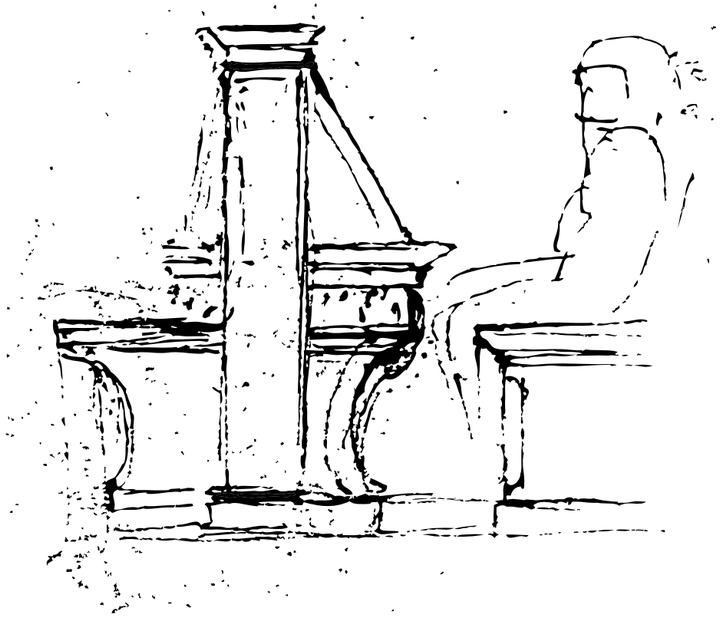
Permanent Museum Installations

Goppion

Goppion - The Art of Case Design



Michelangelo's design for the desks at the Biblioteca Medicea Laurenziana
(Florence, Casa Buonarroti, inv. 94A)

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We wish to thank the directors of the museums in which photographs were taken for their willingness to help, and all those whose suggestions and assistance have contributed to this volume.

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Content

Introduction

Goppion, founded in 1952, is an engineering firm whose expertise encompasses planning, design, construction, installation, and management. A separate volume fully describes these activities.

We now specialize in the manufacture of state-of-the-art display cases for museums. Goppion cases do not merely serve to protect and exhibit objects, but also provide advanced solutions for preserving them. We possess the skills to customize our products for size, shape, function, design, and finish.

At Goppion, customization is closely linked to the objects around which the cases are built, as well as to the galleries where the cases will blend elegantly into the environment.

In the following pages, we focus on engineering design as a strategic component of the entire production process. While good management makes an optimal project excellent, it does not address the product design and functionalities.

Laboratorio Museotecnico is Goppion's research and development center, the place where we develop our engineering design, where we catalyze the ideas, experience, and methods that generate innovation.

We opened the Laboratorio in the early 1980s when we realized the need to apply to museums the highly specialized methods and processes developed in other sectors: mechanical engineering, installation work, lighting, and energy. At the same time, we set out to study museology and exhibit design by analyzing practical applications. Another essential task was to establish links with leading-edge scientific research by cooperating with major conservation institutions such as the Istituto Centrale per il Restauro (now Istituto Superiore per la Conservazione e il Restauro), the Opificio delle Pietre Dure, ICCROM, the National Park Service (USA), the British Museum, the Victoria and Albert Museum, and the Louvre.

Our basic assumption is that a display case, or museum installation, represents a convergence between the available budget, client specifications, design, and dimensions. The resulting synthesis is achieved through the active participation of all the Museum players in project development. They include exhibition curators, who define what the case should communicate, and who coordinate the cultural goals of the exhibition space; conservation staff, who define the appropriate parameters for preventing damage to the objects; project managers, who keep the project on budget and on schedule; handling staff; security staff; and others. All these needs and requirements inform the work of the exhibit designer, who may be a Museum staff member or a third party. These issues should be addressed at the earliest stage of the design process by the manufacturer, who is in charge of engineering design.

By "engineering design" we mean the phase of the project situated between concept design (also known as schematic design or preliminary design) – the exhibit designer's task – and case production. The latter requires advanced engineering expertise in structures, materials, lighting, micro-climate control, and other are-

as. It also demands highly specialized skills in materials working and finishing. Thanks to these competencies, we can find innovative solutions that will help the finished product meet the Museum's project goals ever more effectively.

At Goppion, project engineering is guided by a collaborative methodological approach: the project designer and the manufacturer work together to develop the product in close interaction with the user—the Museum—which has initiated its design and construction.

Given the manufacturer's critical role, the Client should prepare the selection of the manufacturer as early as the preliminary phase of the project. The Client should carefully assess the bidder's engineering, production, and managerial capabilities, as well as its track record for interdisciplinary work, innovation, and problem-solving. The selection should be made by direct visits to manufacturing facilities and museum displays produced by the bidder.

Even when the project consists of building customized exhibit systems, engineering design is still needed, although it not always specifically written into the contract. When a Client recognizes the special relevance of engineering design, this indicates an understanding of a museum project's complexity, its many facets, and its innovation potential. Sometimes, as with the Museum of Fine Arts, Boston, engineering-design capability has been explicitly defined as a parameter for assessing proposals and awarding the contract.

The projects presented in this volume reflect the approach set out above and Goppion's dedication to engineering design. We have applied our skills at different levels according to the technical complexity and dimensions of each project. In their chronological sequence, the examples below testify to the steady enhancement of our expertise.

This track record prompted a major art museum—the Museum of Fine Arts, Boston—to designate us as leaders in "the art of case design". Our holistic concept of engineering design may have contributed to such an acknowledgment.

At the end of the volume, we briefly describe the specific role of engineering design in the development of a museum project.

