

# La Simetría





## I) DEFINICIONES

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# SIMETRÍA

- La palabra simetría indica la **posición** que ocupan las partes de un todo entre sí.
- La simetría está dada por la relación (bella) de una parte con otra y de las partes con el todo.
- Su expresión manifiesta se encuentra en la repetición regular de motivos y circunstancias similares o iguales, parecidas o afines.





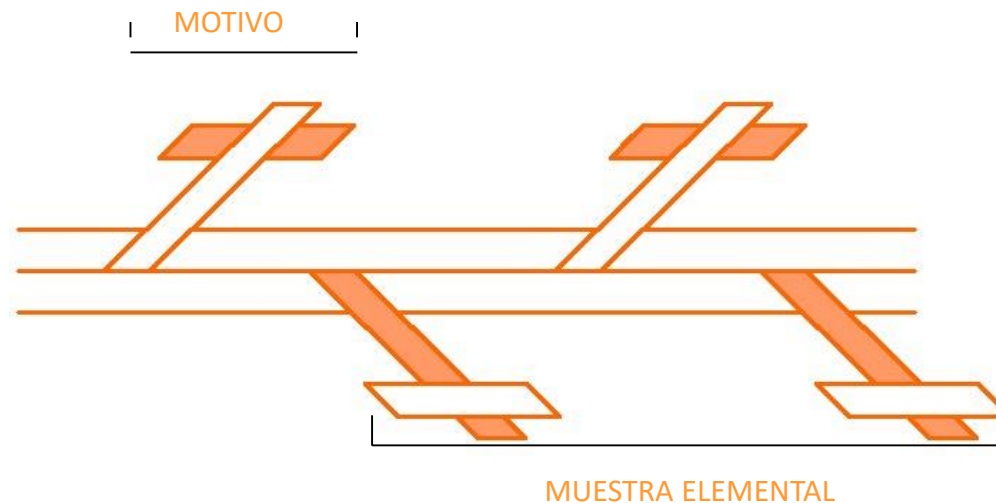


# MUESTRA ELEMENTAL

- Las partes elementales ya no son figuras, relacionadas simétricamente entre sí, sino **MOTIVOS**.

Se denomina **muestra elemental** al agrupamiento más pequeño de motivos que determina toda simetría. – *Motivo repetido bajo unas leyes determinadas*

Así como el átomo (o molécula) es el individuo de una sustancia, la muestra elemental es el individuo de una figura simétrica.





# OPERACIONES DE SUPERPOSICIÓN

Son movimientos de los motivos con cambios de posición

## RECURSOS METODICOS

Recursos de las matemáticas.

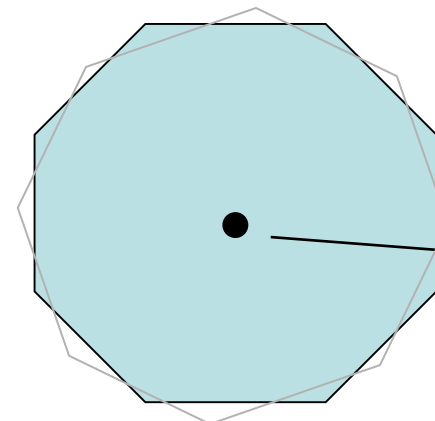
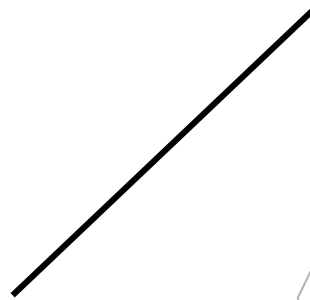
LA SIMETRÍA CLASIFICA LA VARIEDAD DE POSIBLES COMBINACIONES TENIENDO EN CUENTA SU CLASE Y CALIDAD

ORGANOS DE SIMETRÍA: son aquellas figuras geométricas que producen las operaciones de superposición.

figuras geométricas



ORGANOS DE SIMETRÍA:  
PUNTIFORMES  
RECTOS y PLANOS (ortosimétricos)  
CURVOS (kyrtosimétricos)



Octógono:  
órgano de simetría

## II) EL SISTEMA DE LOS CUERPOS SIMÉTRICOS

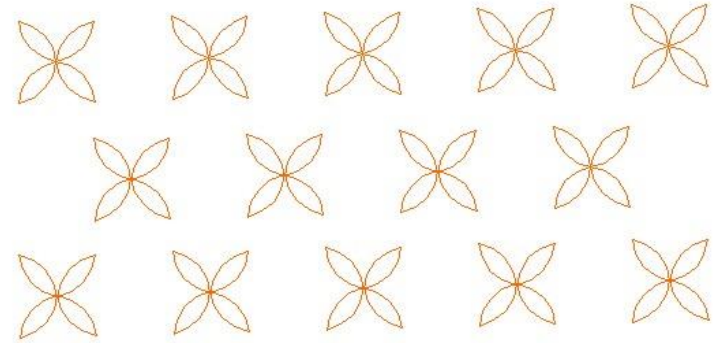
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# 1) GRUPOS PRINCIPALES

ISOMÉTRICA  
HOMEOMÉTRICA  
CATAMÉTRICA

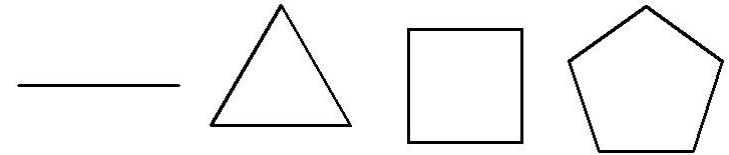
• *simetría isométrica,*

los motivos no son distinguibles entre sí y su disposición se repite uniformemente.



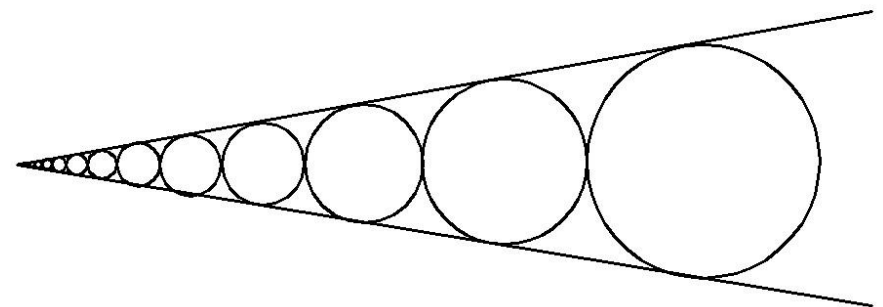
• *simetría catamétrica,*

los motivos no tienen igual forma y tamaño; pero están vinculados entre sí por una relación común, o sus formas continúan siendo análogas, y su sucesión está vinculada por **una ley.**



• *simetría homeométrica,*

los motivos son semejantes entre sí y aumentan o se repiten en sucesión monótona, de manera tal que un motivo se modifica con respecto al siguiente en tamaño, posición o situación, según una ley cualquiera.

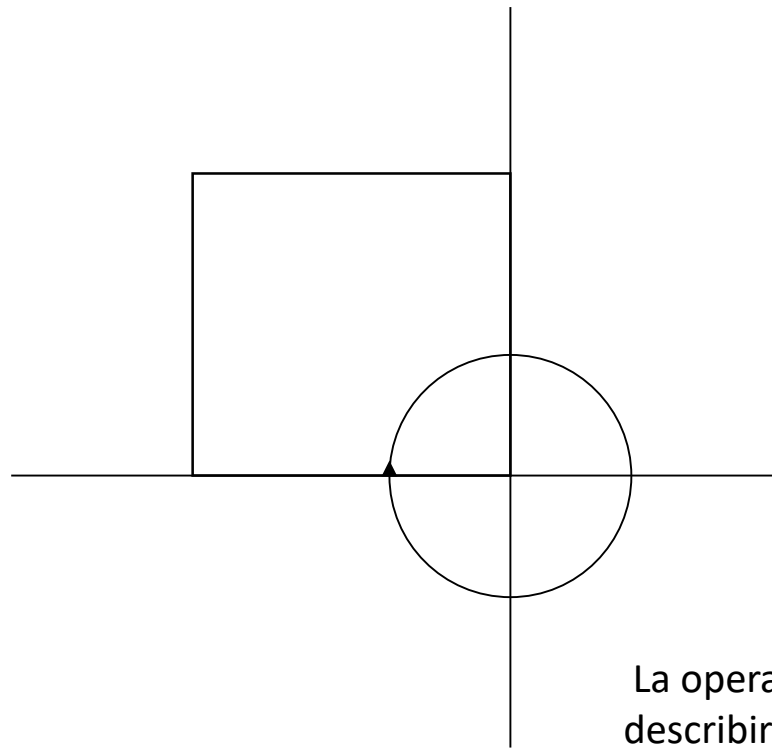


## 2) LAS OPERACIONES DE SUPERPOSICIÓN Y SU COMPOSICIÓN.

1. IDENTIDAD
2. TRASLACIÓN
3. ROTACIÓN
4. REFLEXIÓN ESPECULAR
5. EXTENSIÓN
6. ROTACIÓN TRASLATORIA
7. REFLEXIÓN TRASLATORIA
8. RELEXIÓN ROTATORIA
9. EXTENSIÓN TRASLATORIA
10. EXTENSIÓN ROTATORIA
11. EXTENSIÓN REFLEJA
12. EXTENSIÓN HELICOIDAL
13. EXTENSIÓN REFLEJO TRASLATORIA
14. EXTENSIÓN REFLEJO ROTATORIA

# 1. IDENTIDAD (I)

Representación invariada del objeto sobre sí mismo.



La operación de superposición se puede describir como una rotación de  $0^\circ$  ó  $360^\circ$  alrededor de un punto de identidad.

# IDENTIDAD

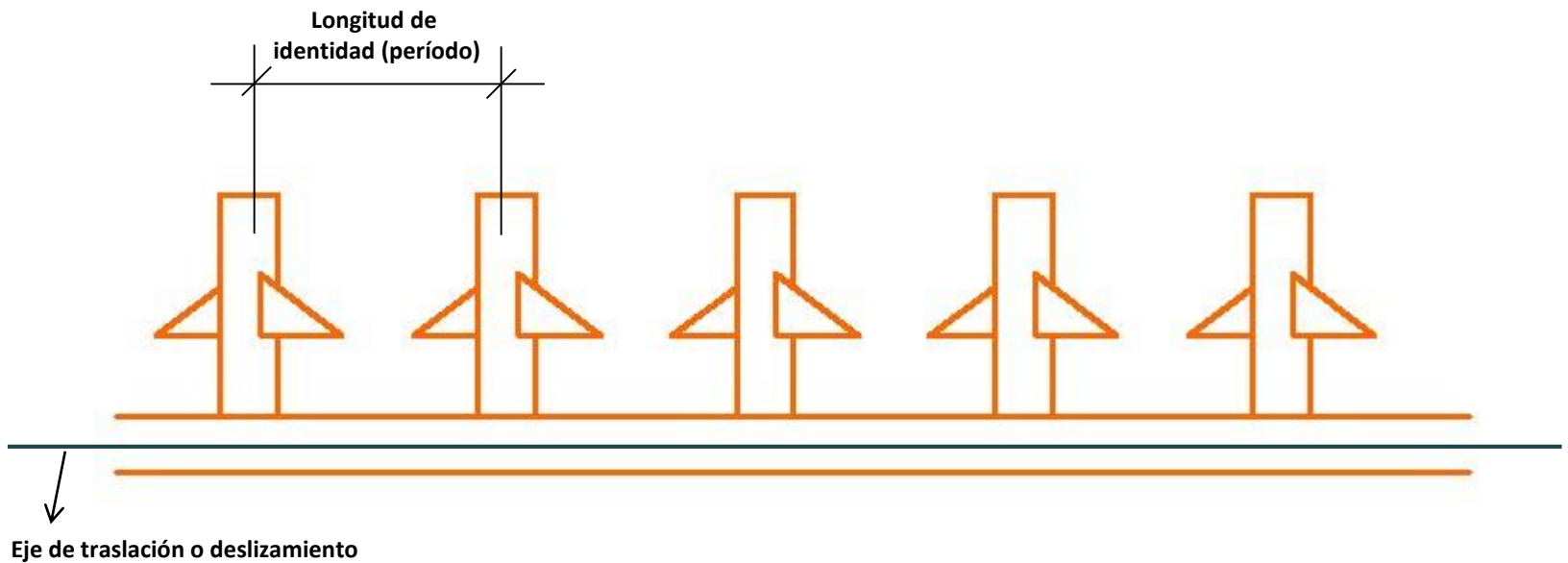


RONCHAMP – Le Corbusier



## 2. TRASLACIÓN.

Corrimiento simple y en línea recta.

