

# SANTIAGO CALATRAVA

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DRAWING, BUILDING, REFLECTING

**Thames & Hudson**

*with* CHRISTINA CARRILLO DE ALBORNOZ

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#### Author

Santiago Calatrava is an internationally celebrated Spanish architect, structural engineer, sculptor and painter. His best-known works include the Milwaukee Art Museum, the Turning Torso tower in Malmö, Sweden, the Margaret Hunt Hill Bridge in Dallas, Texas, and the City of Arts and Sciences and Opera House in Valencia.

Cristina Carrillo de Albornoz is an art curator, critic and author, who has authored and co-authored a number of books on leading artists and architects, including Calatrava and Ai Weiwei. Her work has been featured in the *Observer*, *Beaux Arts* and *Vogue*.

#### Specification

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## Santiago Calatrava

Drawing, Building, Reflecting

Santiago Calatrava, with Cristina Carrillo de Albornoz

A personal reflection on the nature of the architectural imagination, shown through private sketchbooks, by one of the great architects of our day.

#### Marketing points

- **Calatrava is one of the world's most celebrated** – and controversial – architects, whose buildings have animated cities and countryside across the planet.
- **An intimate publication that reveals** the breadth of his influences, from animals to ancient structural principles, and how they have been combined with his background in engineering and architecture to produce his signature buildings.
- **Written in the first person**, the text is accompanied by drawings never seen outside his studio.
- **The humanity of his approach and ideas** offers inspiration not just to architects but to anyone who cares about the evolution of our built world.

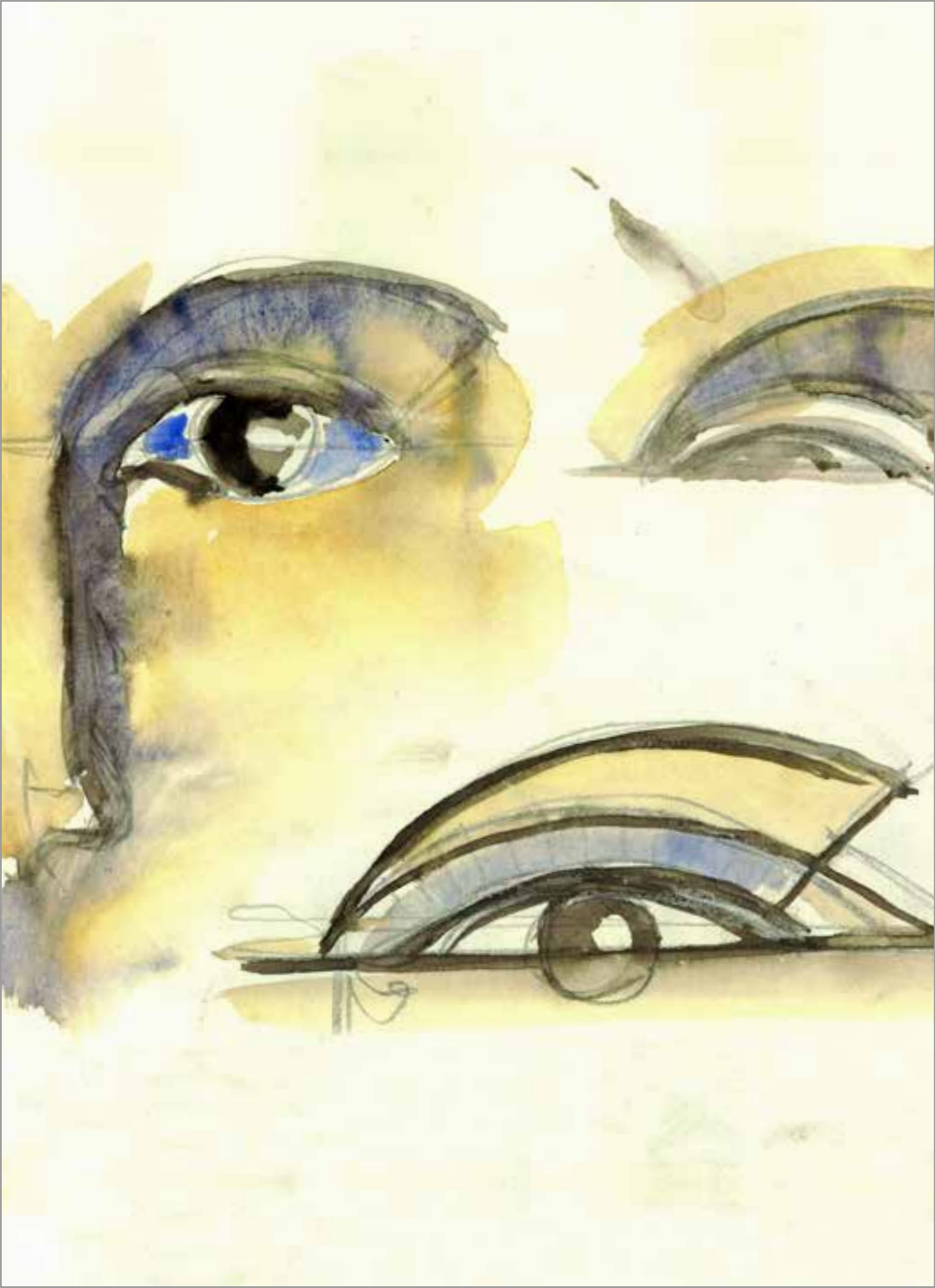
#### Description

Spanish-born, Zürich-based architect Santiago Calatrava first made a name for himself in the late 1980s with delicately designed structures in Zürich that seem to grow out of the earth. He went on to create a series of highly innovative, iconic bridges across Europe, and in recent years he has drawn attention for such large-scale projects as the City of Arts and Sciences in his birth town, Valencia; the Museum of Tomorrow in Rio de Janeiro; and the World Transportation Hub at Ground Zero in New York.

Originally trained as an engineer, Calatrava has, at heart, always leaned more towards artistic endeavours than purely structural ones: an entire floor of his residence in Zürich is devoted to creating paintings and sculpture, which he has pursued throughout his career. His influences range from art history and natural philosophy to antiquity, and he manages to combine these in buildings that are structurally highly stylized yet somehow timeless.

While many publications have documented Calatrava's output over the years, this is the first to offer his own thoughts, in his own words, in a reading format. In this heartfelt memoir of an architect of singular conviction, Calatrava's inspirations, lessons and achievements will touch every reader, whether aspiring architect or lover of art and nature.

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## INTRODUCTION

# ART AND THE ARCHITECT

Drawing is a basic need for me, like breathing. I sketch everywhere and incessantly in order to understand what I am representing. Ultimately, the power of sketching and drawing helps me to materialize my ideas and creates a conceptual background for my research.

I have been drawing for as long as I can remember, but my relationship with art truly began at the age of eight, when my older brother Jose Luis took me for formal instruction in drawing and painting at the Arts and Crafts School of Burjassot, near my home town in Benimamet, Valencia. I was the youngest pupil, which encouraged me to progress quickly. After graduating from high school, I became obsessed with studying at l'École des Beaux Arts in Paris, but soon after my arrival in May 1968, student strikes shut down the school and I was forced to return to Valencia. During my time in Paris, I visited Nôtre Dame Cathedral every day at 11am to make drawings. At that time of morning, the sun enters through the south rose window and the effect is breathtaking. I first began to grasp the power of architecture.

An architect, like an artist, should be entitled to deliver his own message, in his own independent way and in his own words. From day one, I have considered architecture not only as an art form, akin to painting, sculpture, dance and music, but as the most abstract pursuit of all. I project myself, my dreams, my knowledge and my research into my architecture as much as I can. It is said that Pablo Picasso, while visiting Lascaux to admire the cave art, declared 'since Lascaux, we have invented nothing'. Whether it is true or not, this anecdote about the artist I admire the most perfectly illustrates my own philosophy: everything has already been said, so the only path to pursue in art is the realization of one's personal experience.

