendor over midtown Manhattan, and it required 45,000 cu. yd. of concrete. A typical New York City skyscraper takes about four years to build. Construction on 1 WTC had barely reached street level in that time span. "I was effectively handed a pit... *Continued on page 51.*

2 WTC

By Andrew Rice

When Bjarke Ingels set out to create the fourth and final skyscraper at the reborn World Trade Center earlier this year, he faced the same dilemma that has burdened every architect who has ventured onto New York's most hallowed and expensive construction site. Would he design a stately tower, respectful of the history of the property, where some 3,000 people died in 2001? Or would Ingels, a brash Danish prodigy, follow his instincts and steer the building in a more adventurous direction—and risk running into the controversy that has dashed the ambitions of many a World Trade Center architect before him?

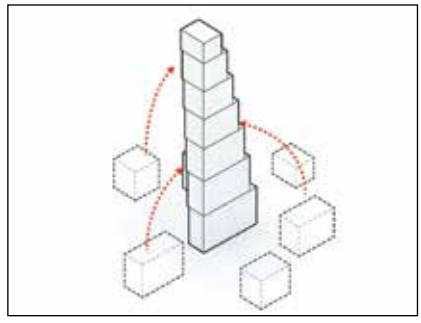
Not surprisingly, Ingels—the founder of the firm BIG and the author of a book called Yes Is More—decided his skyscraper could be both things at once.

"The architecture becomes a solution to an almost unsolvable puzzle," Ingels told me one recent morning. After a secretive design process code-named Project Gotham, the architect was finally ready to talk publicly about his building, which is slated to become the new headquarters of Rupert Murdoch's media companies, 21st Century Fox and News Corp. A tentative lease deal was signed last week, and the first renderings were released today to WIRED. From the World Trade Center's Memorial Plaza, the new building will appear slender and serious. But from other perspectives, like the one looking south from the fashionable neighborhood of Tribeca—where Ingels lives and where we were having breakfast—the stepped tower will present a more madcap personality: Ingels' 21st-century reinterpretation of one of Manhattan's Jazz Age ziggurats.

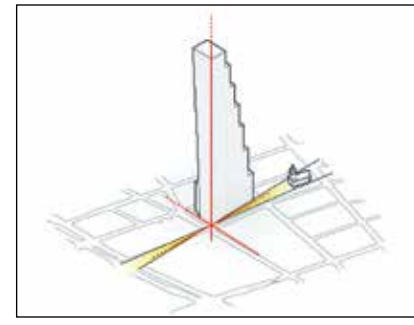
"We have tried to incorporate that duality," Ingels says. "On one hand it's about being respectful and about completing the frame around the memorial, and on the other hand it's about revitalizing downtown Manhattan and making it a lively place to live and work."

The World Trade Center redevelopment began in tragedy and was mired for years in political infighting. But its closing chapters—like so many New York stories—have been plotted by the dictates of the real estate marketplace. Last year, One World Trade Center opened with a media company (Condé Nast, which owns WIRED) as its anchor tenant. The once-dowdy area known as the Financial District has been transformed by an influx of companies from the advertising, design, and tech industries. The neighborhood's creative direction was powerfully attractive to James Murdoch, Rupert's son and a key executive at 21st Century Fox, who spearheaded the search for a new headquarters along with chief financial officer John Nallen.

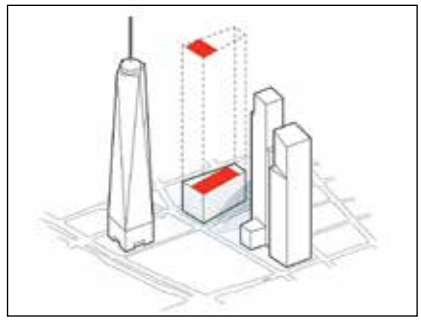
Larry Silverstein, the developer who leased the Twin Towers before their destruction and has played a central role in the redevelopment ever since, had a prime piece of land to offer: the last of four skyscraper sites set out in a decade-old master plan. But there was an obstacle to making a deal. There was already a design for the building, officially known as Two World Trade Center, which Silverstein commissioned years ago. Lord Norman Foster, the 80-year-old architect of acclaimed buildings like London's iconic Gherkin, had envisioned a gleaming 79-story trophy along the Hudson River, crowned by a slanted glass roof divided into four diamonds. Due to the complexities of the World Trade



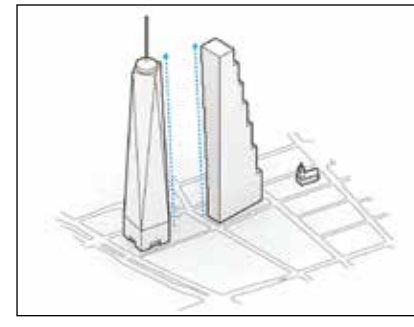
Built on a Strong Foundation
The needs and requirements of the tenants are concentrated into seven separate building volumes, each tailored to their unique activities. The volumes are stacked on top of each other from the largest to the smallest, creating unity out of diversity.