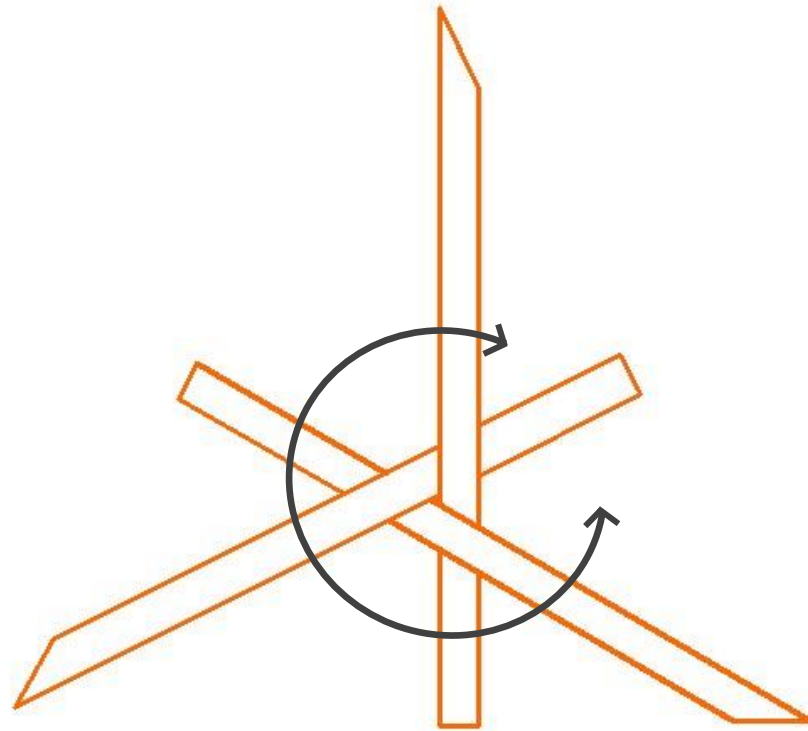


# TRASLACIÓN.



### 3. ROTACIÓN. (r)

Giro del cuerpo alrededor de un eje, el eje de rotación.



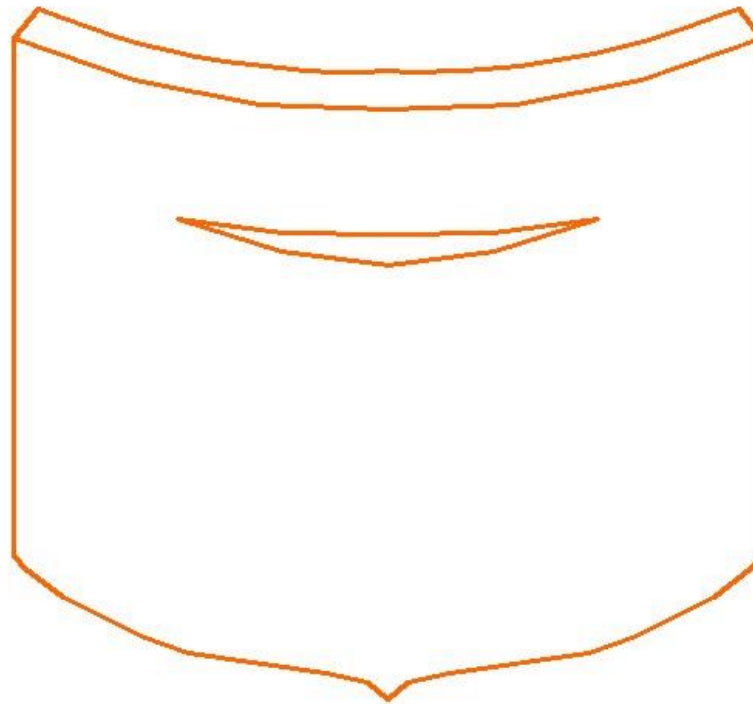
# ROTACIÓN.



## 4. REFLEXIÓN ESPECULAR.

Retrato bilateral en el que se invierten los lados.

Puede efectuarse según ejes o planos del cuerpo considerado.





## REFLEXIÓN ESPECULAR.



## 5. EXTENSIÓN.

Variación o multiplicación monótona del motivo, desde un punto singular o punto de extensión, y en la cual el motivo permanece semejante a sí mismo.



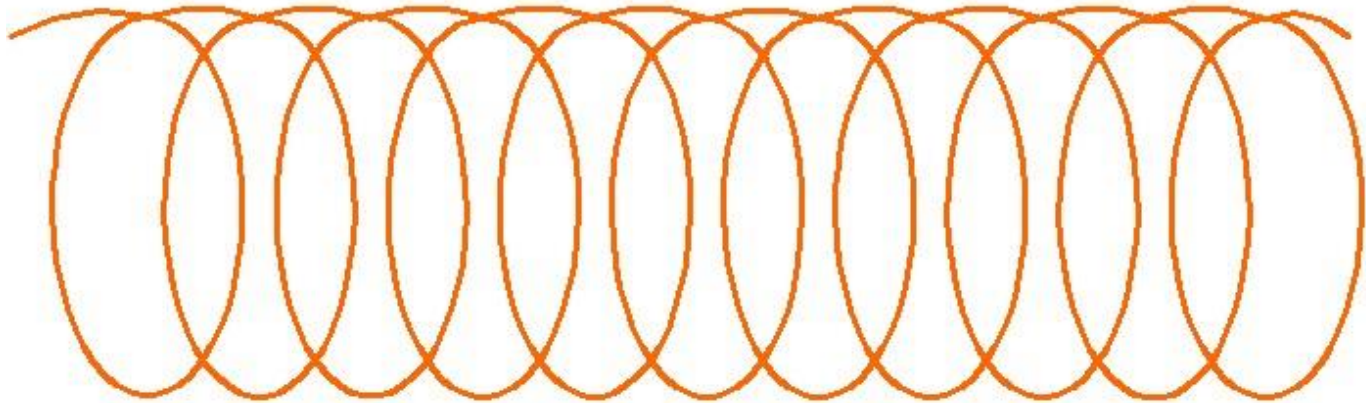


## 5. EXTENSIÓN.



## 6. MOVIMIENTO HELICOIDAL o rotación traslatoria.

Acoplamiento de traslación y rotación, y da una operación independiente que está siempre unida a la traslación pura.

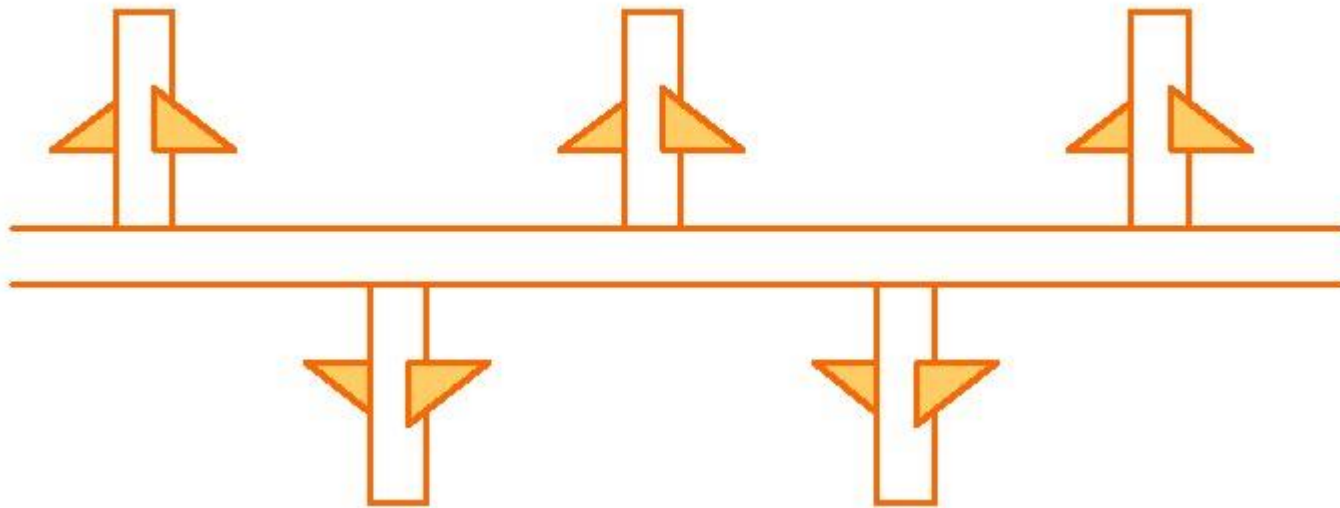


**MOVIMIENTO HELICOIDAL o rotación traslatoria.**



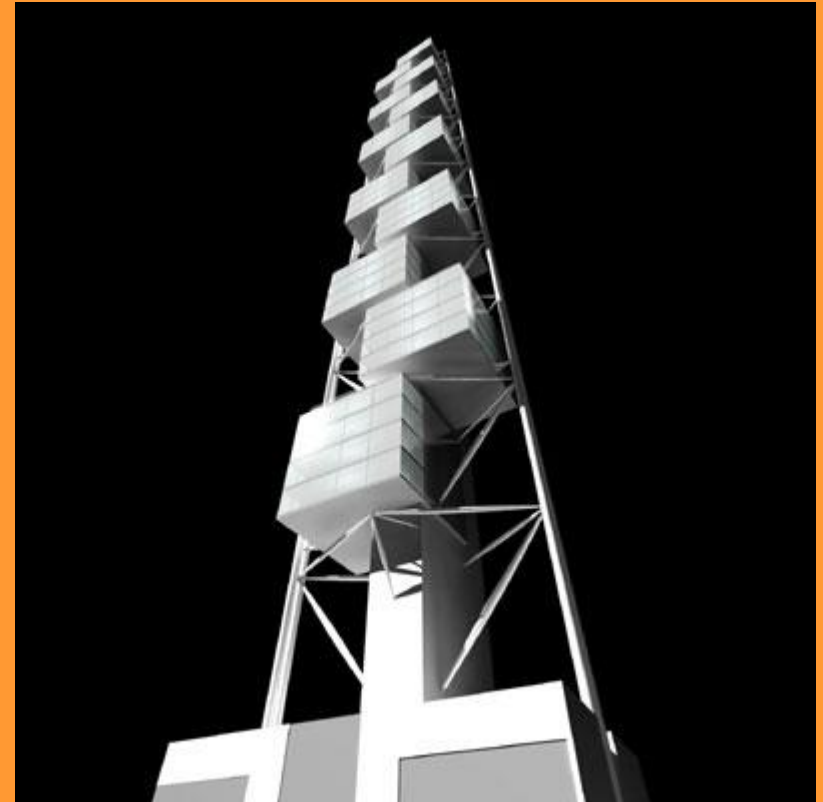
## 7. REFLEXIÓN TRASLATORIA.

Acoplamiento de traslación y reflexión especular a lo largo de un eje de reflexión traslatoria.