Permanent Museum Installations

1991 **Museo di Castelgrande, Bellinzona, Swiss Confederation**
Sezione Storico Artistica

The Castelgrande complex, of Bellizona, Switzerland, is an essential component of a larger defensive outpost from the Visconti-Sforza era that includes three castles and an extraordinary system of walls. A major architectural restoration and city planning project lasting more than ten years transformed the fortress from a military complex to a vibrant center of culture and leisure, in the process opening a dialog between the castle and the surrounding city. The south wing of the castle houses the Castelgrande Museum, which integrates the new public functions. Inspired by the historical value of the exhibition space, the architect's design fosters the interplay between the unique aesthetic features of the building and the works on display.
The museum layout is organized in two sections. The first follows the history of the hill on which the fortress stands, presenting its main archeological artifacts along with a collection of historically significant coins from the 16th century . The second focuses on the Sforza period, during which much of the territory's most notable art and architecture was created. The key exhibit features a set of 144 tempera works on paper selected from the 280 that originally graced the wooden ceiling of a lavish 15th-century home (now destroyed) once located in the town center. An anonymous Lombard artist developed in these pieces the favorite iconographic themes of the secular art of the Quattrocento: Love, Virtue, Fame and the chivalric Epic. The result is a work of art that is essential for the history of local culture, an expression of a merchant class that enjoyed its finest season during this period.

The challenge

The fragility of the drawings (tempera on cotton fiber paper; mineral pigments) and their state at the time they were recovered demanded a particularly rigorous approach to their conservation; one specifically aimed at halting the inexorable process of deterioration. In addition to the usual protective measures against vandalism, theft and fire, proper conservation of the artifacts called for lighting design and controls that would drastically reduce exposure to ultraviolet and infrared rays, in addition to reducing exhibition times of particularly delicate pieces from the collection. Humidity and temperature had likewise to be kept stable, and all works had to be rigorously protected from dust particles and other atmospheric agents.

Goppion's Solution Goppion built special lectern-style display cases made with panes of laser-welded, tempered float glass, held in horizontal position by a handrail of aluminum tubing that houses the lighting fixtures, electrical wires and micro-climate sensor cables. Inside the cases, the relative humidity is held constant at 50-60%, the level indicated by the ICCROM, using Art Sorb humidity control sheets. The lighting system was also designed in collaboration with ICCROM to not exceed 50 lux. A weighted metal base supports the entire structure.

Client Museo di Castelgrande
Exhibition Design Aurelio Galfetti, Bellinzona
Project Data Exhibition area: 160 m²; exhibition units: 12; length of the exhibit fronts: 20 m

1993 - 1994 **Tower of London, London, United Kingdom**
The Jewel House

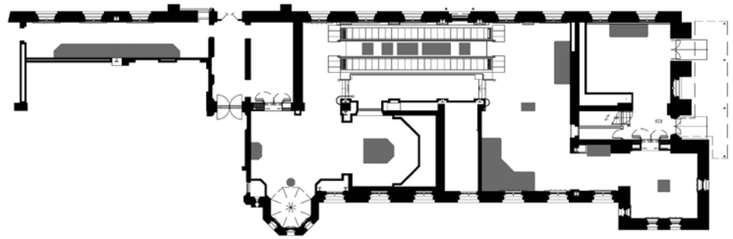
The Crown Jewels of Great Britain are displayed in the new Jewel House, built in 1994 on the specially restored ground floor of the Waterloo Block of the Tower of London. The display is organized to follow the sequence in which the jewels are used in the coronation ceremony. Two innovative moving walkways prevent overcrowding in front of the display cases containing the precious masterpieces.

The challenge

The challenge was a particularly significant one: the material and symbolic value of the collection is immeasurable and the creation of its display and protection had to be executed in kind. Every aspect of the display cases required considerable innovation: security to protect against theft, vandalism, and bomb attacks; conservation to protect the precious metals and stones from particles and polluting agents; aesthetics to follow classical form and the use of valuable material; and mechanics to create opening systems capable of safely moving very heavy doors and bonnets. Moreover, every phase of the project, from conceptualization through mock-ups and planning to production and installation, had to be completed under unprecedented confidentiality.

Goppion's Solution

Security requirements drove the technical aspects of this project, but in order to seamlessly mesh with the classical architecture of the original building, aesthetic considerations were equally critical. To meet those twin requirements, Goppion developed and applied the principle of "zero clearance." A hinge usually requires some millimetres of clearance to allow its simple rotational movement. This clearance provides an entry point for explosives or levers to gain access to the case. The hinges we developed for this project utilize precisely engineered opening and closing mechanisms that have virtually no clearance – and no room for error! The Goppion team of experts was able to design and manufacture such a mechanism and integrate it throughout the exhibit. In addition, we provided armour-plated



display cases with the most advanced mechanics, lighting engineering, security and air conditioning. We selected materials and treatments perfectly suited to the classical design of the constructions, including solid brass fittings and profiles. The display cases include an advanced, centralized active climatization system that maintains ideal temperature and humidity levels in the display environment. Fiber-optic units with accent lighting illuminate each display case, educing exceptional qualities of refraction and reflection from the precious stones.

Colonel H G Stanislao Mackinlay
Deputy Governor and Project Coordinator
Jewel House Relocation Project

"We have used Goppion Cases to house the Crown Jewels since the opening of the new display in 1994. During this time we have built up a relationship with the Company that is based on respect for the quality of the product they supplied to us."

Client
Tower of London

Building Restoration and Exhibition Design
Sidell Gibson Partnership, London

Project Data
Exhibition area: 810 m^2; exhibition units: 15; length of the exhibit fronts: 80 m

1994 - 1995 **Duomo di Orvieto, Orvieto, Italy**
Case for the display and conservation of the reliquary by Ugolino di Vieri

A masterpiece of the Gothic style, the reliquary in the Duomo's Chapel of the Corporal was created by the Sienese master goldsmith Ugolino di Vieri in 1337-38. The triptych of silver, enamel and precious stones depicts 24 scenes from the life of Christ and eight episodes of the Miracle of Bolsena.

The challenge

The essential task Goppion and the technicians of the Instituto Centrale del Restauro faced was conservation: the fragile reliquary of silver, enamel and precious stones was visibly decaying. We had to immediately place it in a micro-climate that would protect it from shifts in humidity levels, exposure to corrosive substances, and minor seismic vibrations that might cause the enamel to flake off even more. We also had to ensure that the fine detail and delicate beauty of the masterpiece was clearly visible to all.