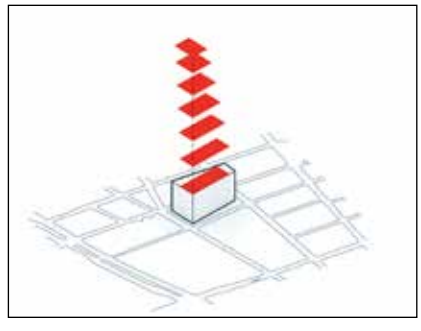
Following the "Wedge of Light"
2 WTC is aligned along the axis of Daniel Libeskind's "Wedge of Light" plaza to preserve the views to St. Paul's Chapel from the Memorial Park.



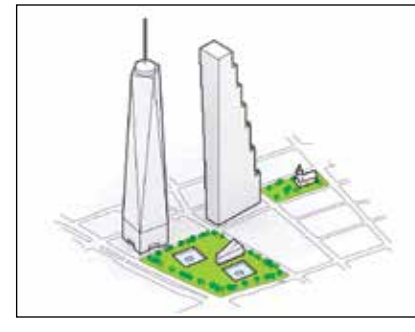
The Site
Two World Trade Center is located at 200 Greenwich Street and bounded by Church Street to the east, Vesey Street to the north, and Fulton Street to the south. The base of the building utilizes the maximum area of the 56,000-square-foot site.



Leaning Toward 1 WTC
As a result of the stacked columns, the building's steps are at an angle parallel to the incline of 1 WTC, a nod to the twins that previously stood on the site.



Transition Between Typologies
Floor plates between the maximum and minimum sizes are optimized to specific tenant needs and requirements.



Stepping Terraces to St. Paul's Chapel
The terraces are heavily planted, creating a vertical succession of the greenery rising from St. Paul's to the skyline.

Center's redevelopment, a foundation had already been constructed at the time the property's ultimate owner, the Port Authority of New York and New Jersey, built the transit hub and shopping mall that are positioned beneath the site. But James Murdoch didn't care for the building, which he thought was more suited for an investment bank than a modern media company. That's why Foster ended up being bumped aside in favor of Ingels, who is exactly half his age—a wunderkind by the standards of the profession.

"The first thing James said to me is he didn't want to build a tower," Ingels says. The younger Murdoch is around the same age as Ingels and favors the kind of open-plan work schemes preferred by tech companies like Google. As it happens, Google is a BIG client. Ingels and another architect, Thomas Heatherwick, collaborated on the firm's proposed new 60-acre Mountain View, California, campus, which features landscaped interiors covered by futuristic glass canopies.

"They liked the idea of a more integrated workplace, where the space flows more easily and people are more likely to collide and collaborate," says Mary Ann Tighe, chief executive for the New York region at real estate brokerage CBRE, which represented Fox and News Corp in negotiations. It would be impossible, however, to re-create a Silicon Valley campus in Manhattan, where even billionaires are constrained by the street grid. Murdoch gave Ingels the task of fitting his ideal workplace into a vertical structure. (At 1,340 feet, it would be Manhattan's third-tallest building today, behind its neighbor One World Trade Center and 432 Park Avenue, a new ultra-luxury condo building by Rafael Viñoly.) Over the course of six months, a BIG team came up with a concept that divided the skyscraper into seven boxes, each

around a dozen stories tall, stacked like children's blocks. "It is like seven different buildings stacked on top of each other," Ingels says.