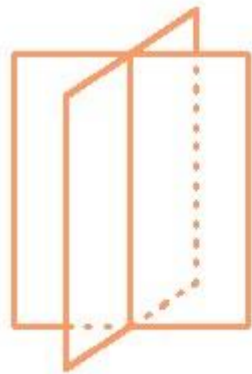


## REFLEXIÓN TRASLATORIA.

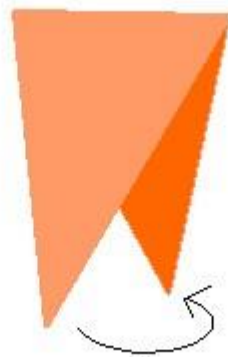


## 8. REFLEXIÓN ROTATORIA.

Acoplamiento de rotación y reflexión especular.



a)  $rs$



b)  $r + s + rs$

## REFLEXIÓN ROTATORIA.





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Malmö, Sweden 1999 – 2005  
Based in form on the sculpture Turning Torso

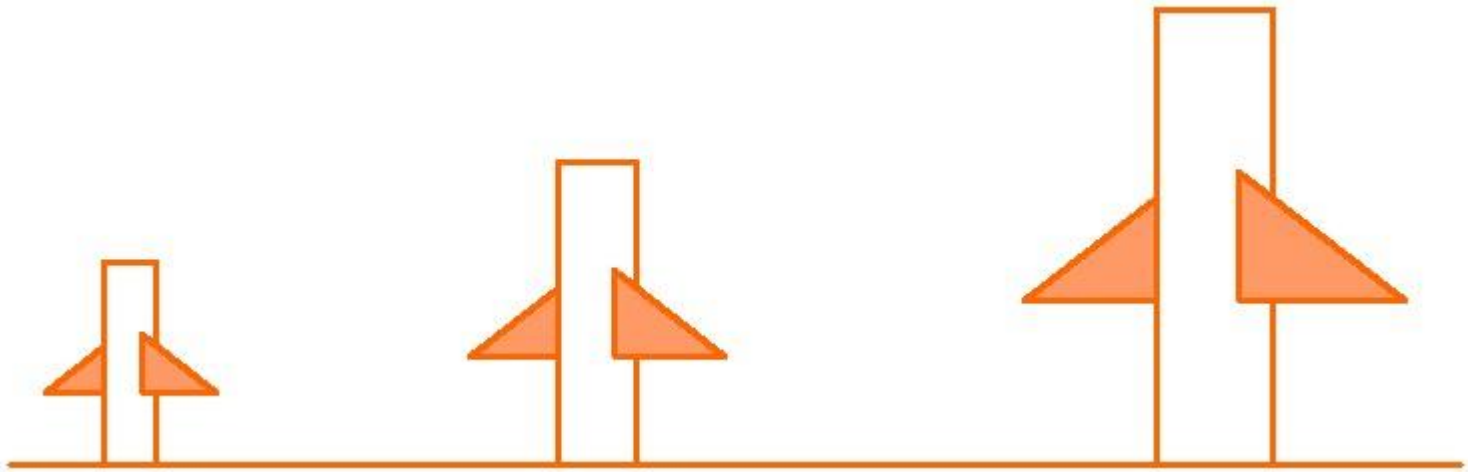
The residential tower is meant to be seen as a freestanding sculptural element posed within the cityscape. The equivalent in the tower of the sculpture's steel support is the nucleus of internal elevators and stairs, through which the box units communicate.

SANTIAGO CALATRAVA

High Rise Apartment Tower in Malmö  
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## 9. EXTENSIÓN TRASLATORIA.

Acoplamiento de traslación con extensión y se produce a lo largo de un eje de extensión



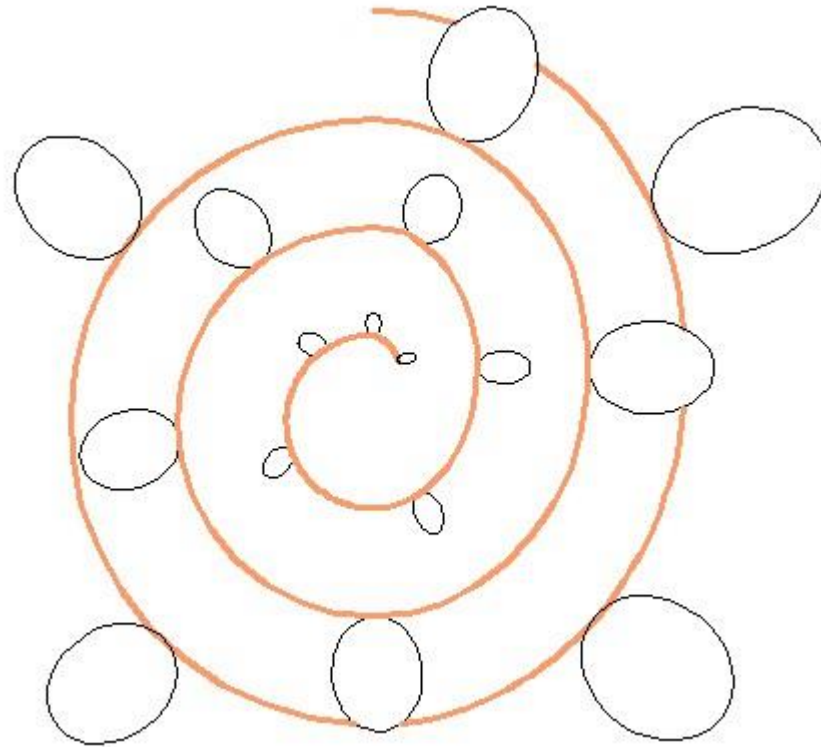
## EXTENSIÓN TRASLATORIA.





## 10. EXTENSIÓN ROTATORIA.

Acoplamiento de rotación y extensión alrededor del punto de extensión rotatoria



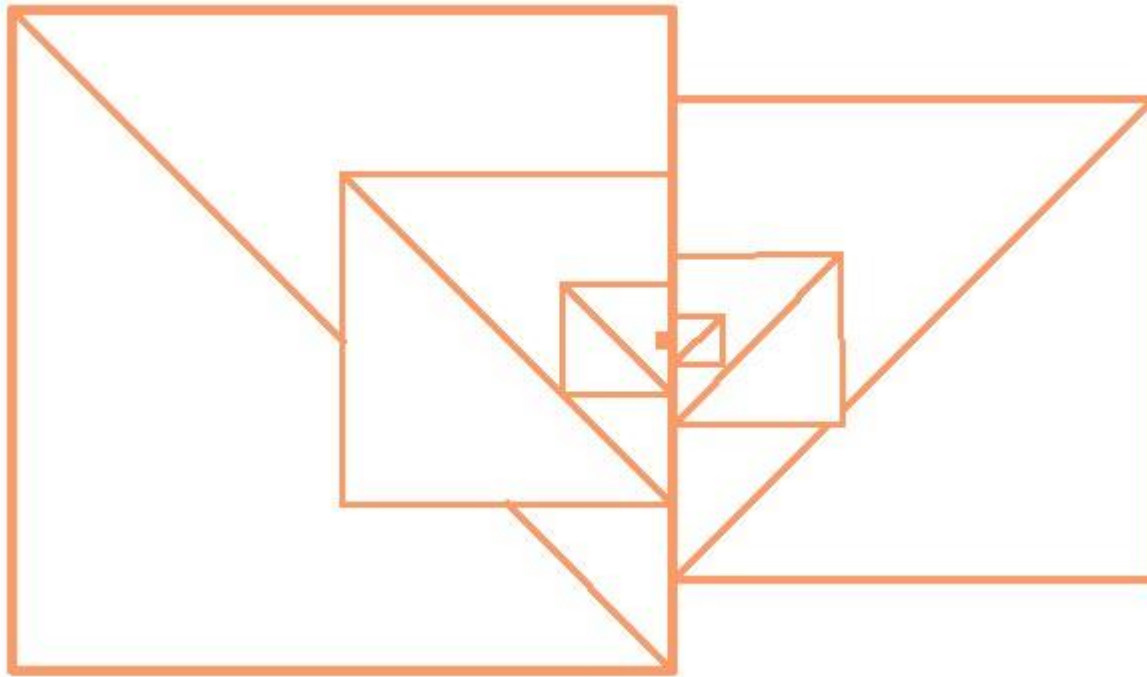


EXTENSIÓN ROTATORIA.



## 11. EXTENSIÓN REFLEJA.

Acoplamiento de reflexión especular y extensión. Tiene como característica que no se corre el punto de extensión.



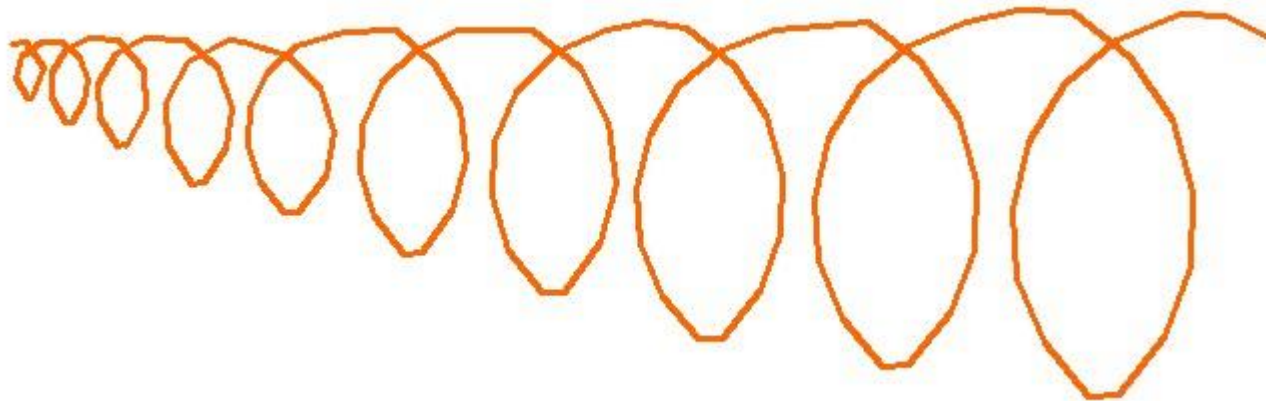


EXTENSIÓN REFLEJA.



## 12.EXTENSIÓN HELICOIDAL.

Acoplamiento de traslación, rotación y extensión a lo largo del eje de extensión helicoidal.

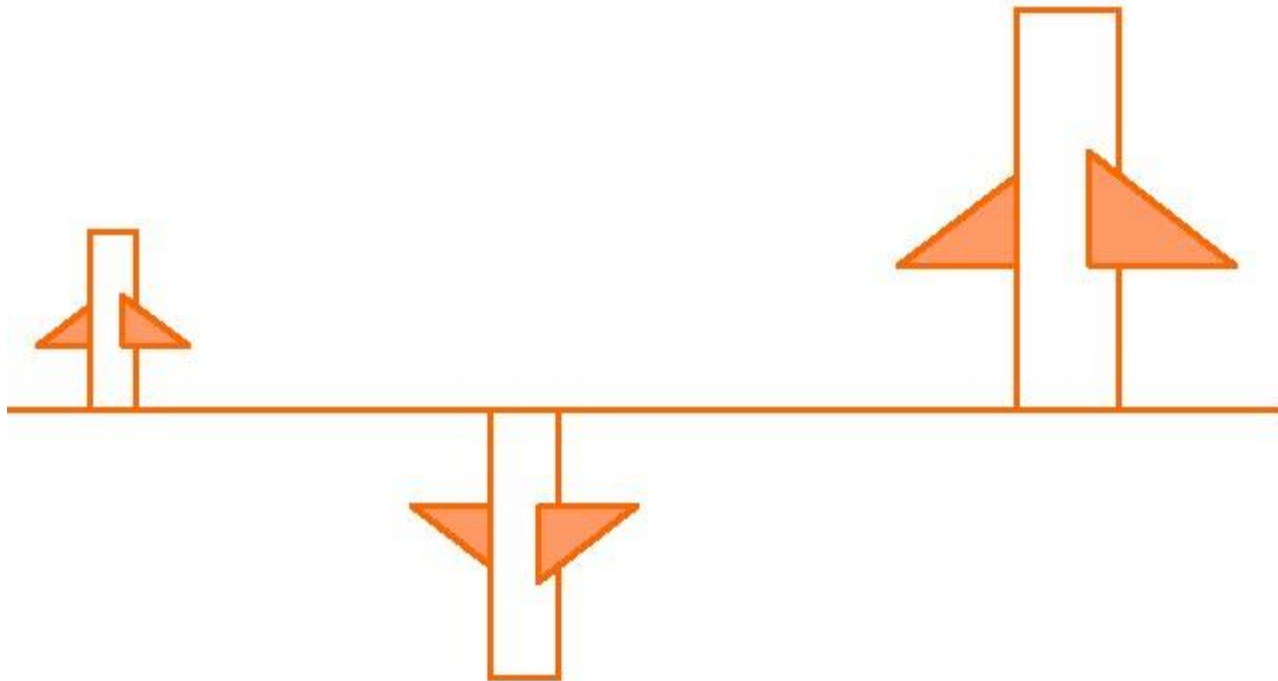


## EXTENSIÓN HELICOIDAL.



### 13. EXTENSIÓN REFLEJO TRASLATORIA .

Acoplamiento de traslación, reflexión especular y extensión a lo largo del eje de extensión reflejo-traslatoria. Resulta de acoplar a la reflexión traslatoria una extensión del motivo y una extensión de la longitud de traslación.