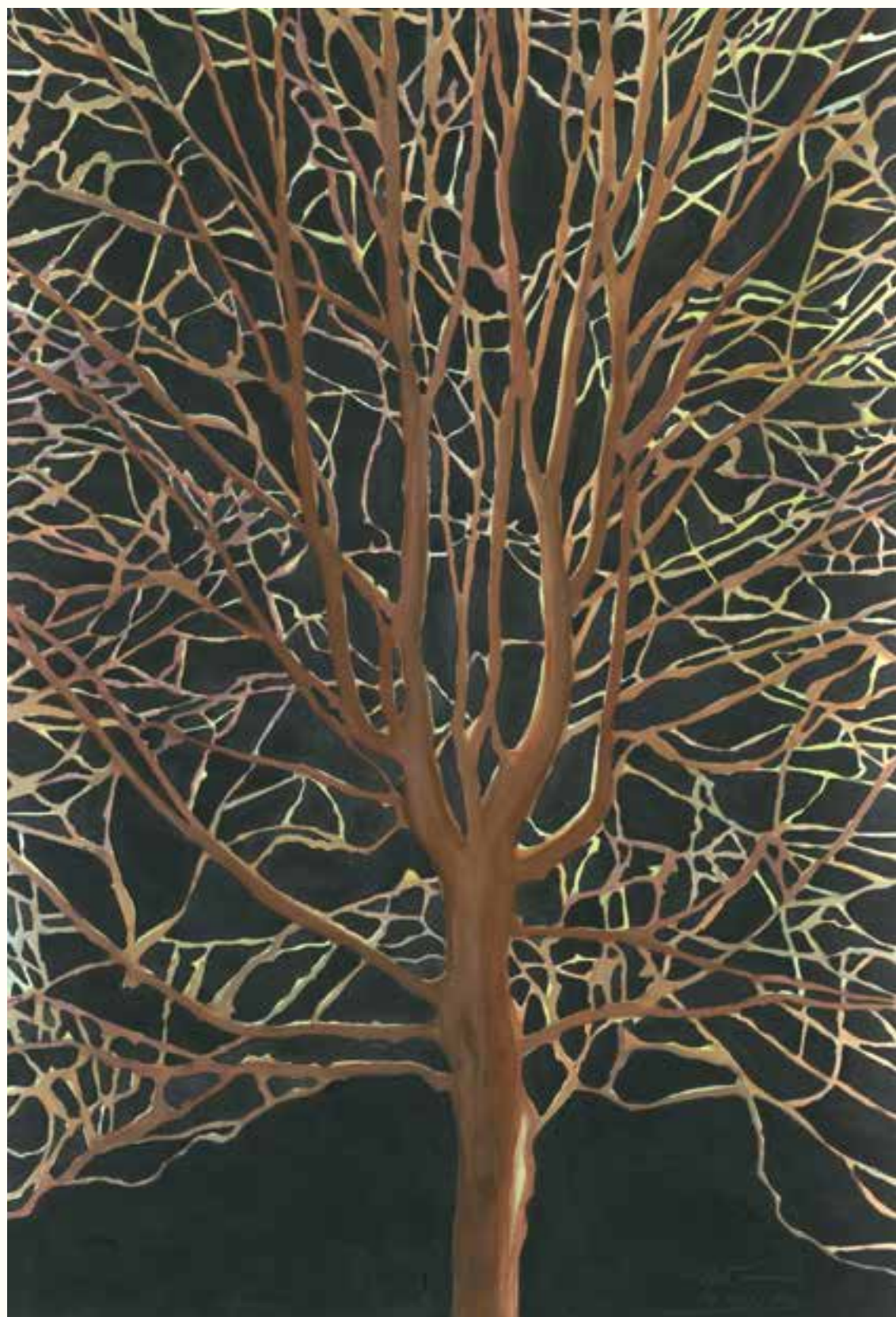
I do not work according to the paradigms of an architect, but to those of a painter: to solve architectural questions, I must work for myself, representing myself. To become a recognized artist or architect, one needs to have a personal style that can be decoded into a formal vocabulary. After a career

spanning over thirty-five years, I consider my most important achievement to be the building of my own aesthetic language. I have chosen to follow Picasso's statement 'I paint what I like, when I like, and where I like.' The great Spanish artist was once asked what his paintings meant, to which he replied, 'Do you ever know what the birds are singing? You don't. But you listen to them anyway. So it is sometimes with art, it is important just to look.' I hope people who see my work will invent other styles and find their own way, just as I have integrated the works of those before me on the path to finding mine. We should not forget that, like an artist, an architect's work is autobiographical.

My vocabulary as an architect has evolved through strictly formal reasoning, the largest influence in my development being sculpture and my work as a sculptor. I began to create my first sculptures immediately after graduating with a degree in civil engineering from the Eidgenössische Technische Hochschule (ETH) in Zürich, and an architecture degree from Valencia. I was attracted to problems relating to potential

energy and equilibrium. My first sculptures were composed of various geometric cubes in tension, inspired by watching my eldest child taking his first steps, how he stood and reflecting on the functions of the spinal column.

The study of geometric transformations is key to understanding architecture and, in the same way, my first sculptures (based on transformations of cubes and other basic geometric forms) were an essential first step in my architectural progression. The ideas developed in my sculptures at an early stage in my career went on to find full realization much later on in my architectural projects.



## CHAPTER ONE

# Nature: *Mater et Magistra*

For many artists, art begins with nature, but it also offers a boundless source of inspiration and information for the architect. My understanding and conception of the natural world is, as the motto goes, *natura: mater et magistra* ('nature: mother and teacher'). This was the subject of my doctoral thesis in engineering ('On the Foldability of Space Frames') and it is my earnest conviction that one can find valid answers to all problems, artistic and practical, by observing nature and its enigmas. The organic forms of many of my sculptures and buildings reflect nature's guiding force throughout my career.

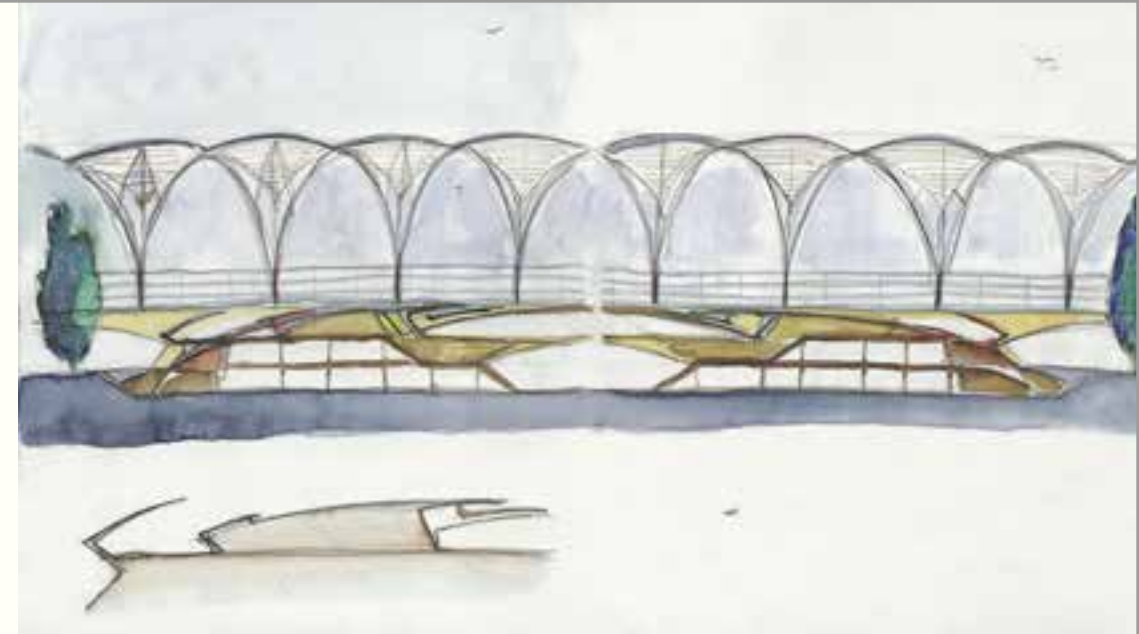
Architecture translates nature into rational forms, yet I have been always more interested in nature's mystical and intangible qualities: the powerful emotions evoked by the complex and delicate structures of trees, by sunsets and sunrises or by the movements of the body can be astonishing. Moving fingers, tree branches waving in the wind and the undulations of ocean waves are awe-inspiring to me because they are each an integral part of nature's whole.

### EARLY LESSONS

When I was nine, I took a class called 'observing nature'. I still recall the teacher's name, Remigio Benito, and his lessons about the forms and colours and markings of fish. He used to let me make chalk drawings that filled the entire blackboard. Remigio

OPPOSITE Sketches and observations of trees have formed a basis for several of my architectural projects.





taught us how to look at nature with wonder, and I have tried to maintain this attitude, and the continuous need to surprise and to be surprised, ever since.

My father also encouraged me to observe the natural world and its arresting abstract forms with care and attention. I was raised among orange groves near Valencia and some of my most cherished childhood memories are of long walks with my father from Benimanet, our village, to the beach at Burjasot, passing through magnificent gardens and forests along the way. When I was eighteen, a friend and I wrote a long essay on the pine trees local to Valencia. I remember my sadness later when a millennium pine I hid and played in as a child was chopped down inexplicably by the local authorities.

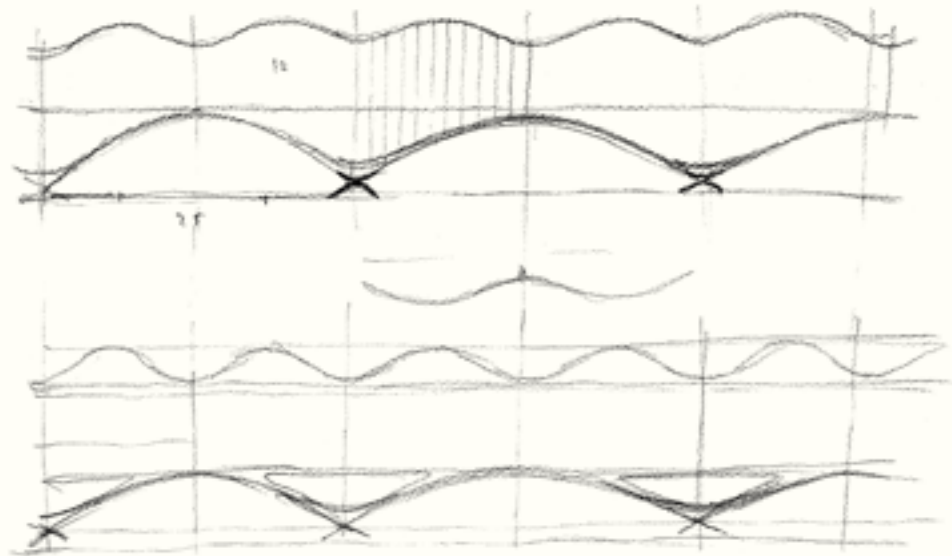
Trees have gone on to be a constant source of inspiration in my work as an architect. Resembling a steel forest, the Lisbon railway station I designed, Estação do Oriente (1993–8), was inspired by a Fernando Pessoa sonnet and the richly wooded hills that surround the city. I wanted to create a building that was connected intrinsically to the landscape and to Lisbon's cultural history. The railway station appears to 'grow' organically from its covering, with steel and glass 'trees' above the platforms.