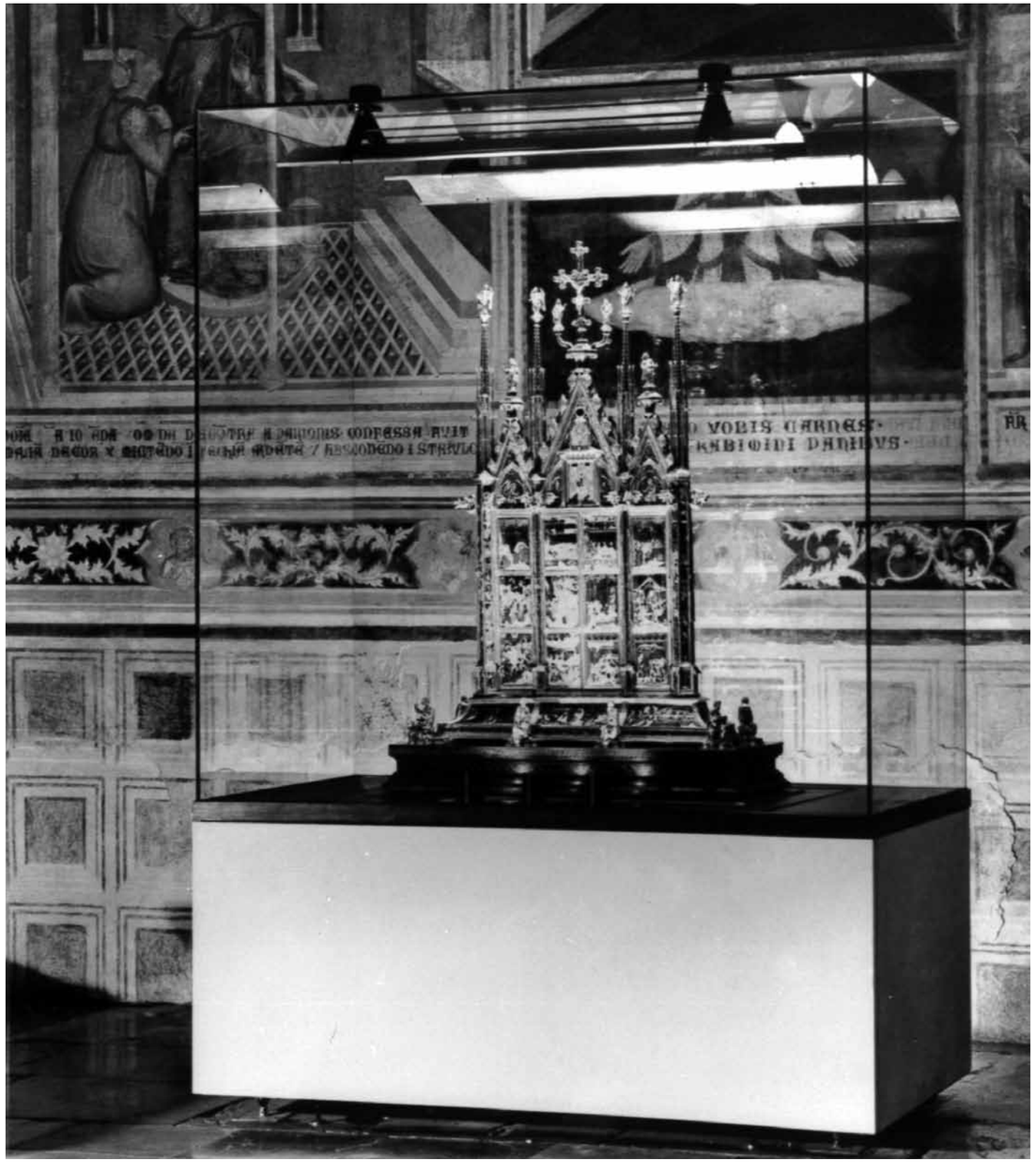
Goppion's Solution

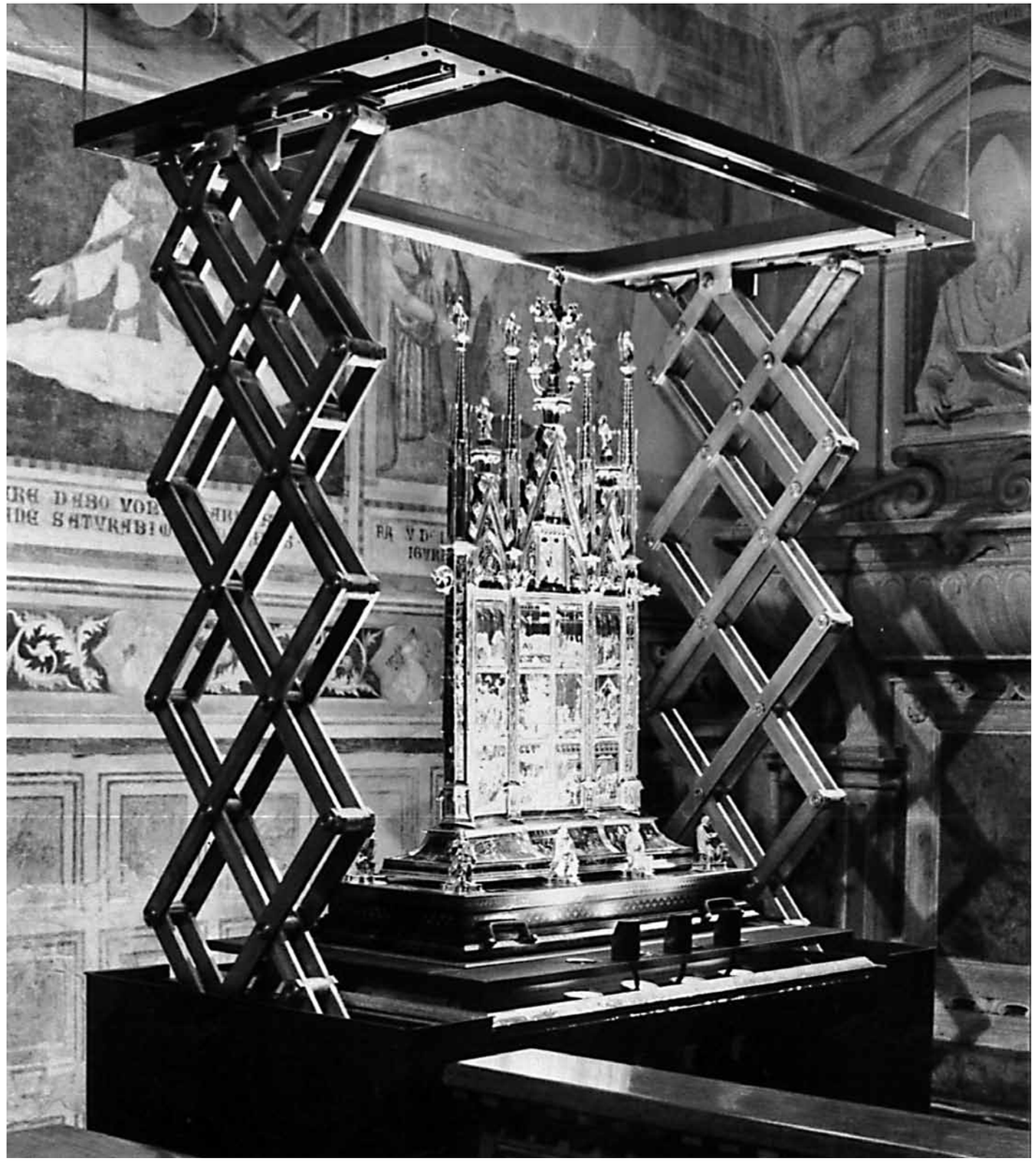
To respond to these needs, we constructed a large, environmentally controlled, display case entirely of glass. Its distinctive system for opening and closing the case features a pantograph mechanism that allows the entire enclosing case to be lifted above the height of the reliquary. The precious artifact can thus be inserted or removed without having to tilt it or subject it any other movements that would pose a risk to its conservation. The object's safety is further secured by a spring-mounted oscillating weight to isolate and protect it from vibrations, particularly seismic tremors, by absorbing any energy applied to the structure.

Client
Soprintendenza per i Beni Archeologici, Ambientali, Artistici, Architettonici e Storici dell'Umbria

Exhibition Design
Raffaele Davanzo, Luciano Marchetti, Giusi Testa, Giuseppe Basile, Rome

Project Data
Unità espositive: 1; dimensions: l = 184 cm, d = 105 cm, h = 188 cm





1996 - 1999 **The Getty Research Institute for the History of Art and the Humanities, Los Angeles, United States of America**

The J. Paul Getty Trust is a private foundation for the visual arts and humanities. Located in Los Angeles, the campus hosts numerous activities, including the Getty Research Institute for the History of Art and the Humanities, a modern research center devoted to the study of cultures past and present and their artistic manifestations. The institute's Library holds 700,000 volumes, including books, auction catalogues, almost 2 million photographs, specialist archives, and other ephemera and rare materials related to the history of art and the humanities. A permanent gallery is devoted to the rarest specimens in the Library's collections, and other galleries show temporary exhibits of materials drawn from the Institute's period collections.

The challenge

The prestige of the institution and its designer, the delicate nature of the materials, and Los Angeles' high level of atmospheric pollution made this a challenging project for Goppion to take on. Papers present unique conservation challenges: chief among them is the rigorous management of air infiltration and exchange requiring virtually impermeable seals to the display environment. The cases had to provide state of the art capabilities in conservation, lighting, and display mechanisms. The successful resolution of complex challenges for this project is emblematic of our company and highlights Goppion's engineering excellence and deep well of experience.

Goppion's Solution