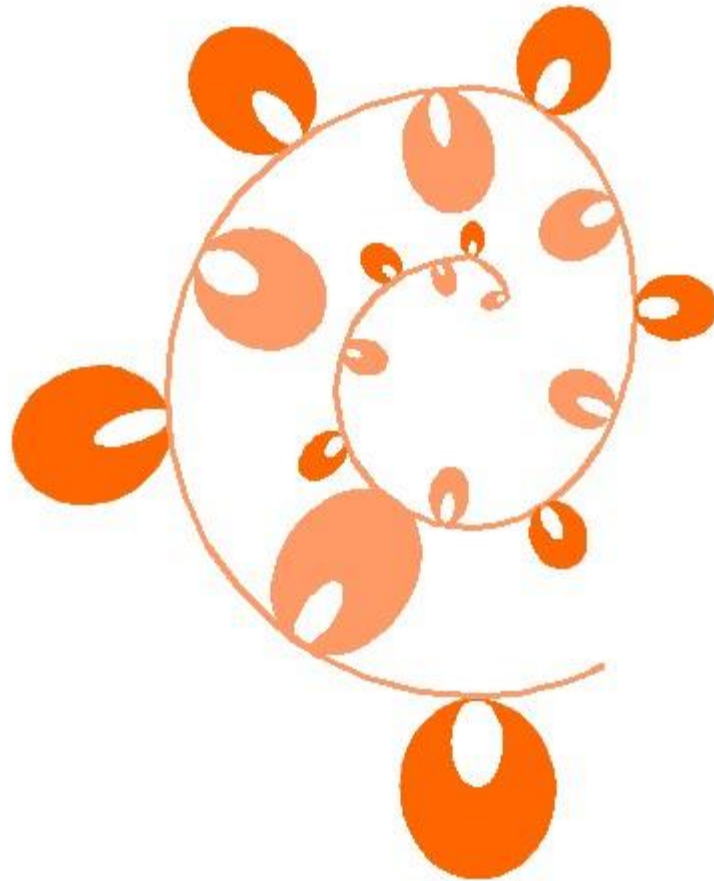


# EXTENSIÓN REFLEJO TRASLATORIA .



## 14. EXTENSIÓN REFLEJO-ROTATORIA.

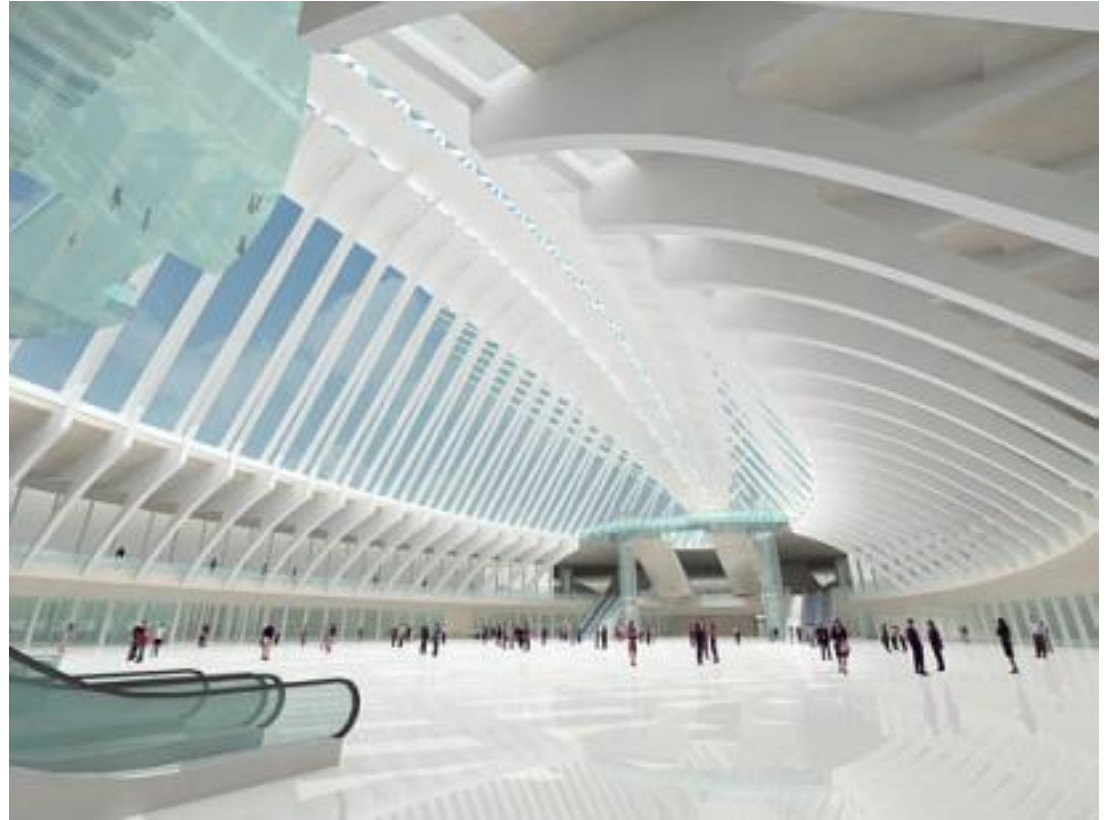
Acoplamiento de rotación, reflexión especular y extensión a lo largo del órgano de extensión reflejo-rotatoria. Con ella siempre va combinada una extensión rotatoria pura.



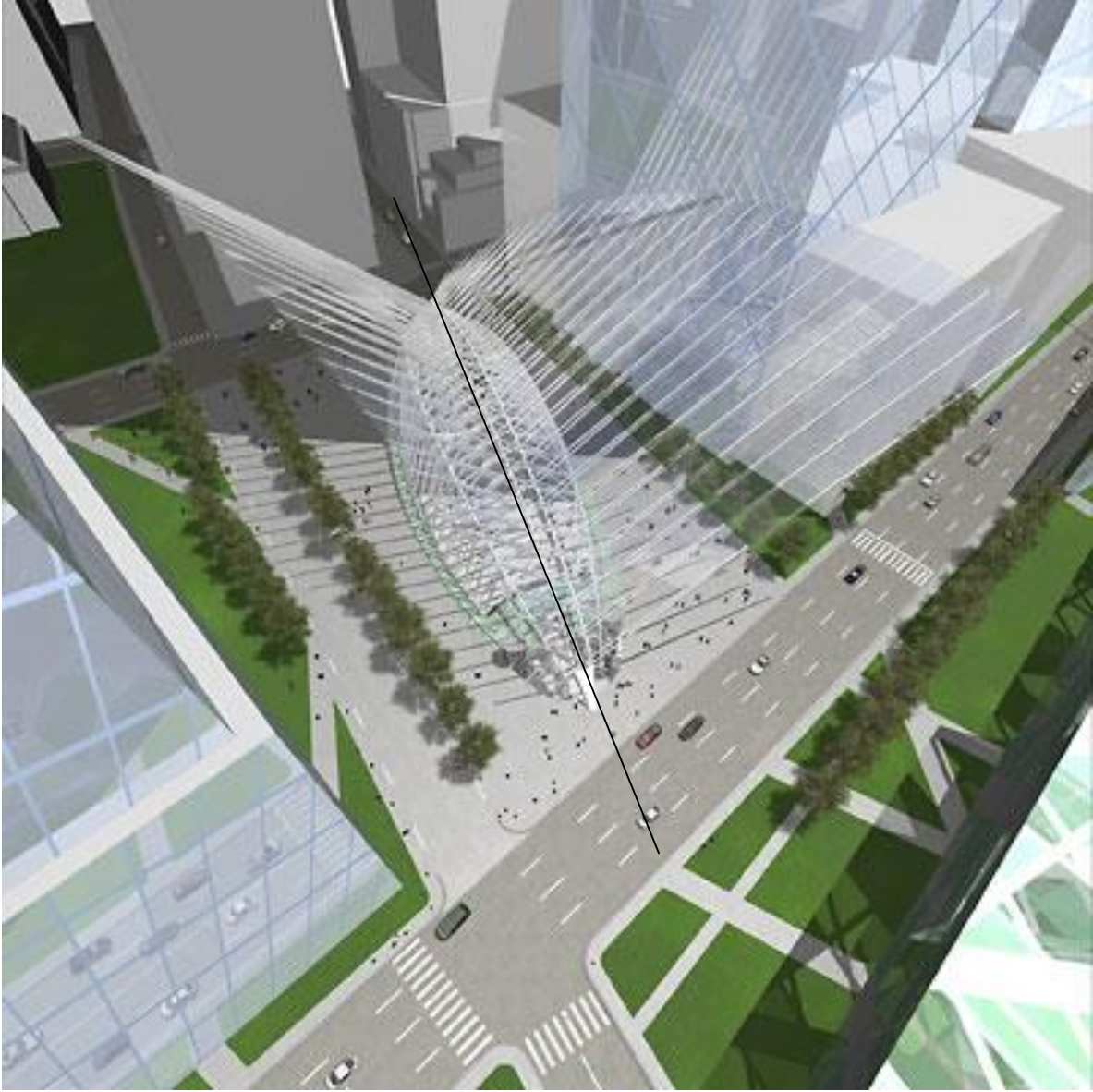
# LA SIMETRÍA EN EL ESPACIO ARQUITECTÓNICO