Valencia's rich art history made it a beautiful place to grow up and its myriad built styles, from Romanesque to Gothic, Renaissance and Baroque, were my first introduction to architecture. It was in Valencia with my father that I saw my first

OPPOSITE AND ABOVE Sketches for the Estação do Oriente in Lisbon, inspired by the forests around Lisbon.



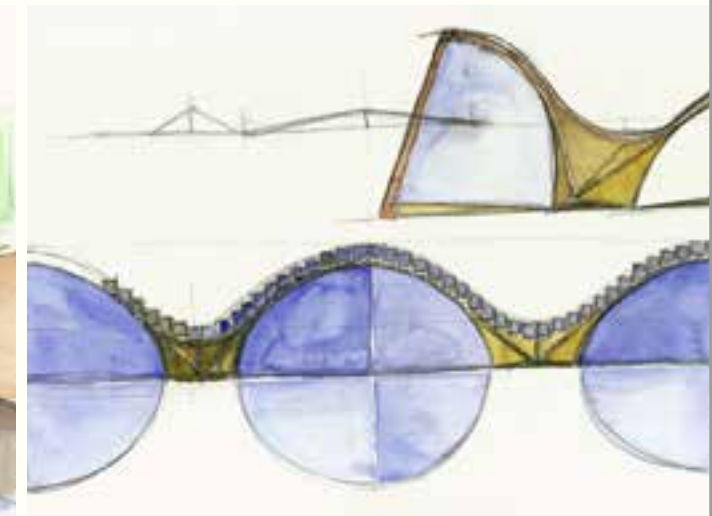
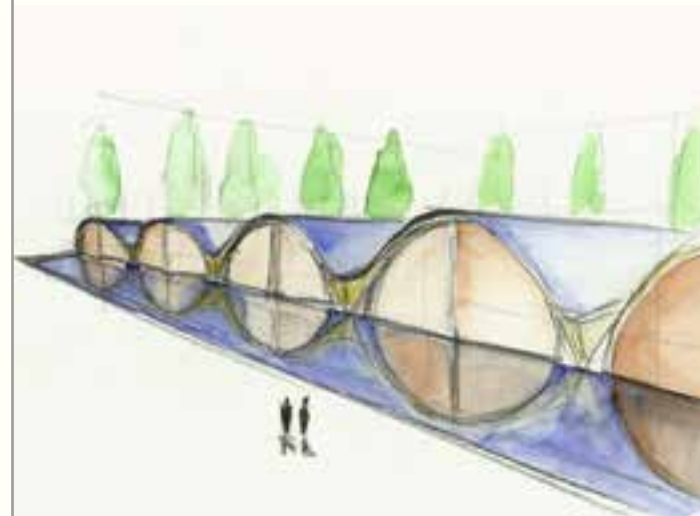
'courageous' building, the fruit market, known as the *Lonja*. My father exported fruit and he used to take me with him to this agricultural exchange, one the most wonderful Gothic structures every built. Both rigorous and technically pure, its numerous thrusting vaults and vertical walls were conceived in Genovese stone with stunning imagination and daring. What makes it truly remarkable, however, are the 28m (92ft) striped helical pillars in its main hall. Standing beneath them evokes the extraordinary sensation of being in a forest of palms, which impressed me greatly as a child.



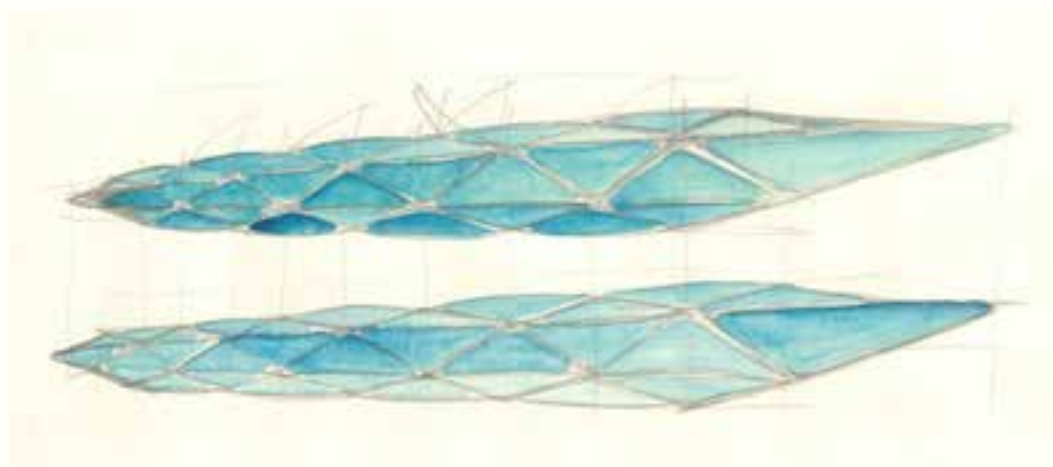
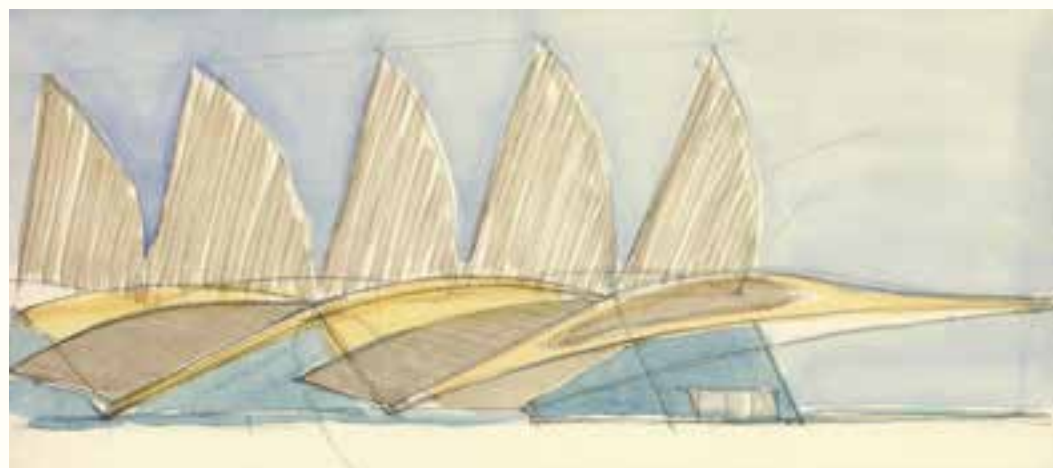
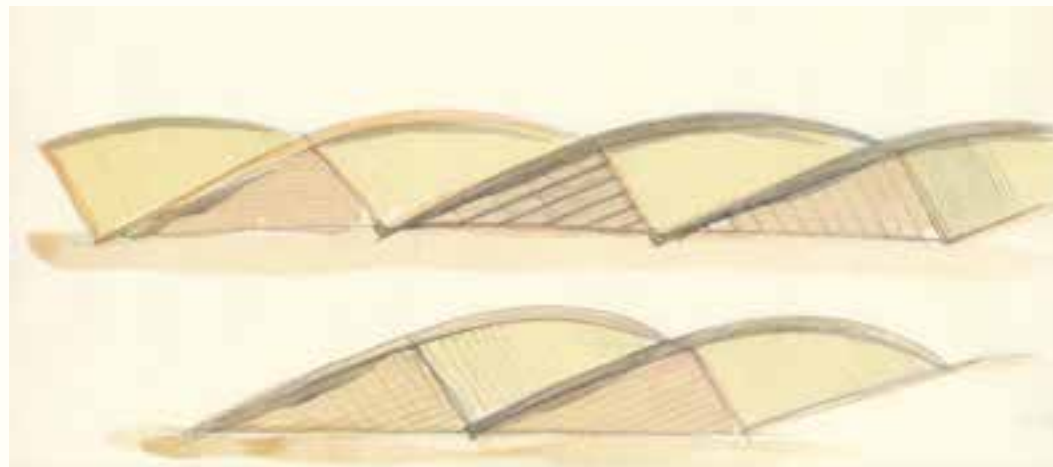
Beginning my studies in architecture was a joy. I learned the fundamental difference between looking and seeing, and was compelled to become fully conscious of my surroundings. I learned how pavements were made, how to observe light passing through leaves, the silver wakes that ducks leave when swimming and the rippling reflections of the moon on the sea. Life suddenly became richer and more pleasing.

I spent the summer following my first year of university visiting the Mediterranean islands: the Balearics, Sicily, Capri and the Greek islands. I travelled with only a backpack, slept on the beach and collected my thoughts into a book on vernacular architecture, which I still find pure and pristine. My intention was to represent architecture's influence

ABOVE Rough sketches for the façade of the Reggio Emilio railway station in Italy, which was influenced by wave forms.



ABOVE The Bodegas Ysios Winery was also inspired by sinuous wave-like forms, this time the outline of mountains in the surrounding landscape.