Goppion devised a mechano-electrical opening system for the large wall display cases. Powered by a remote-controlled electric motor, a series of articulated hinges shift the pivot of the case door away from its striking surface and clear of its enclosing niche, enabling opening without compromising performance or design. The majority of the opening load is carried by a single four-bar hinge on the bottom of the door, giving curators exceptionally easy access to the case interior. The doors are retained by a system of specially shaped interlocked levers that hook onto fixed pins positioned along the perimeter of the door. The curved levers powerfully and uniformly pull against the pins, compressing the door and its gasketing to ensure an airtight seal. Table display cases use a two-armed pantograph system for vertical translation of the glass bonnet that gives curators unfettered access to the display environment within. Goppion also designed an innovative fiber-optic lighting system using ferrules with variable focal length to permit flexible, individual adjustment of each case's lighting.

Steven Lanzarotta
Head of Administrative Services
The Getty Research Institute for the History of Art and the Humanities

"On every count, Goppion proved to be a reliable and responsive partner.
They supplied and installed cases of the highest quality and that have proven capable to meet our collections' varied needs."

Client The Getty Research Institute for the History of Art and the Humanities
Building Project and Exhibition Design Jon Frishman and Richard Stoner, Richard Meier & Partners Architects, New York
Project Data Exhibition units: 12; length of the exhibit fronts: 23 m

1999 - 2000 **Basilica di Santa Maria in Trastevere, Rome, Italy**
Case for the display and conservation of the Icon of "Madonna della Clemenza e della Pace"

In 2000, the "Madonna della Clemenza" panel was returned to the altar of the Altemps Chapel after a nearly 50-year restoration. The icon had been at the Istituto Centrale del Restauro since 1953, over which time a painstaking restoration had revealed its true splendor to the world by recovering the original paint film hidden beneath centuries of retouching and varnish. The icon, painted in encaustic between the late 6th and early 7th centuries, depicts the Virgin and Child enthroned, surrounded by angels and the figure of a pope in proskynesis. Until this restoration, the panel had never been moved from the basilica of Santa Maria in Trastevere; it had been created in the original Paleo-Christian edifice and remained in place as the church was reconstructed by Innocent II in the 12th century. Throughout its storied history, the Madonna della Clemenza has been seen as everything from the prototypical Marian image, to a symbol of the investiture controversy surrounding the Treaty of Worms, to an icon of the Counter-Reformation.