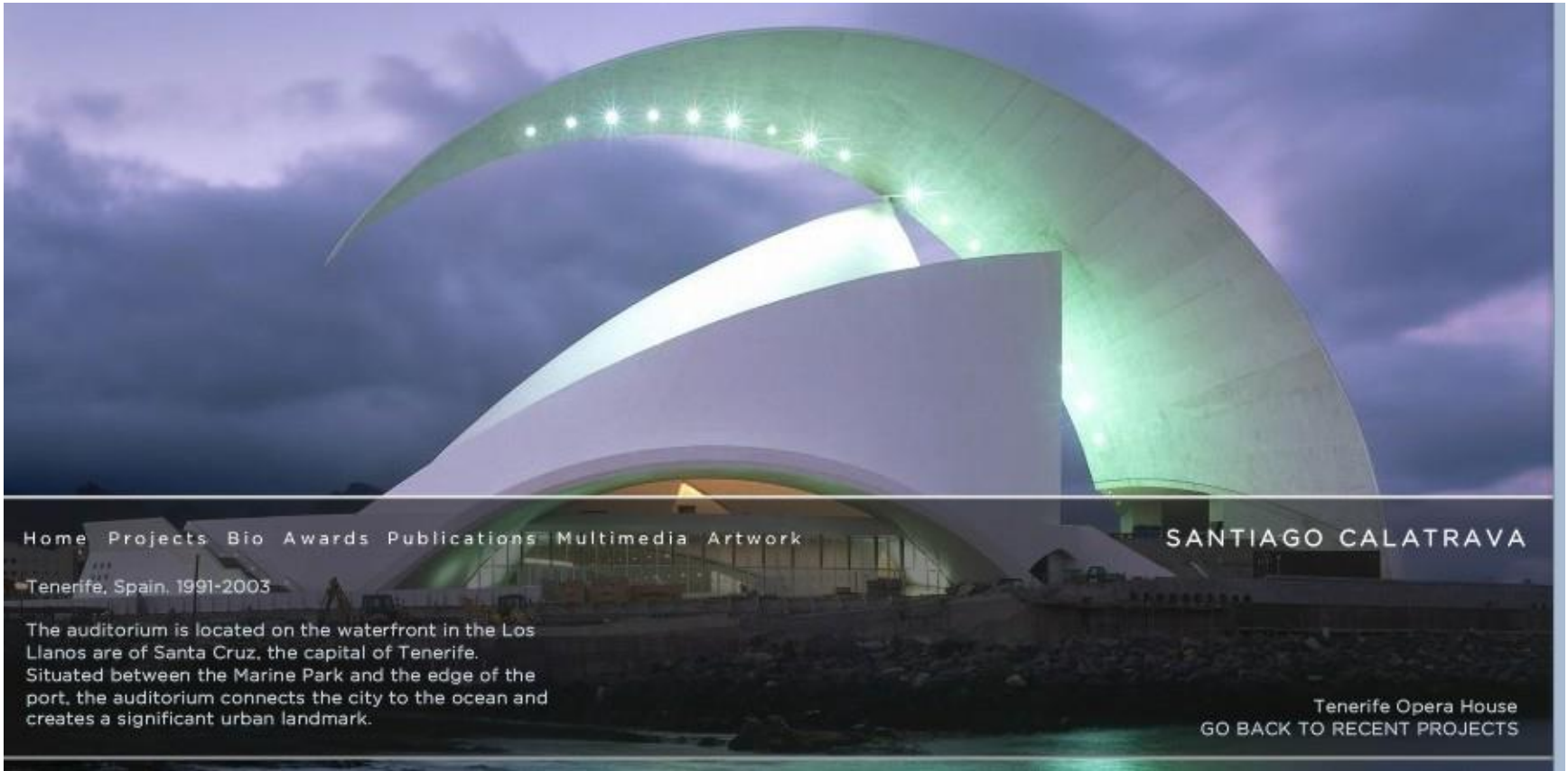
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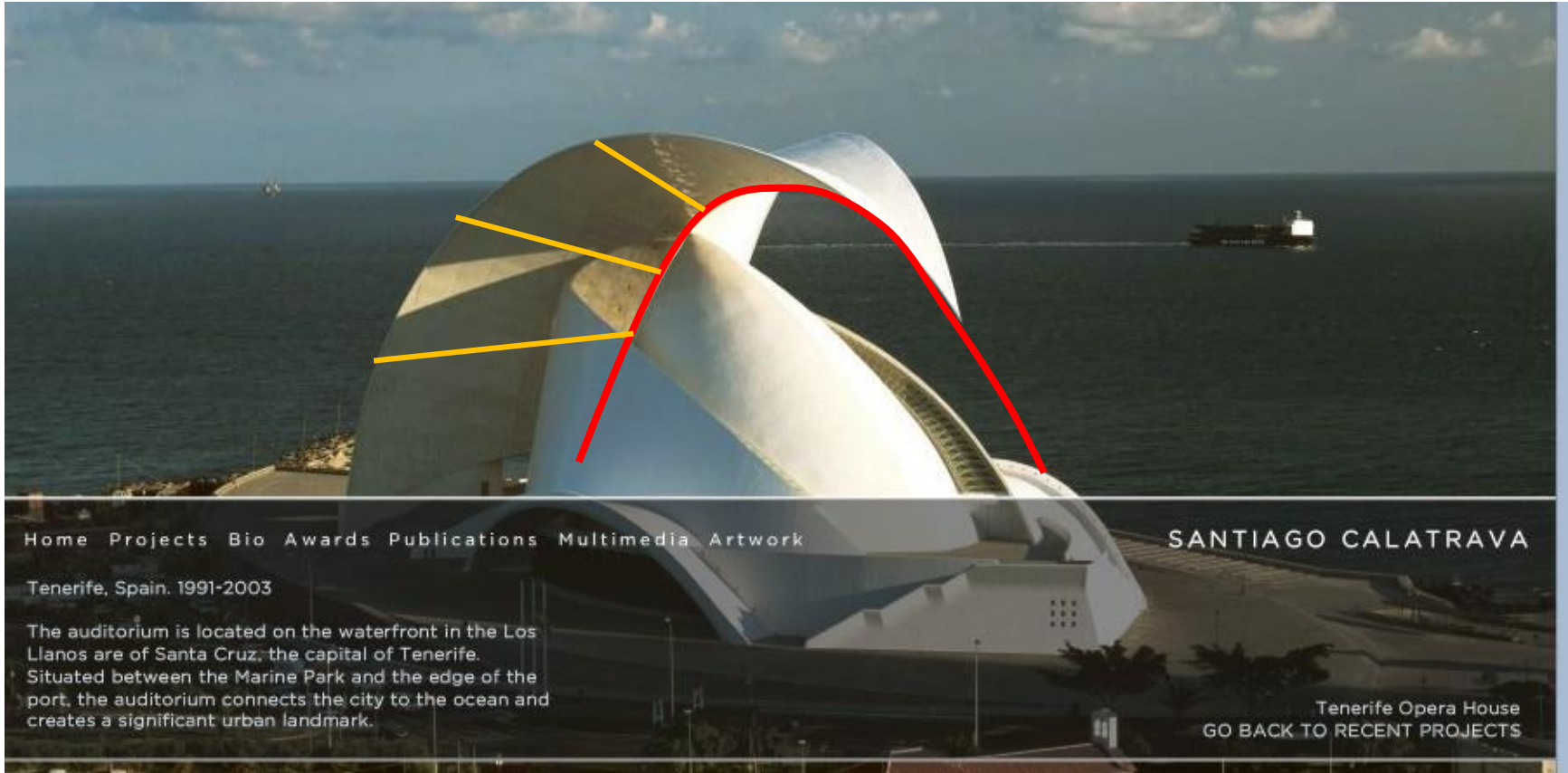
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Tenerife, Spain, 1991-2003

The auditorium is located on the waterfront in the Los Llanos area of Santa Cruz, the capital of Tenerife. Situated between the Marine Park and the edge of the port, the auditorium connects the city to the ocean and creates a significant urban landmark.

Tenerife Opera House  
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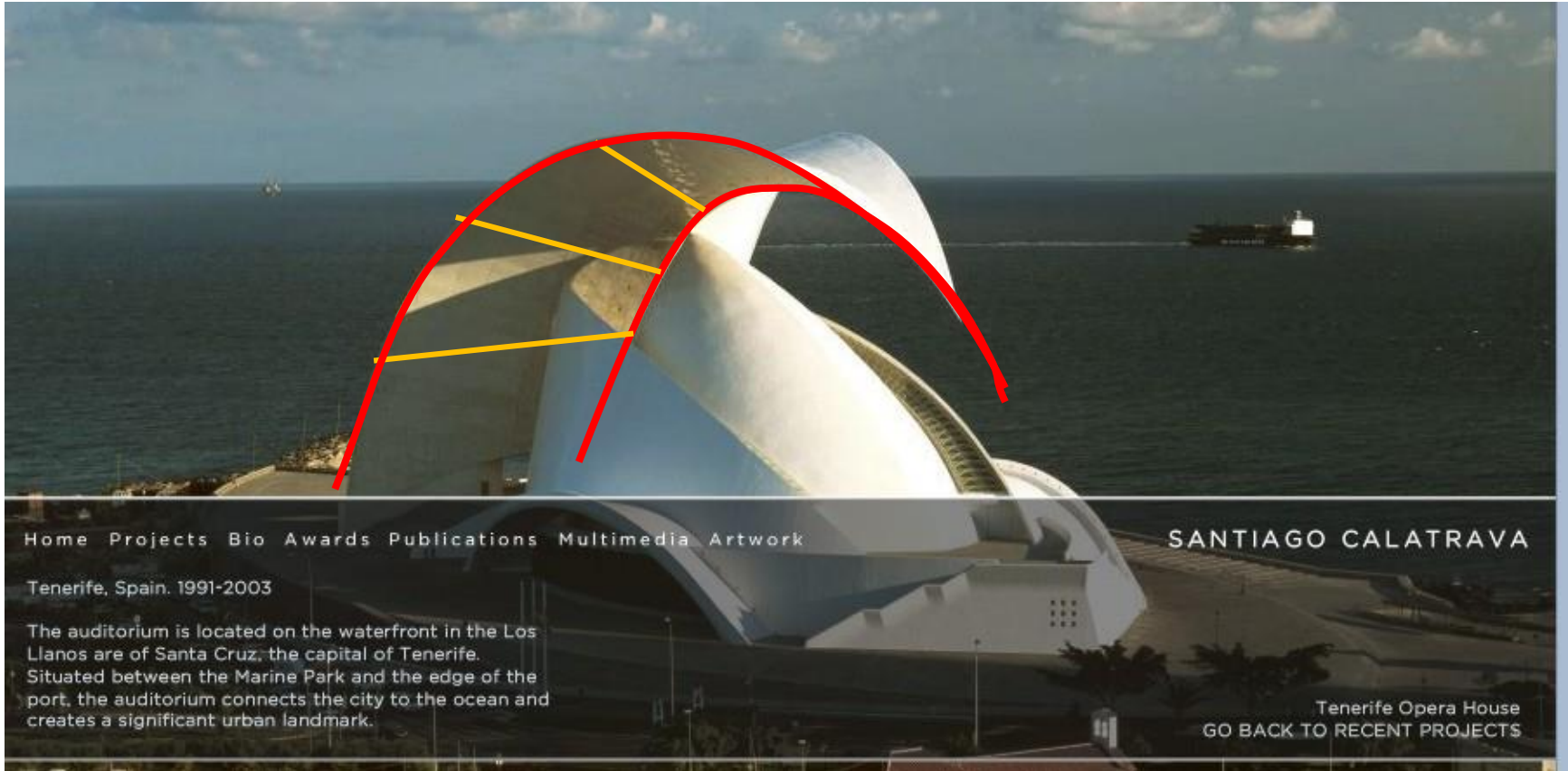
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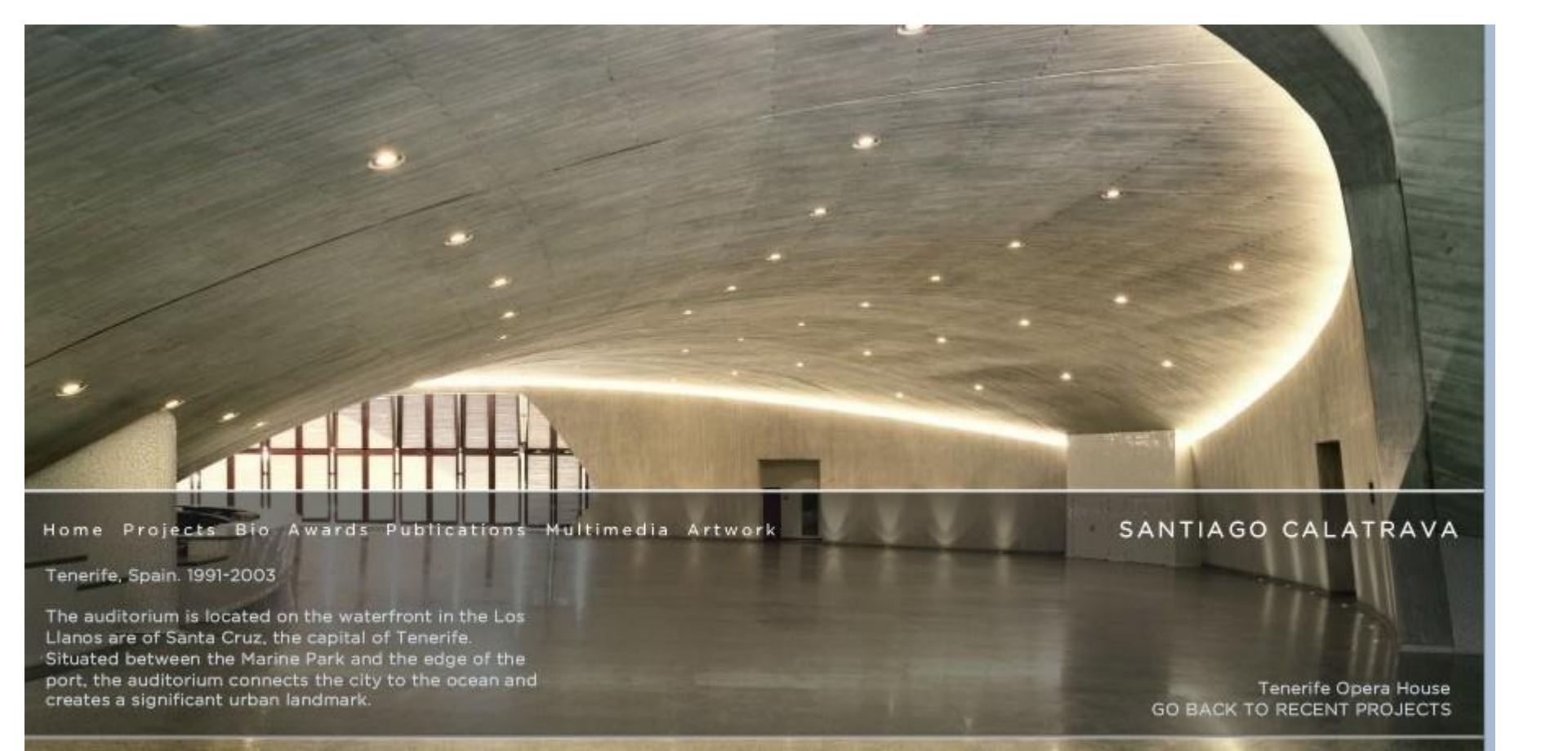
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SANTIAGO CALATRAVA

Laguardia, Alava, Spain, 1998-2000  
Winery complex for the Bodega & Bebidas Group

The building is conceived as an element that is integrated into the powerful, surrounding landscape while being somewhat autonomous at the same time, in the manner of a site-specific sculpture.