ABOVE Flowers and the forms of their unfurling petals have influenced the roof shapes and delicate cones of the Museu do Amanhã in Rio de Janeiro.

on the landscape and to capture the shifting functions of buildings in relation to ideas about the natural world, from the ancient notion of a cosmic order through to our modern conception of nature as an expanse of greenery.

Any natural form can be reinterpreted into an architectural structure. Valencia's coastal influence has led to waves and wave-like shapes appearing almost instinctively in many of my projects. These forms are most apparent in the façade of the Reggio Emilia railway station in Italy, the Nations' Wall of The Athens Olympic Sports Complex in Greece, and in the sinuous undulating roof of the Bodegas Ysios Winery in Spain, which creates a kinetic effect against its mountainous backdrop. Like the rhythms and patterns of nature, my architecture often tends to incorporate an element of repetition.

Other natural phenomena inspire my more recent projects, including the flower-shaped Museu do Amanhã in Rio de Janeiro (2015), with its large leaf-patterned entrance canopy and its steel roof 'petals' that draw towards the sun in slender cones. The DCH Tower in Dubai was inspired by the slender form of a lily and my Greenwich Peninsula project — reconstructing a large area of central London — is inspired by British garden cities, the engineering projects of Brunel and Paxton and quintessentially British greenhouses. Its towers are designed to follow sweeping u-shaped curves, like the contours of two tulips.

#### ABSTRACTING NATURE

For me, nature has three overriding principles that can inspire solutions to architectural problems: firstly, nature's optimal combinations of materials and colours; secondly, nature's dynamism and rhythm and organic shapes, growth and movement; thirdly, nature's freedom to transgress boundaries, which mirrors my personal approach to architecture.

Nature proves that form does not merely follow function, and that a beautiful form can also be useful. This is a fundamental concept in architecture. Ultimately, I found my way forward as an architect by employing nature's apparently simple and abstract principles in my work. Architecture's distinctive power is to evolve natural inspirations into something entirely new.

Architecture is a pure creation of the human spirit, so it doesn't imitate nature. As an architect I intuitively transform the forms of flowers, trees, waves, rhythms, patterns or natural textures into one of my architectural compositions, but in so doing I am only trying to translate the fantastical abstraction we find in nature into functional physical form. In this sense, nature is the model of simplicity, synthesizing nature's wealth and completeness, via mathematical models, into a kind of geometric purity.

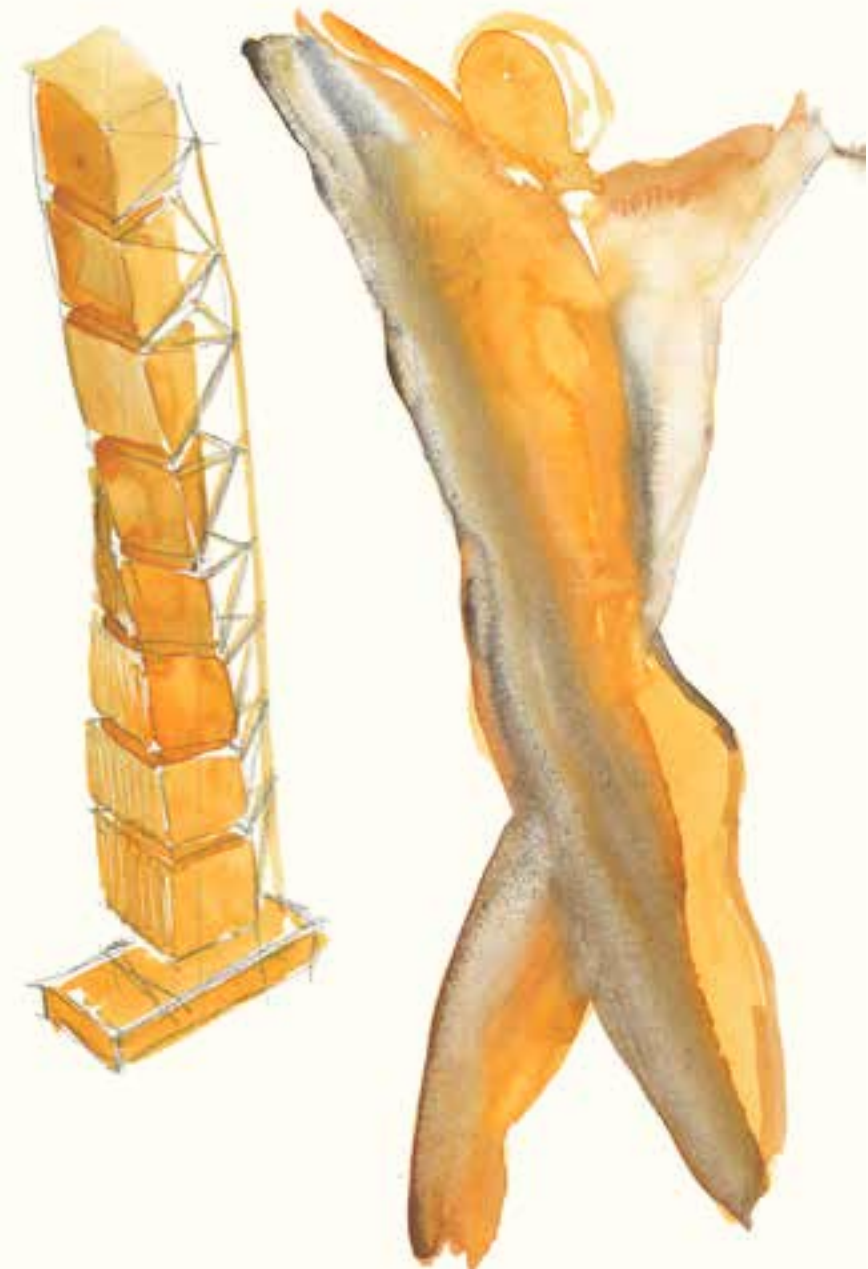
The synthetic appreciation of nature in the drawings of Paul Klee, Piet Mondrian, Mark Rothko or Ellsworth Kelly has also been incredibly influential. I hugely admire the work of each of these artists and feel close to their radically simplified aesthetic, which encourages internal reflection. In my own work as a painter, I depict trees and the human body every day. Even if my work is very representational, as soon as I have subjected an object from nature to my conscious process in the act of drawing or painting, it becomes an abstraction. As Rothko puts it, 'I wish to approach truth



as closely as is possible, and therefore I abstract everything until I arrive at the fundamental quality of objects'.

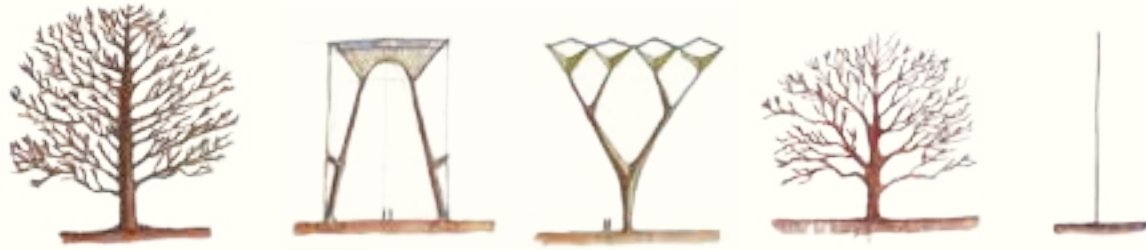
In architecture, the artistic concept of the 'abstract' is connected to the need for a clear analytical understanding of the project in hand. To illustrate this, consider the process of drawing a tree blowing in the wind, and how this would be approached differently by an artist, an architect and an engineer. An artist will paint a tree in all its detail, including each twig and leaf, in a way that makes you feel the wind and the resulting movements of its branches. When painted by an architect, the tree becomes a cantilever bearing its load and with mechanical calculations of the forces that must act upon it to prevent the tree falling down in the wind. When an engineer paints the tree, it becomes almost pure abstraction: three lines and some structural calculations based on safety factors.

ABOVE The complex forms of the human figure are a constant source of architectural inspiration.



ABOVE The curving shapes of a human spine inspired my Turning Torso skyscraper in Malmö, Sweden.





This reductive process is beautiful to me. I have long been asked questions about the forms my buildings represent, but I wish for them to be read as pure abstractions. Architecture and engineering are arguably the most abstract disciplines and this is the case because they have been nourished historically by all of the other arts.

#### NATURE'S DESIGN

We engineers and architects (the difference between the two is mere convention) have an empirical spirit. I relate to John Locke's fundamental principle that 'all of our knowledge and ideas arise from experience. All of our perceptions come from experiments and the observation of reality'. Paradoxically, Empiricism's emergence as a philosophical movement coincides with the emergence of engineering as a discipline. Engineering is also a practice of abstraction that explains reality and nature through mathematical models. I often find solutions to engineering challenges in nature, such as problems of stability, tectonic movements (mountains are an example) or the optimal distribution of mass with the maximum load.

As an engineer, I feel a kinship with the methodic approach of the painter Paul Cézanne, who completed his work slowly, painting mainly outdoors in order to capture the constancy of the natural world. Building natural forms can prove arduous, but it becomes very rewarding when following simple models in nature. Many architects, including Eero Saarinen and Alvar Aalto, have built with this in mind – one reason, perhaps, why their buildings are capable of evoking such emotion.