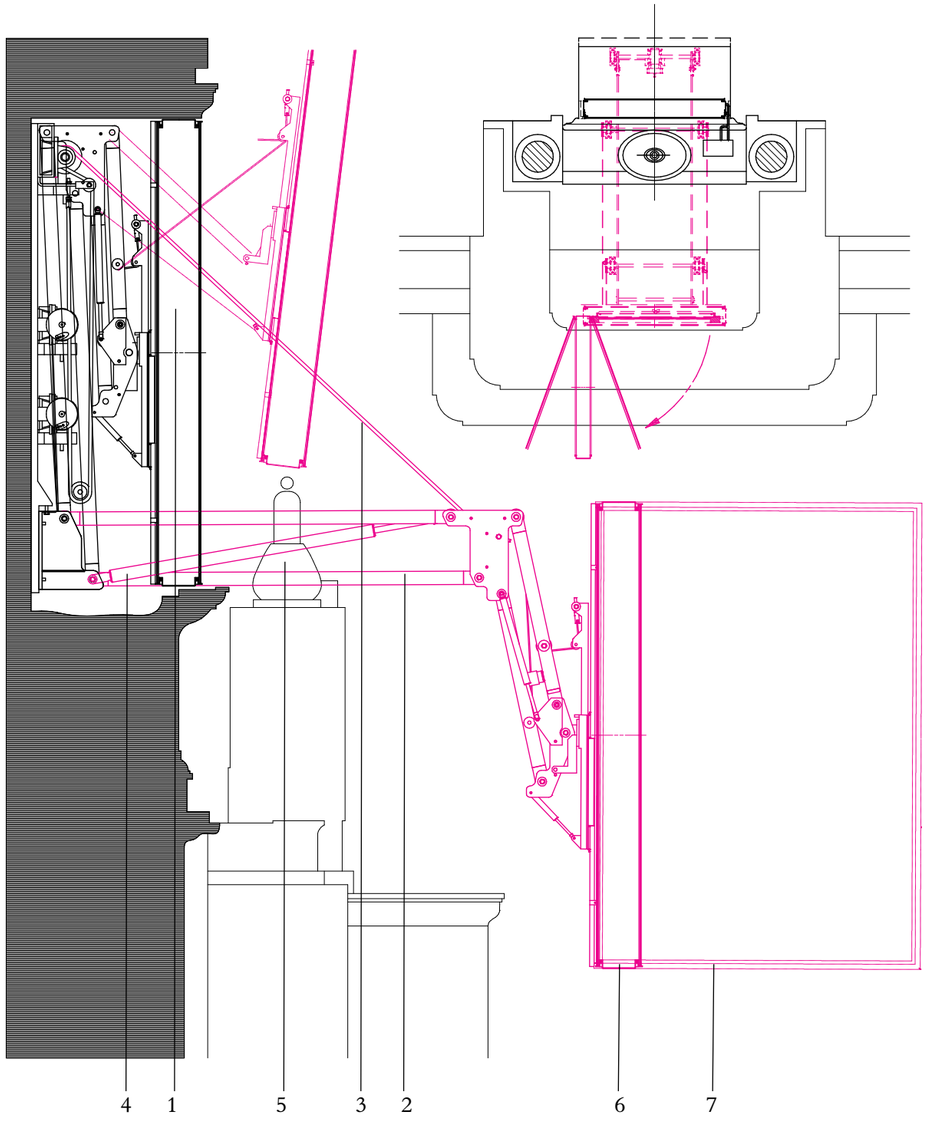
The challenge

Thanks to the quality not only of the encaustic technique but also of the materials used – linen canvas stretched over a cypress panel – the painting reached us relatively intact, though extremely fragile due to past calamities, including a fire. The display case for the icon needed to ensure its conservation in a climatically hostile environment while at the same time providing easy access by specialized personnel tasked with directly monitoring its state of conservation. Moreover, the casework could not impede the visual immediacy of the icon, which many Romans especially love as a symbol of the vibrancy and constancy of their city and the Church.

Goppion's Solution

To meet these conditions, Goppion designed and built a mechanized display. Just slightly larger than the icon itself, the case has two paired anti-glare glass panels which can be opened from the front and back, facilitating direct inspection and, if necessary, emergency conservation measures. These operations can be done in situ, at the foot of the altar, thanks to a mechanical structure that allows the case to be moved from its position above the altar to the base by the simple manual commands of a single operator. The regulation of the internal micro-climate is ensured by a system of automatic humidity controls, significantly reducing maintenance.

Client Istituto Centrale per il Restauro
Exhibition Design Giuseppe Basile, Francesco Sacco
Project Data Exhibition units: 1; dimensions: l = 1.500 cm, h = 2.100 cm



The drawing shows a section of the display case (1) in closed position inserted inside a niche behind the altar. The principle movement is performed by a mechanical device fitted with multiple arms, which build up a four-bar chain (2) and which are controlled by steel rods (3) and gas springs (4). The motion path steps through different successive phases carrying the display case over the immovable tabernacle (5). When positioned on the floor (6), the display case can be opened from both the front and the rear side.

1999 - 2001 **Victoria and Albert Museum, London, United Kingdom**
The British Galleries

The new presentation of the British Galleries was the Victoria and Albert Museum's most ambitious renovation project for the previous fifty years, affecting 10% of the Museum's exhibition space, involving eight thousand objects, and costing over £30 million. The new design uses four organizing themes – *Style*; *Who Led Taste?*; *Fashionable Living;* and *What Was New?*. This was to tell the story of British art and design from 1500-1900. The collection to be displayed ranged from rings to period rooms, and included fine art, textiles, furniture, glass, ceramics and architecture – all to be chronologically arranged in 15 rooms, of varying dimension and proportion, on two floors. Woven into the displays were to be an extensive program of interactive elements many of which were quite new to the museum.