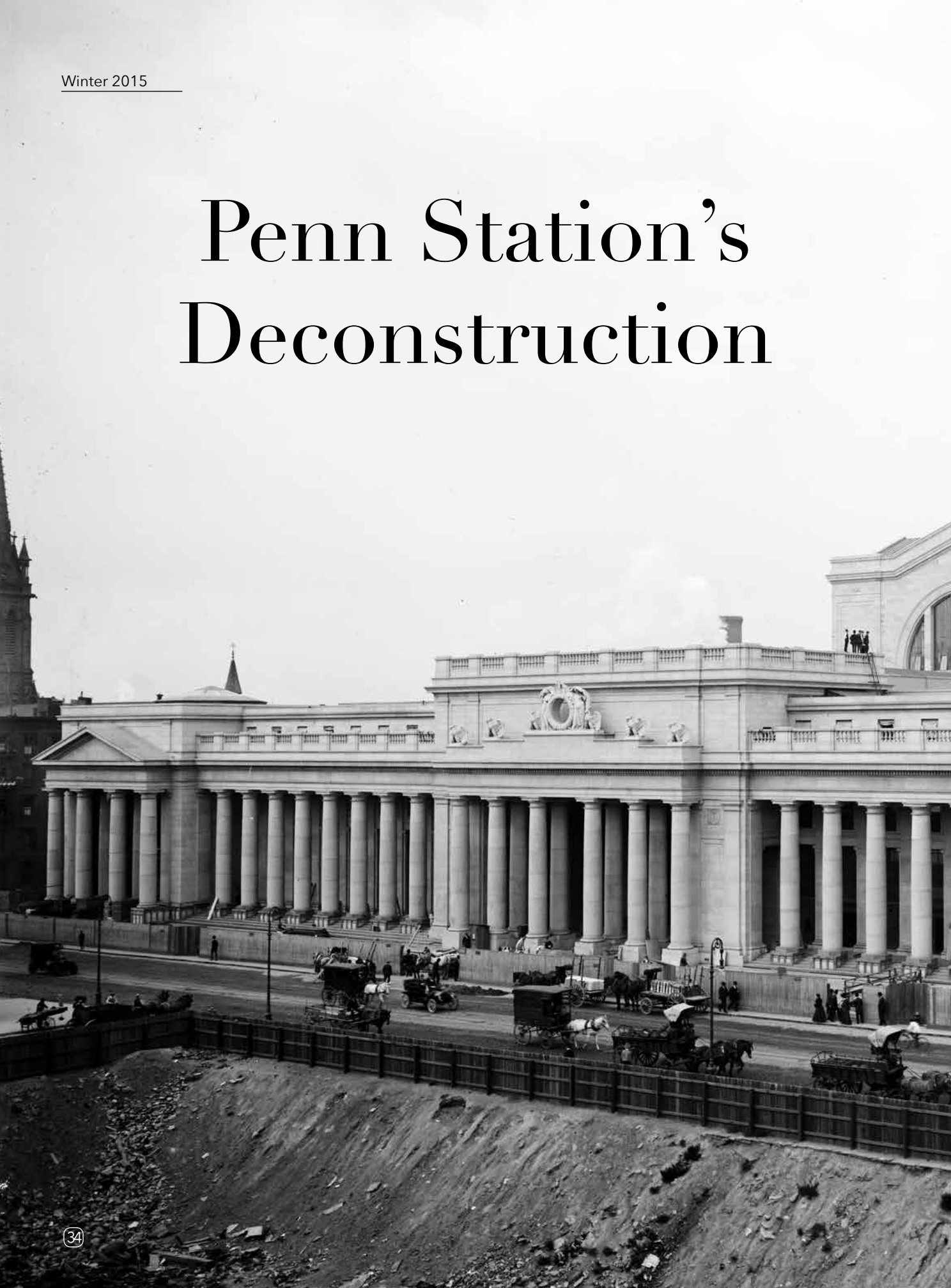
Fox and News Corp, which have operated as separate companies since 2013, will occupy the two largest blocks of office space, while Silverstein will market the upper floors to other tenants. The blocks get smaller as the building rises, creating setbacks where Ingels has designed a series of outdoor gardens, one for each block. They are supposed to evoke varying climates, from tropical to arctic. (A recent BIG exhibition at the National Building Museum in Washington, DC, titled Hot to Cold, arranged his career similarly.) In the parts of the building occupied by Fox and News Corp, cafés for employees will adjoin the gardens. Elevator shafts—the vital spinal column of any skyscraper—will be concentrated on the western end of the structure, allowing capacious space for newsrooms. Winding staircases set against the glassy exterior wall are meant to ensure that the companies feel internally connected, rather than divided into floors and fiefdoms. The building's topmost floor will house a Fox screening room with a stunning view.