The greatest master of this approach is surely Frank Lloyd Wright, who was the first architect to integrate nature and the 'organic' into his philosophy. One of my most poignant memories is of visiting Taliesin West, his winter home in Arizona's Sonoran desert and a living memorial and testament to his life and work. Taliesin

**ABOVE AND OPPOSITE** While an artist might draw a tree to capture its colour and movement, an architect sees the forces acting upon the tree and an engineer will see the tree as a purely abstract mathematical form.



West was revolutionary because it was built using the desert stone found on site and it proved to be the inspiration for some of Wright's most famous later projects, including the Guggenheim Museum in New York. Most memorable for me was the recognition of the building's deep understanding of nature. This sympathy with nature, which can only proceed from an intuitive approach, convinced me that architecture can be sublime.

Although my awareness of nature has been ever-present, this reached its first full realization in my architectural projects during my time in the United States. The buildings I created there were influenced by the country's majestic landscapes and wildlife. One of the most striking sunsets I have ever witnessed was from the Rainbow Room at the top of the Rockefeller Center in New York.

Natural inspirations for my work have also included animals and their dynamic forms. Bull horn shapes can become the supports for bridges, and pigeons, which I have been painting since childhood, have also served as a model for some of my constructions. Soaring birds are depicted on the TGV Railway Station at Lyon Saint Exupéry Airport and the Milwaukee Art Museum, or in bridges such as the Samuel Beckett in Dublin and the Haarlemmermeer in Holland.

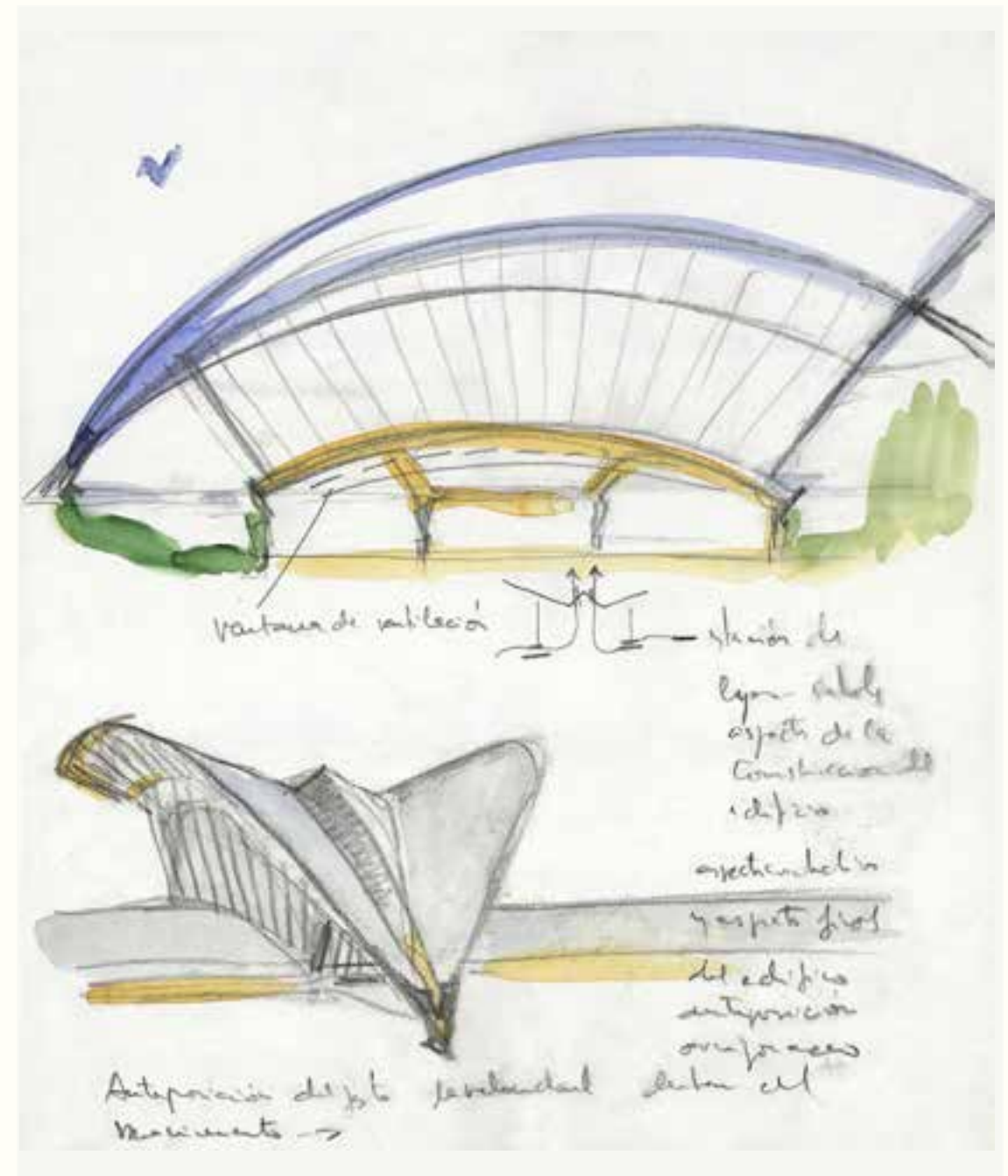
#### BEAUTY (FORM) VERSUS UTILITY (FUNCTION)

Auguste Rodin said 'to any artist, worthy of the name artist, all in nature is beautiful'. One of the key lessons from nature is that beauty (form) is not opposed to utility (function). A beautiful form can also be innately functional. As an architect schooled in the mainstream Modern movement, I was steeped in functionalist doctrine, but I believe that architecture can follow function, and much more. I would even go so far as to argue that function can follow form.

Early in my career I realized that I did not want to be part of a school of architecture, even less so that of Bauhaus pragmatism. If I was to go beyond convention, I knew I had to become free from prejudice and create my own language. I am talking from the perspective of understanding architecture beyond the banal.



BELOW Charging bulls (top) and a soaring bird translating into abstract shapes (bottom).



ABOVE The forms of birds' wings can be seen in the roof design of the TGV Railway Station at Lyon Saint Exupéry Airport.



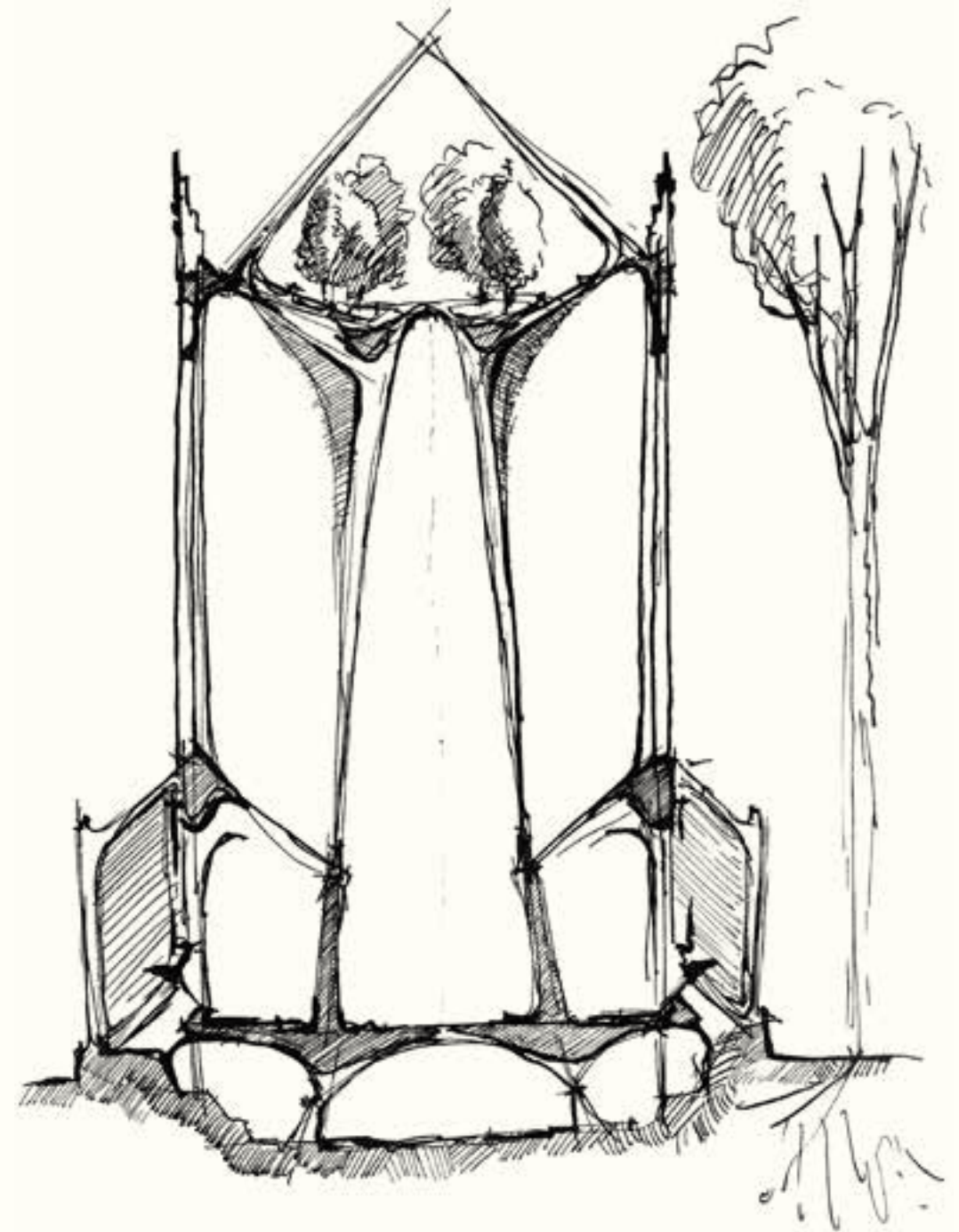
Louis Khan is the modern architect who has moved me most deeply in this regard. His architectural vocabulary is totally free, like that of an artist. Two of his constructions have particularly inspired me: the National Assembly in Dhaka, Bangladesh and the Indian Institute of Management in Ahmedabad, Gujarat, India. In these masterworks, form does not necessarily follow function. Instead, Khan celebrated the total freedom of exploring new possibilities with limited materials, including brick cubes, concrete ties and dynamic brick colonnades.