San Sebastian / Laguardia - Bodegas Ysios  
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St. Gallen, Switzerland 1988 - 1998

Moosbruggstrasse

First use of a movable roof covering based on slats and a mechanical hoist system

Along with its protruding, elliptical, pitched-glass roof, the plinth has been conceived as a sculpture, set against the historic backdrop.

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Lisbon, Portugal 1993 - 1998  
Avenida Berlin and Avenida Reciproca  
Transport hub for the north-east district of Lisbon / Invited competition

Calatrava proposed piercing the existing embankment to establish a link between the two separated areas of the Olivais District and placed the railway platforms on a bridge structure.

Orient Station  
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Athens, Greece, August 13, 2004

The host city and organizing committee for the 2004 Olympic and Paralympics Games invited Santiago Calatrava to improve and harmonize the existing Olympic Sports Complex. Calatrava's master plan and architectural interventions have established a central pedestrian axis, with clearly marked entrances; created a sense of place by developing a landscaped Common Domain.

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Athens Olympic Sports Complex  
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Zurich, Switzerland, Stadelhofen Square 1983 - 1990  
Expansion and redefinition of an existing station.  
Competition with Arnold Amsler and Werner Rüegger

Instead of a tunnel and an open excavation, Calatrava proposed an intervention, which would undercut and redefine the hillside to create an open platform while respecting the slope of the terrain.

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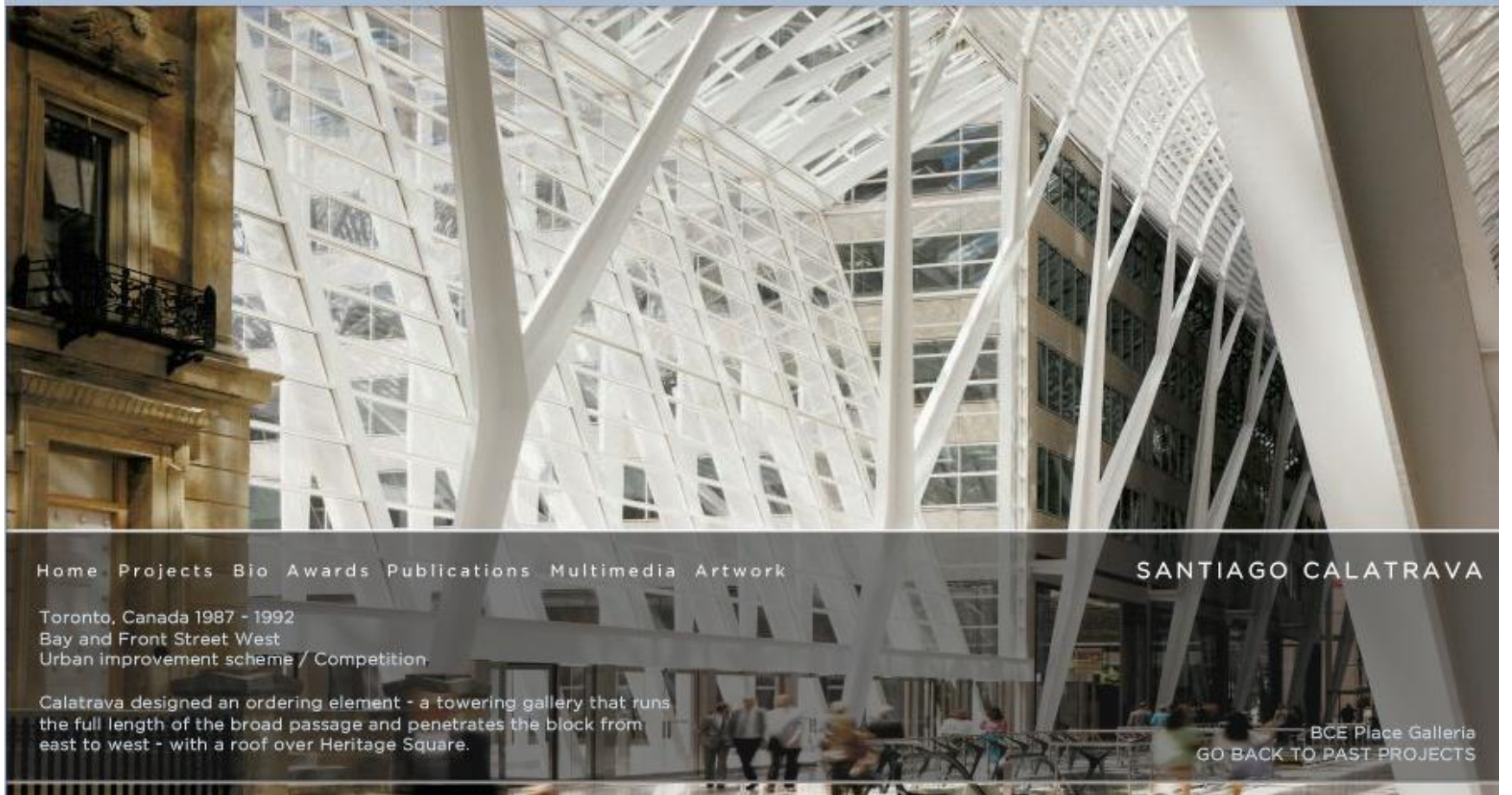
Toronto, Canada 1987 - 1992  
Bay and Front Street West  
Urban improvement scheme / Competition

Calatrava designed an ordering element - a towering gallery that runs the full length of the broad passage and penetrates the block from east to west - with a roof over Heritage Square.

BCE Place Galleria  
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Pabellón Barcelona-Mies Van Der Roë

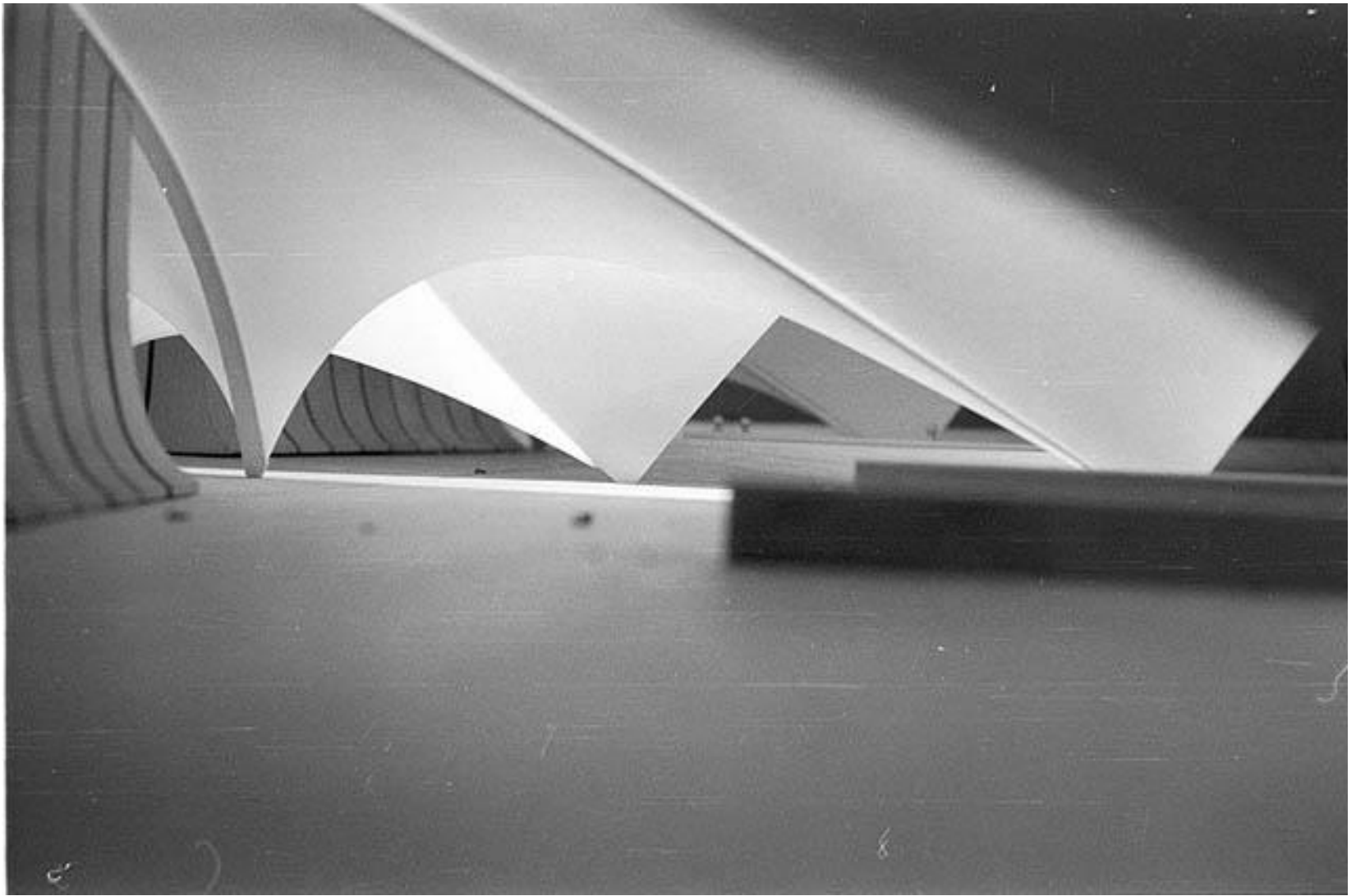






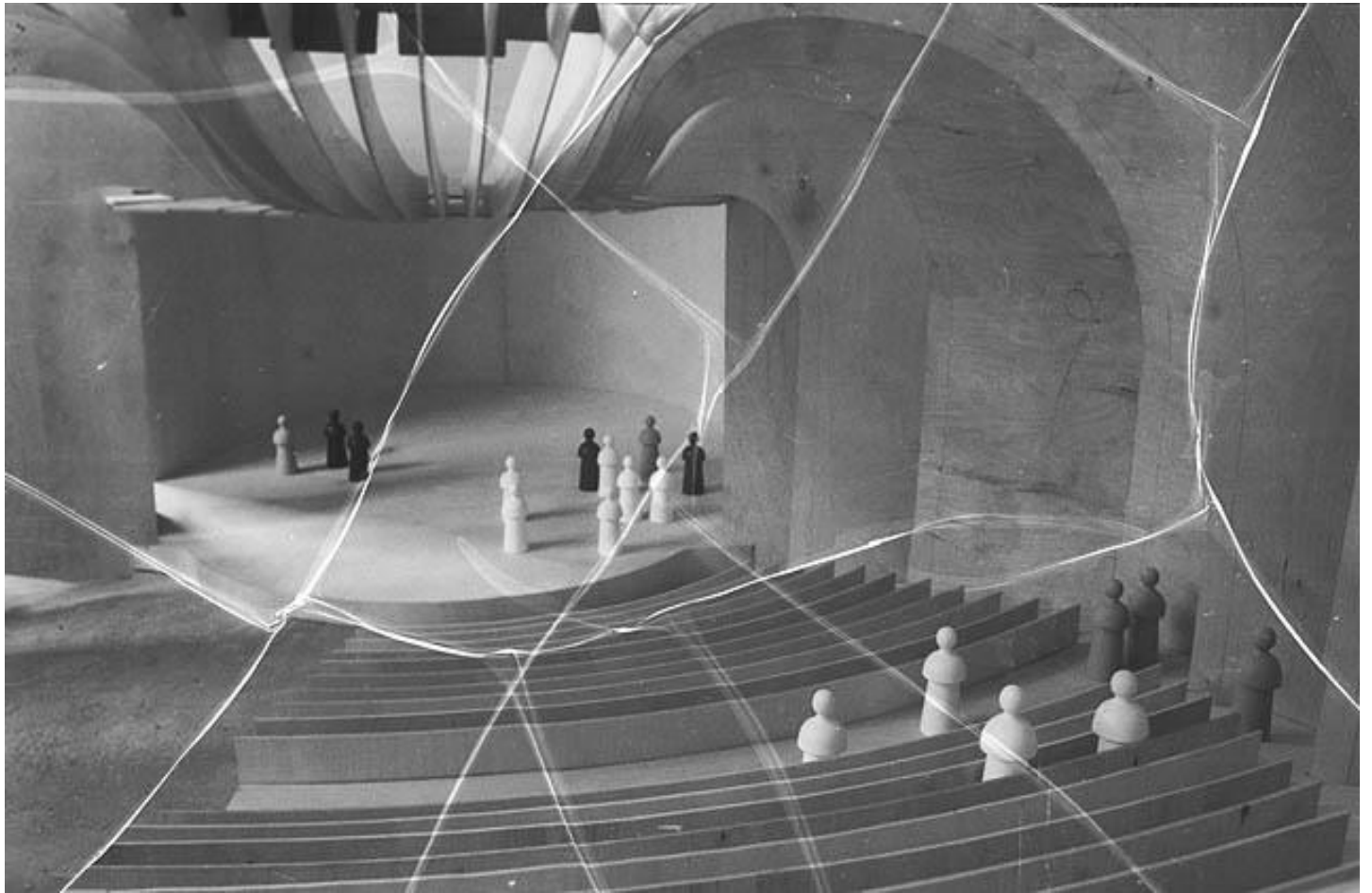














Tadao Ando

















Gaudí





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ESGLÉSIA DE LA COLÒNIA GÜELL