The challenge

The key parameters that the V&A considered for the award of the contract were: design, functionality, value for money and the likely ability of the contractors to be able to deliver a very complex installation on time and on budget. They were also looking for a supplier that could develop, fabricate and install many of the interior fixtures and fittings.
The V&A and their designers were looking for as near as possible uninterrupted views of objects to be displayed inside cases; the ideal would have been cases made entirely of glass with no supporting framework at all. Since it is not possible to have this, the V&A sought the minimum possible framework that would not compromise the function and security.
The project was a huge undertaking calling for 170 unique display cases. A range of different sizes from very small to extremely large was required to accommodate the great diversity of objects and to make the best possible use of the available space within the building – much of it irregular. In addition to the requirement for the cases to provide a secure, stable, dust – free environment, only passive materials, that would not interact chemically with exhibits placed inside, were to be used. The cases were to have the greatest possible clear opening and be safe in operation.

Goppion's Solution

We worked intensively with the V&A exhibition designers and the museum project team to refine the designs. A substantial degree of re-working of these was carried out through drawings, trial mechanism and prototype cases in order to arrive at 'families' of showcases based on seven different opening mechanisms, some of which would be entirely new.
One of the exhibition designer's fundamental aims was to create large glass showcases that, as well as protecting the objects, offered them up for clear inspection with unconstrained visibility.
One of the most innovative solutions was designed and engineered as a large glass "box" that opens by releasing the seals between the glass bonnet and the case plinth

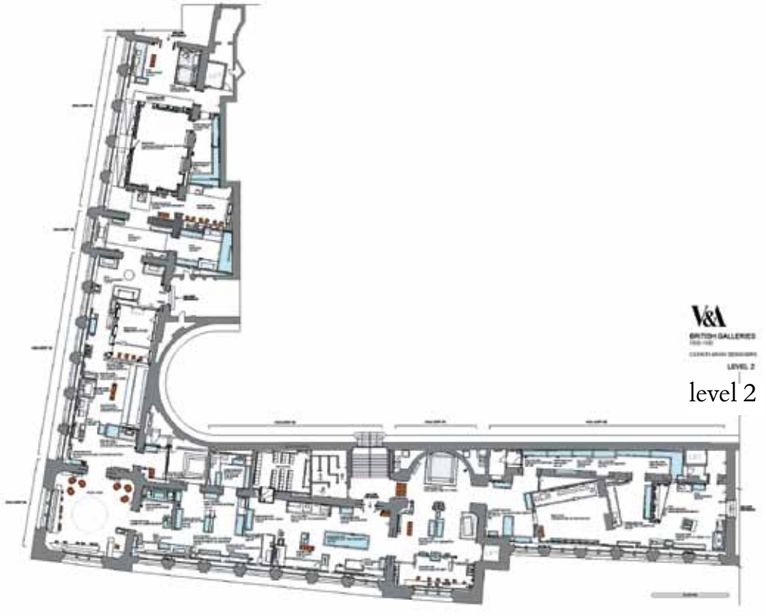
allowing the entire bonnet to rotate out of the way on specially machined guides, thereby giving curators unfettered access to its contents.
To make the 120 meters of primary gallery display cases, Goppion had to use numerous juxtaposed doors without intermediate uprights. Many of these, especially those of the lateral display cases, had to be able to be opened in relatively small spaces. Specially configured seals were used for the pull & slide opening systems to assure airtight security.
In addition, Goppion engineered several distinct types of exhibition drawer systems to meet varied display requirements. Those that open and close manually are fitted with hydraulic end-stop dampers; others, housing particularly delicate and fragile objects, use electric motors to ensure fluid and uniform operation.
Designing, building, and installing the cases required 5,000 technical drawings and 40,000 detailed construction specifications! Materials included over 1,600 square meters of glass shelving, over 200 machined slate slabs, nearly 100 pieces of honed pietra serena (sandstone), and 22 different types of fabric. Installation took 100,000 man hours.
Goppion and the V&A chronicled this complex, collaborative project in a joint publication, *Creating the British Galleries* (2004), Volume 4 of the *Annals of the Laboratorio Museotecnico*.

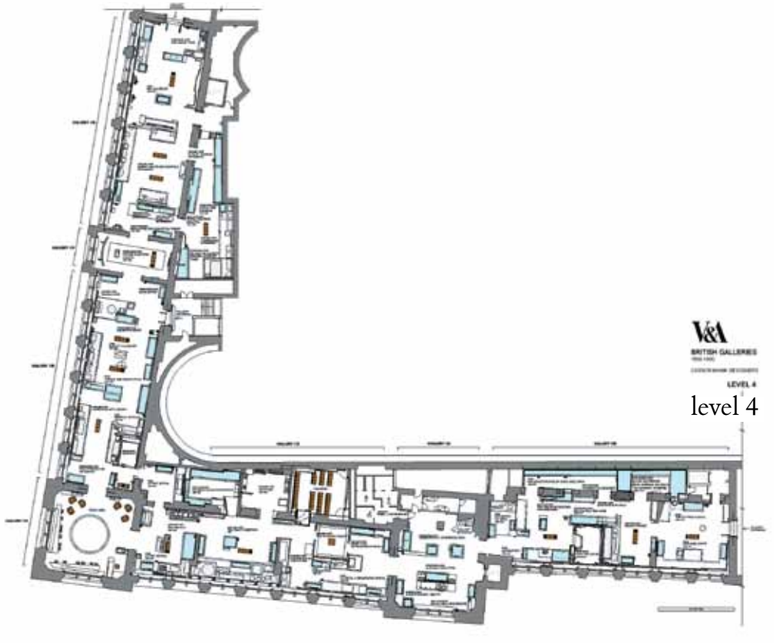
Awards The museum won the *European Museum of the Year award 2003*.