When thinking about the sublime in architecture, one immediately imagines cathedrals. If we go inside an extraordinary cathedral, such as Rheims — a masterpiece of Gothic art — we realize that its interior elevation is remarkable for the impression of vertical tension created by the upward thrust and relative narrowness of its volumes. It is noteworthy that this elevation was designed not only to invite spirituality and allow space for more worshippers (function), but also for aesthetic reasons (form).

When I approach a project, I often start by thinking about it intuitively and in terms of form (beauty). Once the form is defined, it adapts naturally to the rational utility (function) of the project.

In his treatise on architecture, *De Architectura*, Roman architect and engineer Marcus Vitruvius (c. 80–15 BCE), outlined three principles of good architecture: *firmitas* (durability) — it should be robust and remain in good condition; *utilitas* (utility) — it should be useful and functional for those who use it; *vetustas* (beauty) — it should serve people and raise their spirits. Later, scholars in the Middle Ages compared these Vitruvian principles with three central qualities of humankind: *firmitas*, they said, is like human tenacity and the heroic gesture of existence. *Utilitas* compares to functionality that also reclaims what is good, which I relate to the charity and altruism required of architecture. Finally, *vetustas* (beauty) in humans is their intelligence. Of all three, I consider beauty the most enigmatic because it is the most difficult to recognize.

I believe that architecture does not need to be conventionally beautiful to be good. Art and architecture are not the expression of a beautiful thing, but a beautiful expression of something. A perfect example of this is 'The Slaughtered Ox' (1655) by Rembrandt. At first glance the dead ox might repel, but Rembrandt, then at the pinnacle of his career, turned it into a sumptuous miracle of artistic beauty and poetic and spiritual profundity. Great art is not perfect and the painting's disturbing quality elevates it beyond convention. This quality is something I admire in artists Masaccio, Michelangelo, Rembrandt and Cézanne. As a method of distortion, it gives evidence of struggle, but it is presented with such authenticity and conviction that it is ultimately persuasive and becomes beautiful in an unconventional manner.



ABOVE The structure of a cathedral can be reminiscent of tree trunks and branches.



I seek beauty because I must go beyond the expected. I designed my first works, shelters for bus stops and balconies in Zürich, in 1983, after fifteen years at university. One of these was the Baumwollhof Balcony – a Neo-Liberty metal balcony hooked onto a nineteenth-century building, which featured all the elements that would go on to define my signature style. These were very ‘insignificant’ commissions, but my architectural convictions were present even then. I put everything into the realization of my ideas and the final outcomes balanced the functional with my pursuit of a beautiful ensemble.

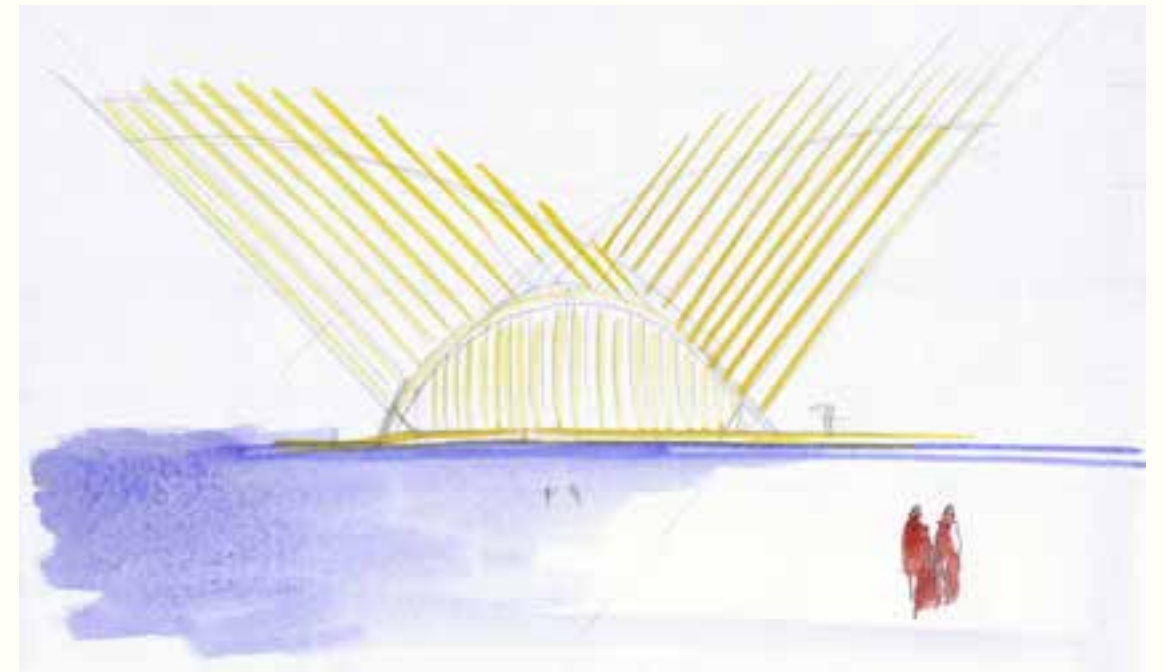
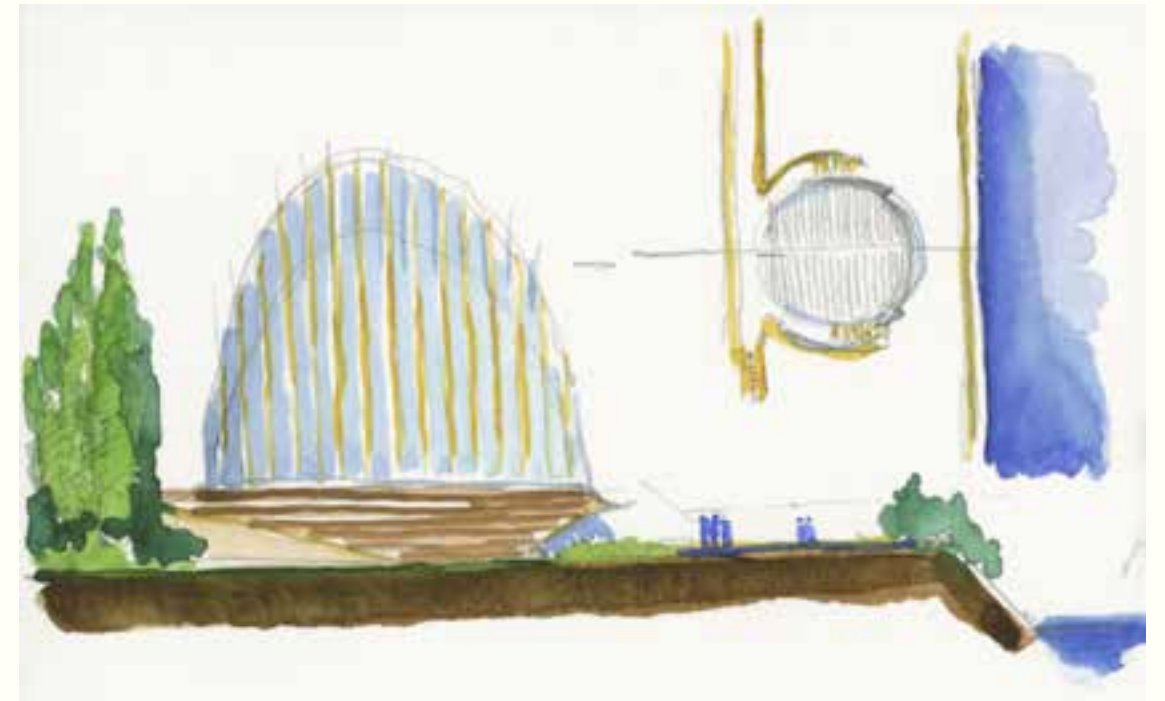
When I was working on the construction of the bus stop shelters, I dreamed that one day they would become railway stations, and when I designed the balconies, I imagined that they would become bridges. Slowly, in time, they became so. The slender outline of the Bac de Roda Bridge in Barcelona recalls my early work in Zürich. I have continued to take on similar ‘minor works’ ever since, because there is a lot to learn from the enormous quantity of information and experimentation that lies behind them.

In Zürich I often take the tram, as I do not have a driving licence, and sometimes I feel sad when I see bus stops that lack grace. In these moments my mind wanders to Hector Guimard, and his quintessentially Art Nouveau subway entrances in Paris, which were based on structures by architect Viollet-le-Duc. These entrances have a studied composition and a sublime ornamentation. Guimard was an architect who believed in the unique, designing his entrances to visually enhance the experience of underground travel on the new metro system. Both design approaches, that of ordinary bus stops I see in Zürich and that of Guimard’s metro entrances, are valid. One is restricted by the dictates of mere function, whereas the other takes a step forward. But Guimard’s work is in the Metropolitan Museum’s collection; I feel inclined to follow his approach.