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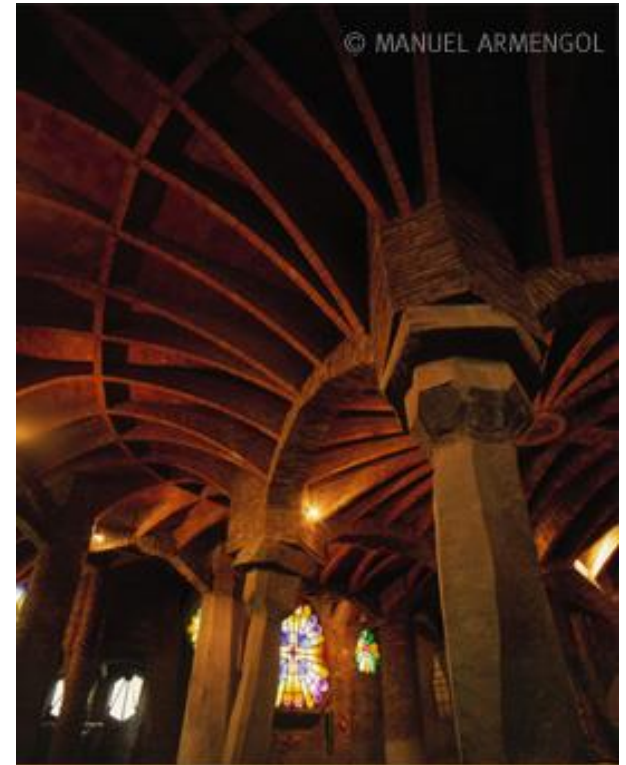




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**CASA BATLLÓ**  
Golfes Casa Batlló

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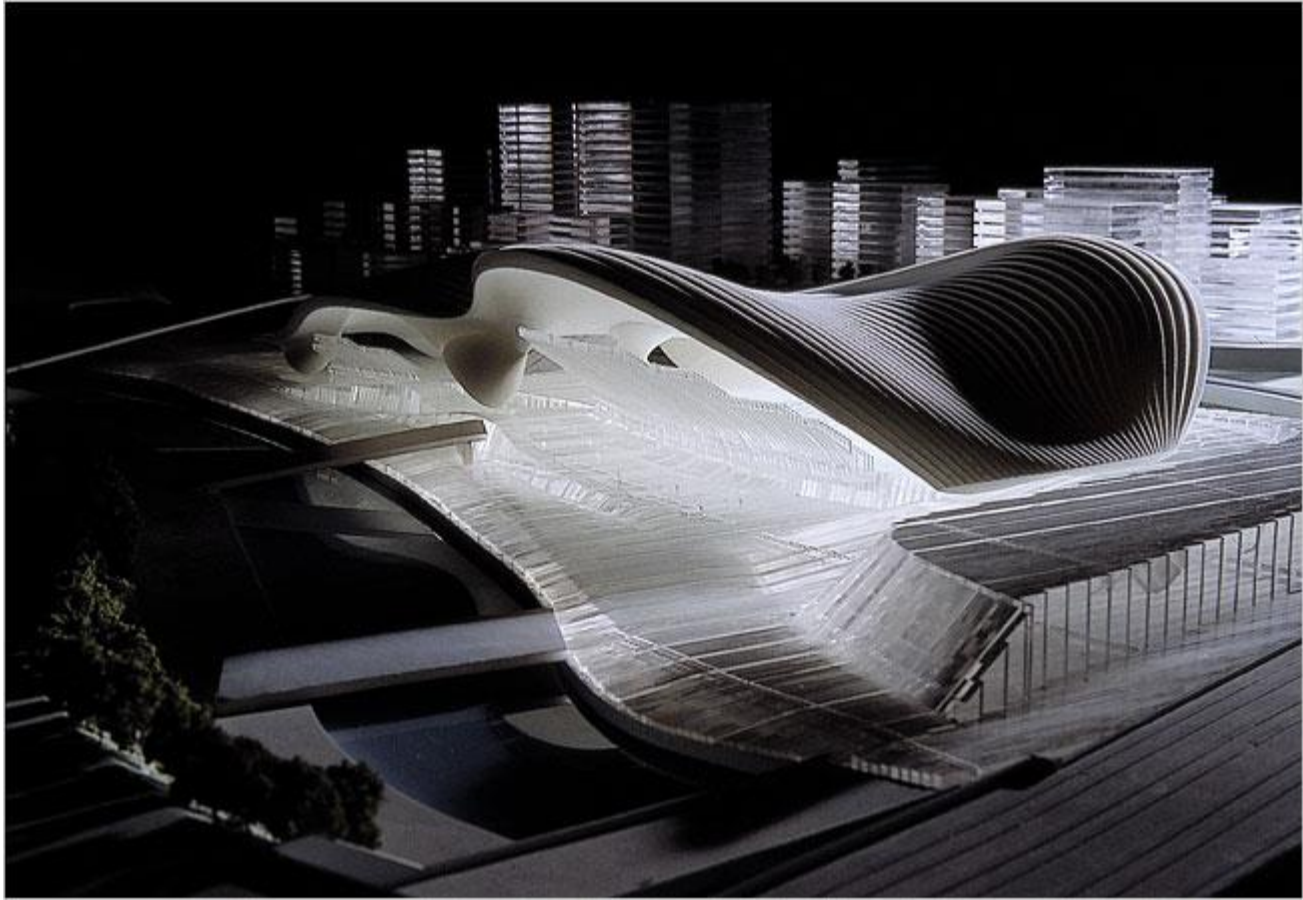






# Saha Hadid





mendelson





Pelli Clarke Pelli Architects

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TRANSPORTATION

A 1 2 3 4 5 6 7 8 Second Passenger Terminal, Tokyo Haneda Airport



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WORK

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TRANSPORTATION

A 1 2 3 4 5 6 7 8 Second Passenger Terminal, Tokyo Haneda Airport

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Salmona



EL LADRILLO OCRE Y EL CONCRETO OCRE



MI ARQUITECTURA NO ES PINTADA



CON LA LUMINOSIDAD  
Y LA PENUMBRA, Y LA  
TRANSPARENCIA...