Nick Umney
Museum Project Manager
British Galleries
1500-1900 Project
Victoria and Albert Museum

"It was important that principal points of contact within the Goppion organisation do have excellent language skills. The fact some engineering details of the design continued to evolve (and improve) throughout the contract is a measure of the energy, commitment and enthusiasm (the passion) of the Goppion team and their seemingly endless willingness to try to create the best product possible within our mutual resource.
Goppion's whole way of working encourages collaboration and partnership and perhaps it is just as well that we got into this way of constructive dialogue and problem solving early on since the installation on site phase was very difficult for us all. The works of construction and fit out were delayed and the intended dates of beneficial occupation by the client of galleries on a phased basis was significantly set back. Despite this, Goppion's representative on site was endlessly polite, patient hard working and positive and we were able to work together with him and with construction managers and others to open on time."

Client Victoria and Albert Museum
Interior design Alistair Gourlay, GA Associates, London; David Mlinaric, London
Exhibition Design Dinah Casson, Jon Williams, Casson Mann, London
Project Data Exhibition area: 3,400 m²; exhibition units: 170; length of the exhibit fronts: 396 m






Baroque
1685–1723


1610
0191

2002 **The British Museum, London, United Kingdom**
The Chinese Jade Gallery

The Chinese Jade Gallery of the British Museum contains objects from the Neolithic Age to the 19th century and illustrates the history of this exotic precious stone, long appreciated for its beauty and its magical properties and used by skilled Chinese craftsmen to create ornaments, ceremonial weapons, and ritual objects.

The challenge

The project design called for a seamless display environment twenty seven meters in length, front accessed, with only the glass face visible as a case structure. There were architectural and structural challenges that needed to be addressed without impacting the core 'window to a collection' concept.

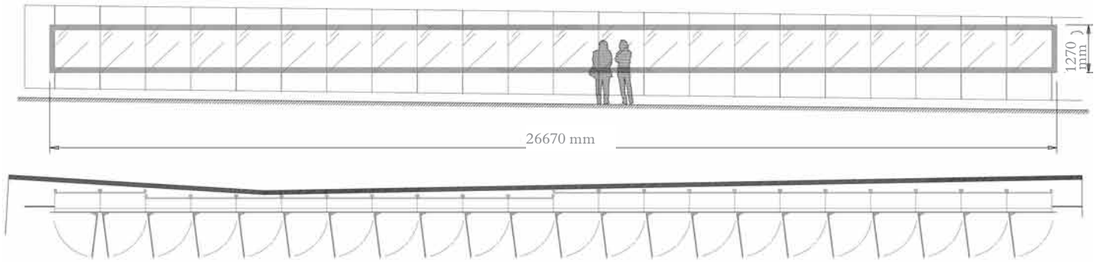
Goppion's Solution

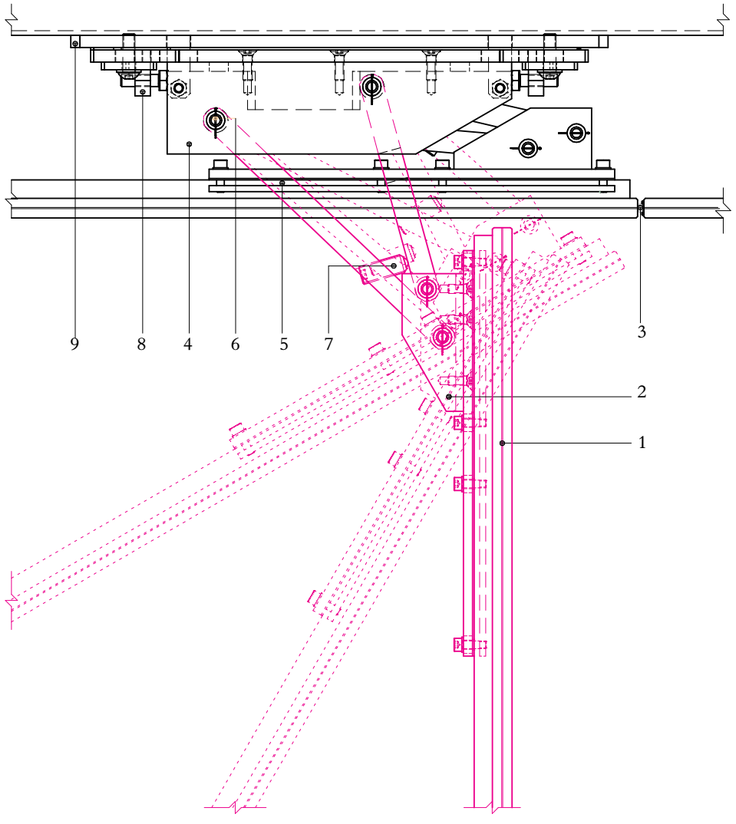
For the Jade Gallery, Goppion engineered a single display case, devoid of visible interior dividers or structure that could be 'suspended' within the gallery wall. A series of doors are mounted on concealed four-bar hinges with specially configured gasketing sealing them against the rear face and between lites. Wood cladding surrounds the case, unifying the display environment and highlighting the linear organization of the exhibition's content.

Client
The British Museum

Exhibition Design
Geoffrey Pickup, The British Museum Design Office, London

Project Data
Exhibition area: 70 m^2; exhibition units: 1; dimensions: l = 2,667 cm, d = 40 cm, h = 127 cm





The display cases present in this gallery have their entire glass fronts with doors openable by rotation. The rotation is by means of articulated quadrilateral hinges; the diagram illustrates a detail composed of: 1, plate of the openable front; 2, mobile part of the hinge; 3, silicone seal; 4, fixed hinge unit; 5, arms; 6, pins with anti-fall split pins; 7, screws for end-of-stroke on opening; 8, system of slotted plates to adjust the hinges; 9, strengthening strike plate welded to the structure of the display case.