It was when conceiving the main entrance of Oculus – the World Trade Center Transportation Hub – in New York that I had an opportunity to create my own unique entrance (another station, in this case). I devised a longitudinal rooftop opening placed according to the position of the sun on 11 September, which would allow what I term ‘the way of light’ to fall into the interior, illuminating it naturally at the time of the tragedy on that day. This idea reflects my strong belief that architecture only has meaning if it possesses an existential element that lifts the spirits. I wanted to demonstrate that this could be achieved on an everyday basis through something as familiar as a commuting hub.

This takes me back to Vitruvius’s principles. I believe that the secret to creating meaning in architecture resides in the Vitruvian concept of *utilitas* (function). We build to serve and to aid well-being, creating concert halls for people to listen to music, libraries for people to study and schools for people to learn. For me, *utilitas* does not merely imply ‘goodness’ in architecture, but the understanding of architecture as an offering, in the sense of the German for ‘offering’ (*Opfer*), which means ‘making a sacrifice’ (*ein Kunstwerk ist ein Opfer: ‘a work of art is a sacrifice’*). For me, architecture is an offering to future generations. Philanthropy is the love of humankind, and this should be architecture’s highest purpose.

Looking back at my career, I realize that nature has acted as a metaphor, opening doors and allowing me to seek a poetic dimension in the rigour required by architectural projects. This metaphor has always kept my mind open and alert to the infinite universe, which, as philosopher Baruch Spinoza has noted, ‘we all carry in ourselves’.



ABOVE Fluid shapes seen in sketches for Oculus, for which light plays an important role as a natural memorial to the victims of the 11 September terrorist attacks.

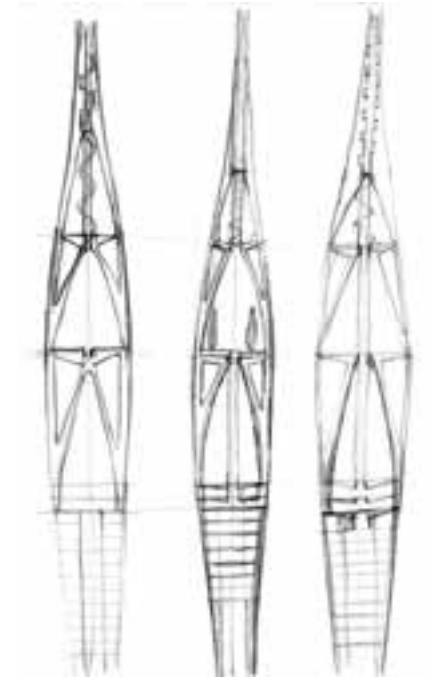




## Tower DCH (2016-)

DUBAI CREEK HARBOUR

*Inspired by the natural forms of the lily*

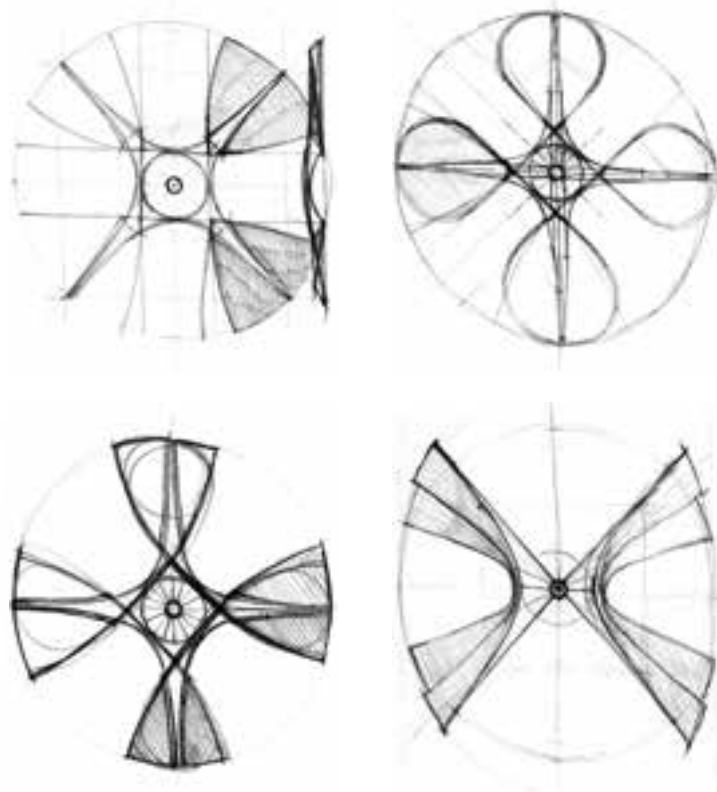
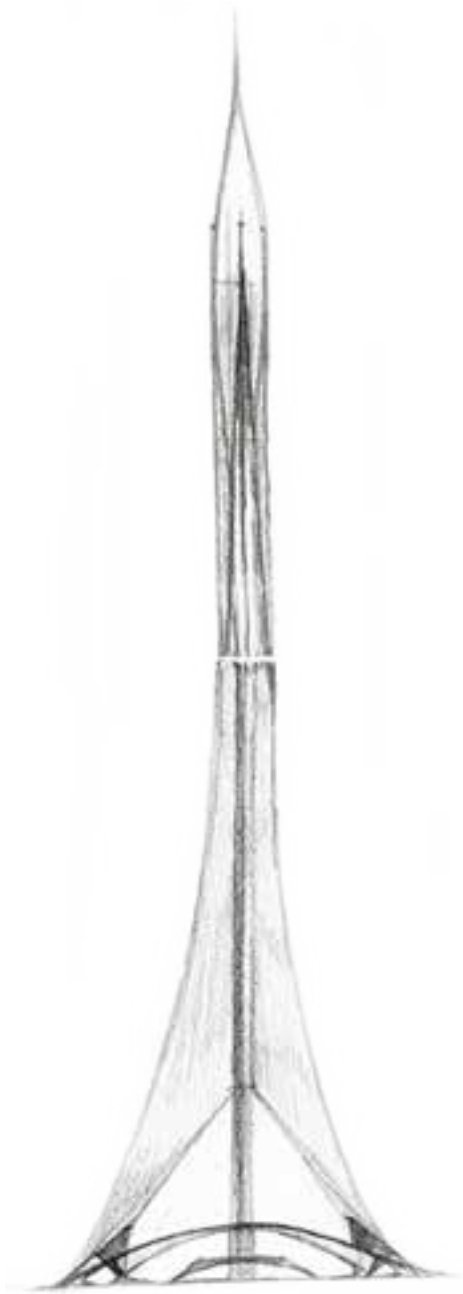


The structural design of this tower, which will be the tallest in the world, began from the solid oval form and clear proportions of a slender lily flourishing high among the skyscrapers around it. While I was preparing the sketches for this project, my wife bought a bouquet of lilies, which she gets from a florist at Lexington Street with Park Avenue in New York. The lilies were still closed when she arranged them in a vase. The main concept for the project was a compact triangular structure, like the closed lilies, which gathers many things inside that will open slowly. At the start, the floor plan of the entrance hall of the tower was triangular, but it became hexagonal in order to follow the form of the lily's flower, once opened. The slender

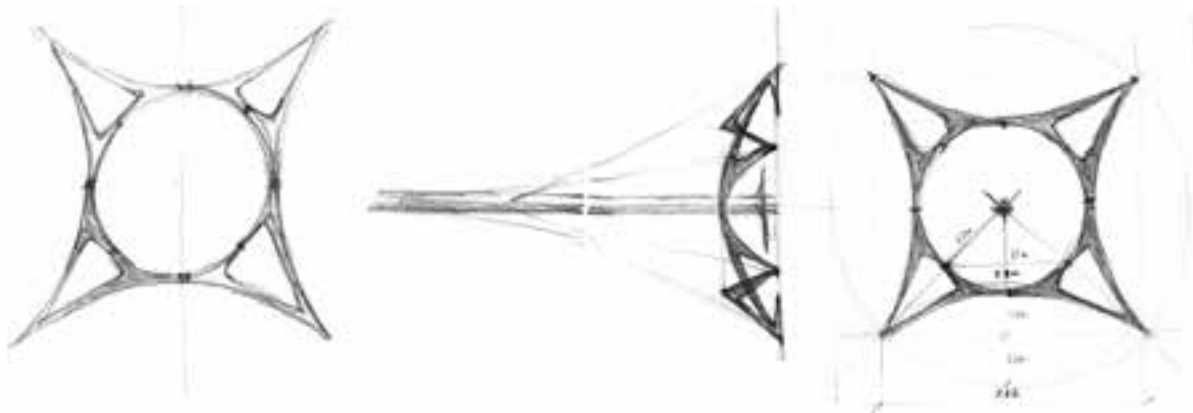
stem 'serves' as the spine of the tower's structure, and the cables linking the building to the ground are reminiscent of the delicate ribbing of the lily's leaves. The structure also provides a beacon at night, with lighting that emphasizes the flower-bud design of the building.

At the same time, the natural symmetries found in nature, and most strikingly in flowers, are linked to the proportions governed by the subtle geometric laws of Islamic buildings. This sense of harmony is also present in my other inspiration for this project, the minarets — traditional Islamic towers — typically found adjacent to mosques. In this way, I connect nature with the richness of the Islamic culture and heritage of the United Arab Emirates.