Ingels' design will complete a spiral of gradually taller skyscrapers ringing the perimeter of the 16-acre site, which was originally laid out by architect Daniel Libeskind in the redevelopment's master plan. It also promises to punctuate the Financial District's new economic identity. "This clearly moves the center of gravity in the city's media industry downtown," said Kathryn Wylde, president and CEO of the Partnership for New York City, an influential business group. Other elements of the redevelopment include architect Michael Arad's somber memorial—a pair of cascading pools that mark the footprint of the destroyed Twin Towers—an adjoining museum, and the commuter train terminal, a $4 billion extravaganza of marble, steel, and glass designed by Santiago Calatrava. All are now open, or close to it. Two of the four skyscrapers are finished, and Three World Trade Center is due to open in 2018. Murdoch's companies intend to move into their new headquarters in 2020, when their lease in a 1950s-vintage skyscraper near Rockefeller Center runs out.

That timetable, however, presumes that the project proceeds as planned—never a foregone conclusion at the World Trade Center. Murdoch and Silverstein recently signed a letter of intent, the first step toward beginning construction, but still have to negotiate a formal lease. Silverstein reached a similar stage of negotiations with Citigroup in 2013, only to see the deal fall through. Much depends on the building's cost, which in turn depends on its design. Ingels will have to perform his craft on a scale—in terms of height, cost, and the degree of public scrutiny—unlike anything he has encountered before. The tortuous and expensive process involved in building at the World Trade Center has chewed up many other "starchitects," and many critics say it has yielded a mishmash of sparsely populated office buildings that look banal or worse.

Yet Ingels was more than eager to take on the challenge. "It's like playing Twister with a 1,300-foot high-rise," he says. Many structural elements of the skyscraper came predetermined by the intricate underground architecture of the property, which was set in place by Port Authority and Libeskind's master plan. Mechanical equipment, like air vents for Calatrava's station, are positioned on the existing foundations and had to be incorporated into Ingels' building. While working around such constraints, he... *Continued on page 52*

Penn Station's Deconstruction



1910 – 1963

How the fall of a New York architectural martyr sparked the architectural preservation movement in the United States.

By Alex Q. Arbuckle

In 1910, when New York City transportation terminal Pennsylvania Station opened, it was widely praised for its majestic architecture. Designed in the Beaux-Arts style, it featured pink granite construction and a stately colonnade on the exterior.

The main waiting room, inspired by the Roman Baths of Caracalla, was the largest indoor space in the city — a block and a half long with vaulted glass windows soaring 150 feet over a sun-drenched chamber. Beyond that, trains emerged from bedrock to deposit passengers on a concourse lit by an arching glass and steel greenhouse roof.

This may sound unfamiliar for present-day residents of New York City, who know Penn Station as a miserable subterranean labyrinth.

Though the original Penn Station served 100 million passengers a year at its peak in 1945, by the late 1950s the advent of affordable air travel and the Interstate Highway System had cut into train use. The Pennsylvania Railroad could not even afford to keep the station clean.

In 1962 plans were revealed to demolish the terminal and build entertainment venue Madison Square Garden on top of it. The new train station would be entirely underground and boast amenities such as air-conditioning and fluorescent lighting.

Vocal backlash and protests ensued, but the plan moved forward and Penn Station was demolished.

The outrage was a major catalyst for the architectural preservation movement in the United States. In 1965, the New York Landmarks Law was passed, which helped save the iconic Grand Central Terminal and more than 30,000 other buildings from similar fates. 2015 marks its 50th anniversary.

Since the demolition of the old Penn Station, train ridership has grown tenfold. The new station, a tangle of subway lines and commuter rail, is the

busiest terminal in the country and bursting at the seams. Plans are currently underway to renovate and expand the station, and restore a modicum of its original glory.

In 1910, when New York City transportation terminal Pennsylvania Station opened, it was widely praised for its majestic architecture. Designed in the Beaux-Arts style, it featured pink granite construction and a stately colonnade on the exterior.

The main waiting room, inspired by the Roman Baths of Caracalla, was the largest indoor space in the city — a block and a half long with vaulted glass windows soaring 150 feet over a sun-drenched chamber. Beyond that, trains emerged from bedrock to deposit passengers on a concourse lit by an arching glass and steel greenhouse roof.

This may sound unfamiliar for present-day residents of New York City, who know Penn Station as a miserable subterranean labyrinth.

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TIMED BY
BENRUS
DOWN STAIRS FOR
INCOMING
TRAINS
LONG ISLAND TRAINS

"One entered the city like a god; one scuttles in now like a rat."

Vincent Scully,
Professor Emeritus of Architecture,
Yale University

"We will probably be judged not by the monuments we build but by those we have destroyed."

New York Times *Editorial,*
Oct. 30, 1963

"Penn Station did not make you feel comfortable; it made you feel important."

Hilary Ballon, Art Historian

Seán Moreau
Emerson College
PB 682