LA ARQUITECTURA  
HA COMENZADO A  
SER EN CONCRETO  
OCRE





**TERCERA OBRA: VAMOS MEJORANDO**

# saarinen





iglesia





TADAO ANDO













BOTTA





















ARQUITECTURA E INGENIERÍA ESTRUCTURAL E INTEGRAL



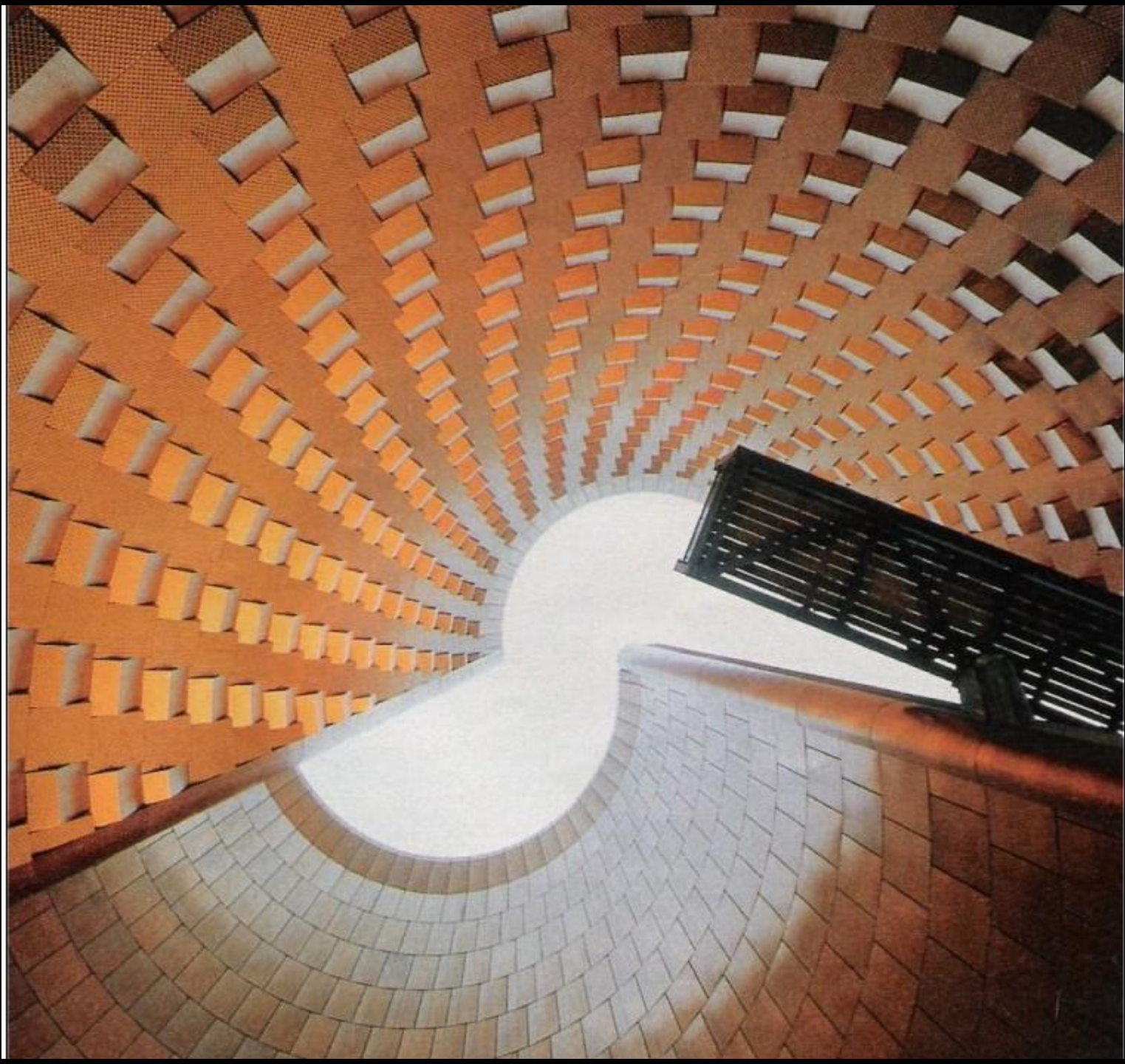


















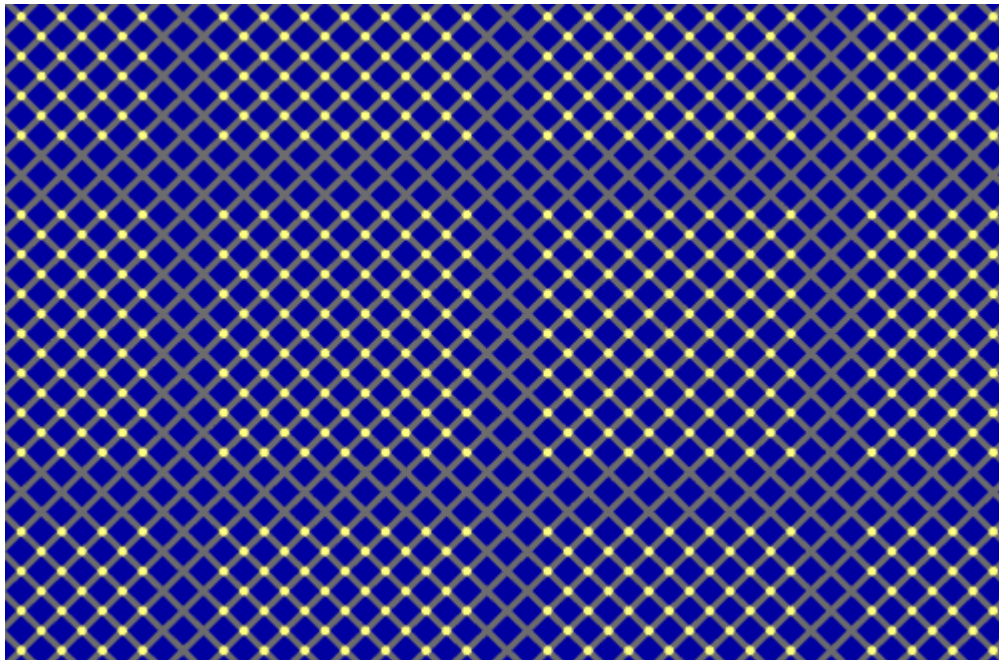
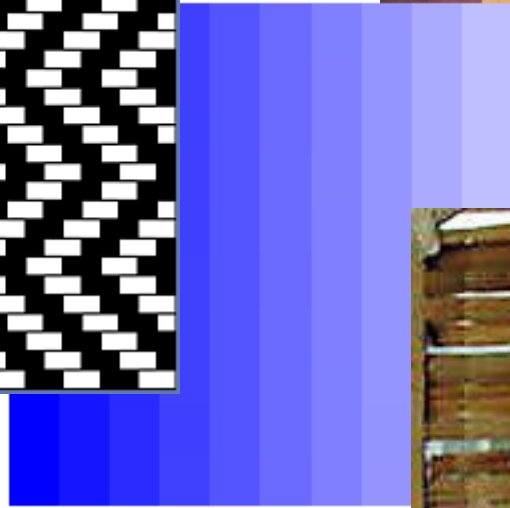
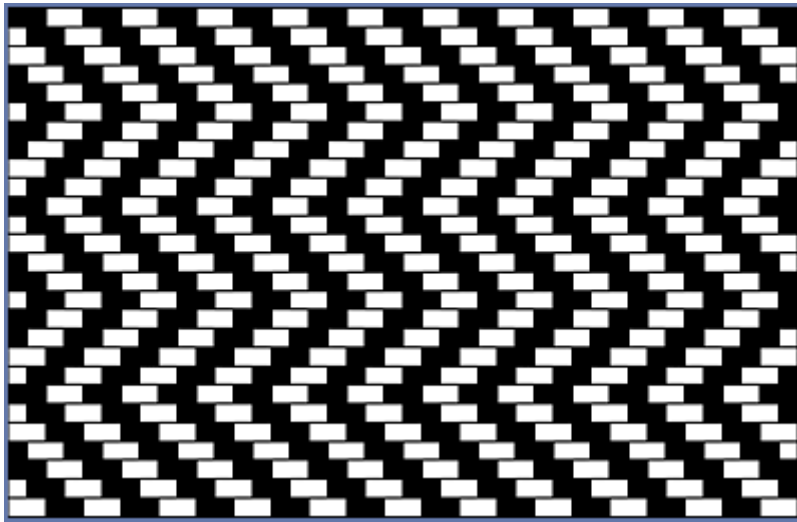


















28 5 2003





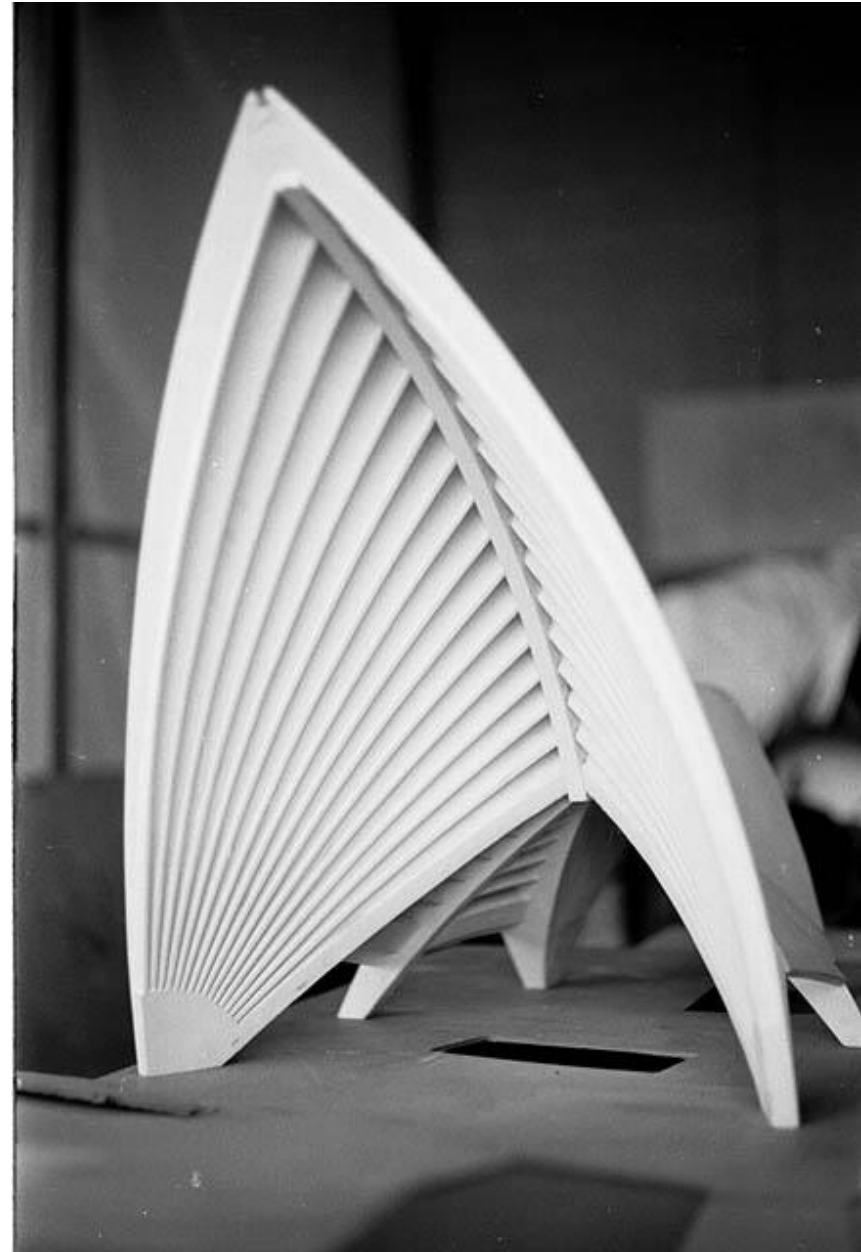




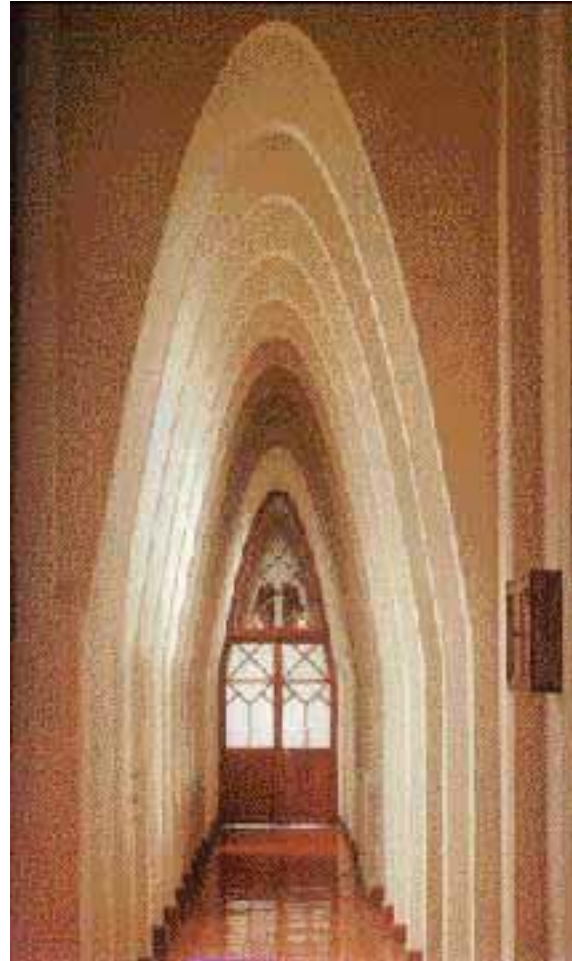
















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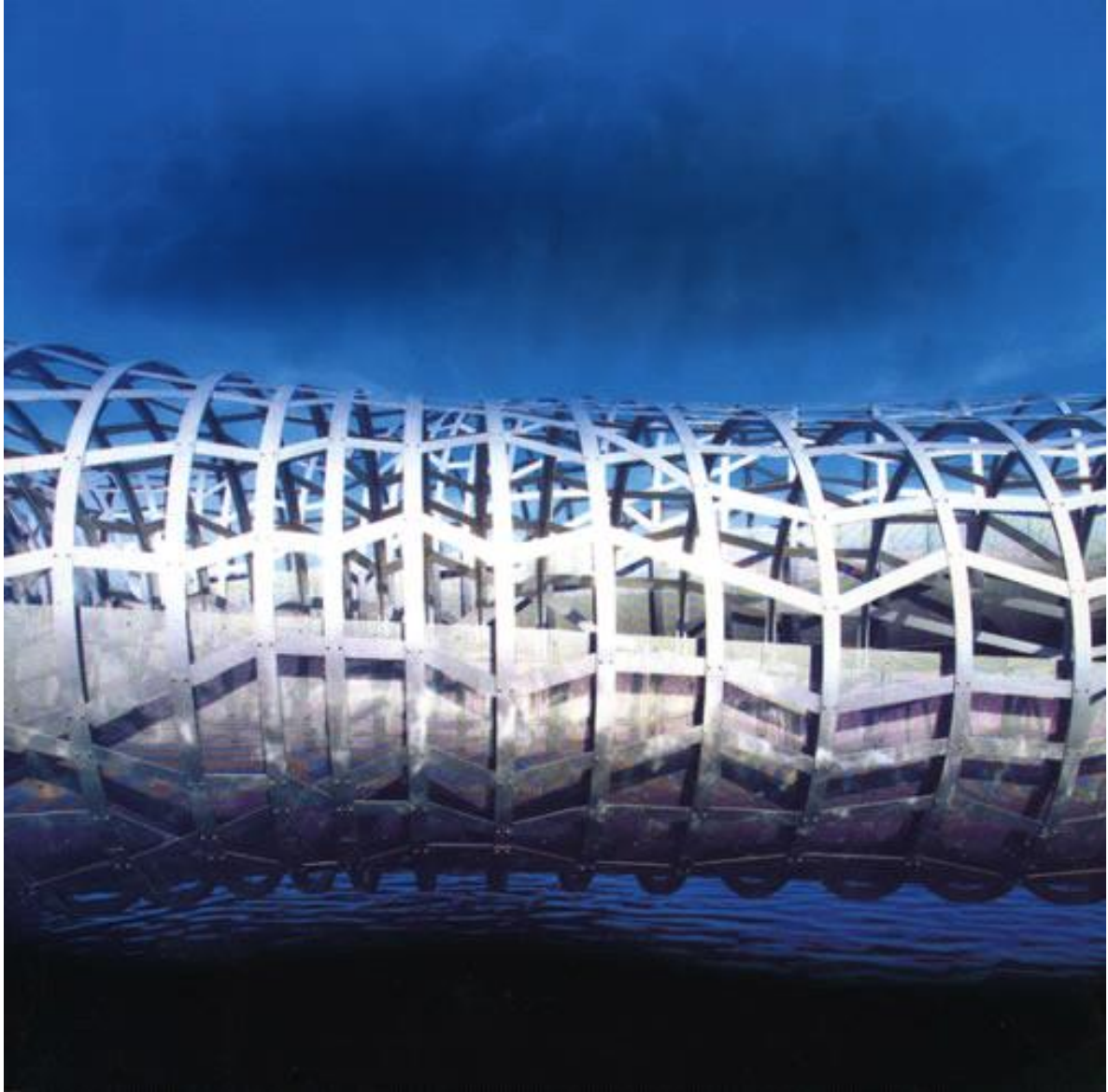
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