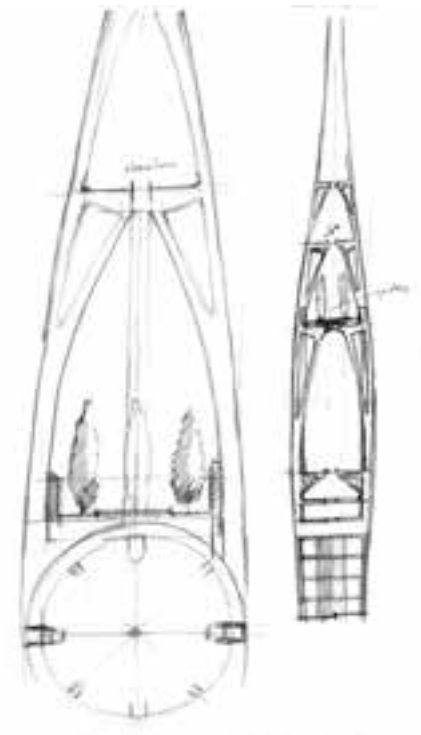
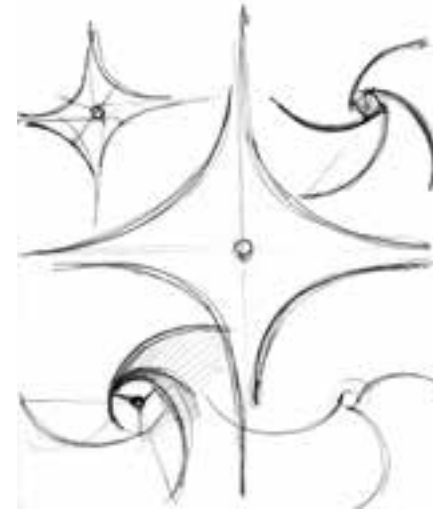




The flowing shapes of the closed lily and its surrounding leaves can be seen in cutaway sketches of the tower and the shapes of its anchoring stay cables (below).



The gently curving form of the tower recalls the shape of a lily bud (right and previous spread).

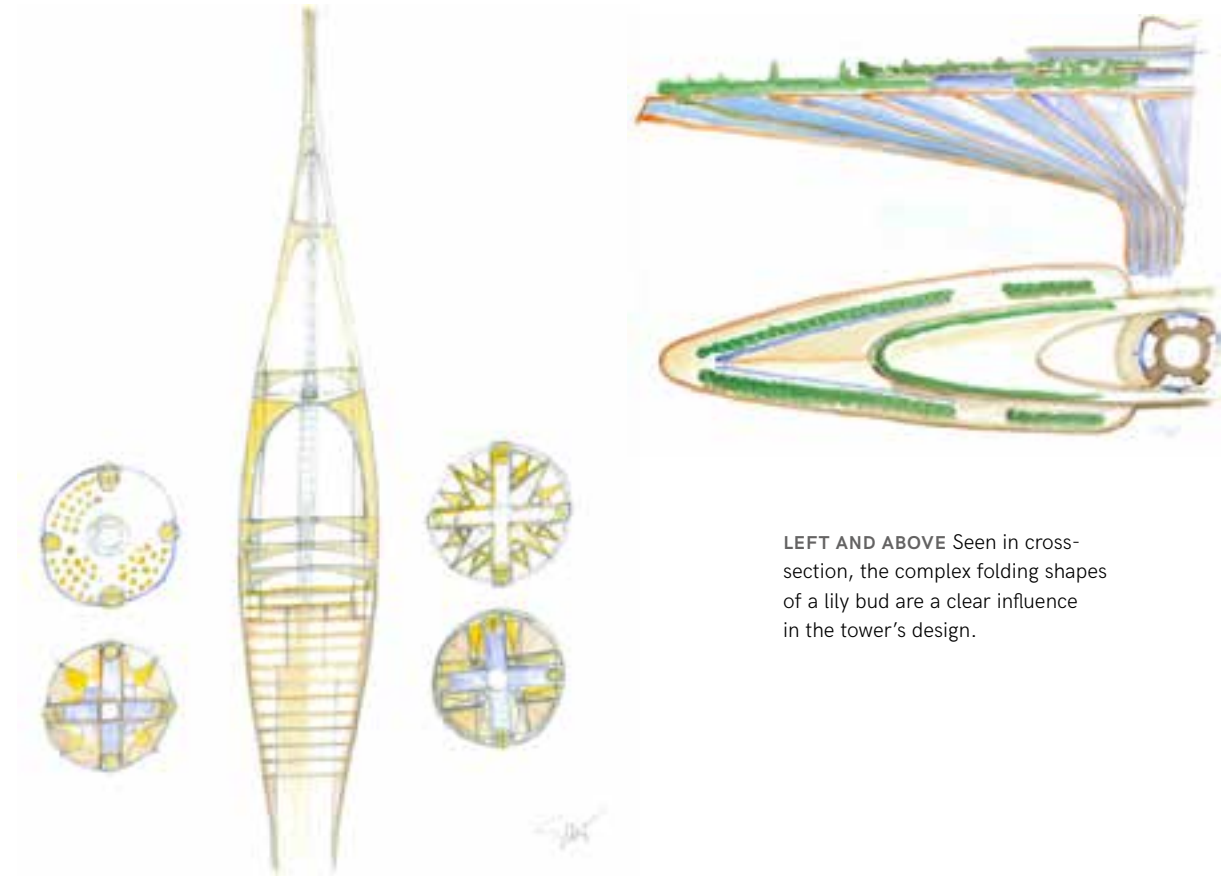


The tower is located in the centre of Dubai Creek Harbour, a six-square-kilometer (two-square-mile) world-class development located on Dubai Creek, which has long been Dubai's center of history and culture and is in close proximity to the Ras Al Khor National Wildlife Sanctuary. The commission came from a visionary client, Mohamed Ali Alabbar, chairman of the Dubai-based developer Emaar Properties, who constructed the 828-metre (2,717 feet) Burj Khalifa tower – an architectural marvel of downtown Dubai. Emaar Properties wanted to build a landmark to define the urban core of Dubai Creek Harbour, to be composed of a central plaza surrounded by gardens and including a new tower that surpassed the height of the Burj Khalifa.

We met at their offices once all the architects for the competition had been selected. When the meeting was almost finished, Mohamed Ali Alabbar said 'now go back to your hotel and deliver up a project of dreams'. This became very meaningful for me.

The tower features numerous balconies that rotate outside its façade, vertiginous observation decks and elevated gardens, offering solar protection, that bring to mind the Hanging Gardens of Babylon. The structure will include ten observation decks and The Pinnacle Room – an observatory taken to the extreme – which will offer unprecedented 360-degree views of the city and beyond. Visitors will be able to see that the horizon is not straight but curved and will have a

Green spaces are essential to the design, incorporating elevated gardens and a public area at the base of the tower (bottom).



LEFT AND ABOVE Seen in cross-section, the complex folding shapes of a lily bud are a clear influence in the tower's design.

clear view of sunsets and sunrises. The tower's ground-level Central Plaza will serve as a bustling neighbourhood shopping centre, a museum, educational facilities and an indoor auditorium.

The tower's design and architectural features have demanded an extraordinary engineering plan. I think Emaar Properties selected my project because they knew that I came from ETH Zürich (The Swiss Federal Institute of Technology), and that, ever since the Eiffel tower (the tallest of its time), tower structures are fundamentally engineering projects, relying on empirical and hydraulic forces. Throughout my career I have

employed technology and engineering as a vehicle for beauty and art, so they also appreciated that my project also had poetic and artistic elements.

The building's design is inspired by the Islamic tradition, evoking the same history that brought the world the Alhambra and the Mosque of Cordoba – these architectural marvels are pure poetry turned to architecture, sublimating spaces in which mathematics prevail. I have always been fascinated by the refinement of the Islamic arts and how they unite the harmonies of the natural world and the simple geometric laws of building with mathematical properties and geometry





LEFT AND OPPOSITE The hexagonal entrance hall recalls the form of a flowering lily at the base of what will become the world's tallest tower.

patterns that suggest the infinite. They project the underlying vision of the cosmos and the natural world, which Plato described as the 'music of the spheres'.

In a way, I feel that this tower — a symbol of belief in progress — should be read as a summary of my career to date. I could not have achieved the technological requirements of this project without everything I have learned from my previous works. The tower will be tethered to its waterfront site via cables-stays, similar to those I used to anchor Reggio Emilia Bridge, (2007) Jerusalem Chords Bridge (2008) and the Dallas Margaret Hunt Hill Bridge (2012). I also explored this technique earlier in my career in my cube sculptures, which were supported by chromium-plated steel cables. This follows an important principle of natural

philosophy that appears in the works of Gottfried Leibniz (*New Essays, IV*), who said '*natura non facit saltus*' ('nature does not proceed by leaps'). This principle expresses how change in natural things and properties can be a gradual process. In an architectural context, this allows one to assume that solutions are a simple continuous progression, and in this specific project the extensive studies undertaken in preparation for the foundations and a clear analytic understanding of the structure have resulted from all I have learned over more than forty years.

Nature is wise, but this project most significantly illustrates the need to approach nature in a poetic way through architecture, as if it were a musical score, and interpret it daringly, like playing a single powerful note.