Jade and
printed illustration

2002 **Musée International de la Croix-rouge et du Croissant-rouge, Geneva, Swiss Confederation**
Case for the display and conservation of the "Geneva Convention"

The International Museum of the Red Cross and Red Crescent in Geneva was founded in 1988 to document the history and activities of these two humanitarian agencies. A quotation from Dostoyevsky welcomes the public: "Everyone is responsible for everyone and for everything." This expresses the mission of the museum, to present humanitarian action free of moral judgement on the source of conflict. The object most emblematic of this mission is the Geneva Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field. Its adoption in 1864 by 12 international signatories, including the United States, is both the founding act of the Red Cross and the first international provision to attempt, as far as is possible, to make war less cruel by recognizing the dignity of human beings and the neutrality of the war wounded. The Swiss flag – a red cross against a white field – was chosen as an emblem of the Convention to honor the host country. To this day, the Red Cross is a symbol of protection and neutrality, recognised the world over.

The challenge

In 2002 Goppion was selected to make a single, highly specialized case to display the original Geneva Convention, which the Museum had obtained in trust from the Swiss Government.
Given the delicate nature and symbolic importance of the manuscript, the case had to provide tightly regulated conservation conditions and high security while affording visitors the ability to easily view and read the entire 6- page document.

Goppion's Solution

To meet the exacting requirements of displaying this document, Goppion created a display case with engineering characteristics similar to those we employed for the construction of the cases for the British Crown Jewels in 1994. Like the cases for the Crown Jewels, the case for The Geneva Convention is highly resistant to forced intrusion of any sort including malicious (terrorist) actions utilizing explosives or firearms. Despite this outsized level of security the case still functions elegantly as a display. Within the case, the six pages of the document are arrayed so that visitors can easily see them. An innovative, combination pin-spot and wash focused, fiber-optic lighting system illuminates the document while protecting it from the heat damage incandescent lighting would incur. Goppion used two simple concrete pillars to support the case. The pillars are not only in keeping with the minimalist architectural style of the Swiss museum but also augment the security of the installation itself.

Client
Musée International de la Croix-rouge et du Croissant-rouge
Project Data
Exhibition units: 1; dimensions: l = 100 cm; d = 10 cm; h = 200 cm

2002 - 2003 **Pinacoteca di Brera, Milan, Italy**
Structure for the restoration on site of the "Pala di Pesaro" by Girolamo Savoldo

The Pesaro Altarpiece is the largest work by Giovanni Girolamo Savoldo, a painter from Brescia active in the first half of the 16th century. Commissioned by the Dominicans of Pesaro in 1524, the panel depicts the Madonna and Child attended by Saints Peter, Dominic, Paul and Jerome. Inspired by the recent innovations of Titian, Savoldo composed the painting in two distinct zones: the divine space illuminated by a trio of seraphim, and the earthly realm featuring natural light and a triumphant view of Venice. When the church of San Domenico in Pesaro was decommissioned in 1811 the work was moved to the Brera; in the process some elements of the altarpiece were lost, including a carved molding on the top and a predella at its base.

The challenge

Because the altarpiece is so large and heavy, moving it for restoration was nearly impossible (in fact, it had only been moved a few times in five centuries, each of them documented on the back of the work). Complicating the problem, the original logistic path used during the piece's move to the Brera in 1811 had been closed off by subsequent renovations. The Brera had the innovative ideas of both restoring the altarpiece on site as well as opening the restoration process to public view.

Goppion's Solution

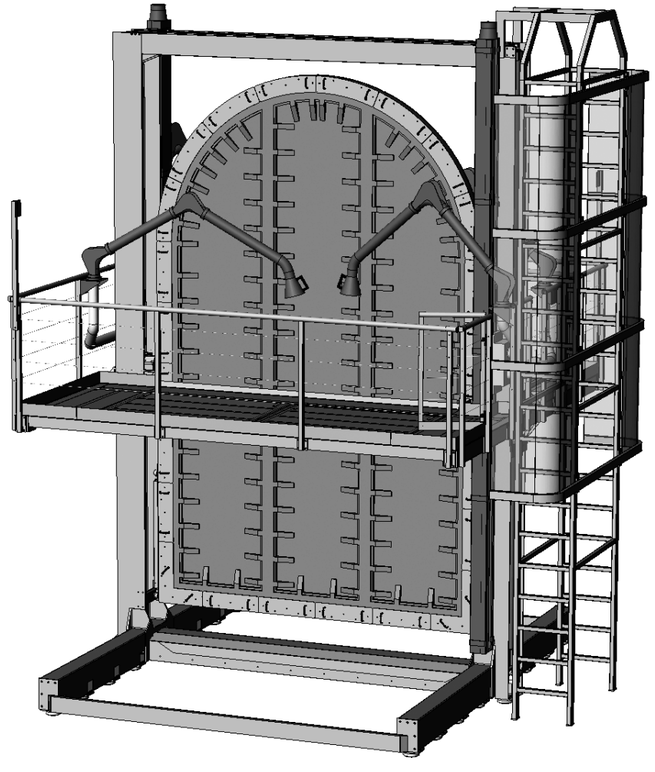
The architectural studio of Sottsass Associates designed a laboratory under glass, with mobile platforms to give restorers access the entire work without moving it. The Brera turned to Goppion to engineer the system, which includes a portal, a scaffolding platform with an access stair, and an armature to support the painting. The project also includes the protective exterior enclosure, a floating internal floor and work surfaces and storage units around the internal perimeter. The main element of the system is the portal, comprised of two weight-bearing columns, an exposed header, and base beams hidden by a raised floor.
The armature, which physically supported the work, was fashioned from a 10x10 aluminum bar that ran the entire perimeter of the painting. Screws and friction blocks applied to the front and back of the panel kept it in place. Specially made cushions of synthetic material ensured that the blocks never made direct contact with the wood of the painting. The armature was mounted on two swivel hinges that allowed the painting to rotate into a vertical or horizontal position.
Restorers used the mobile platform to reach areas of the altarpiece that would otherwise be too high. Once they positioned the platform at the desired height, the restorers climbed to it on a stairway located to the side and protected by self-closing gates. The platform included trays for the tools used for restoration.

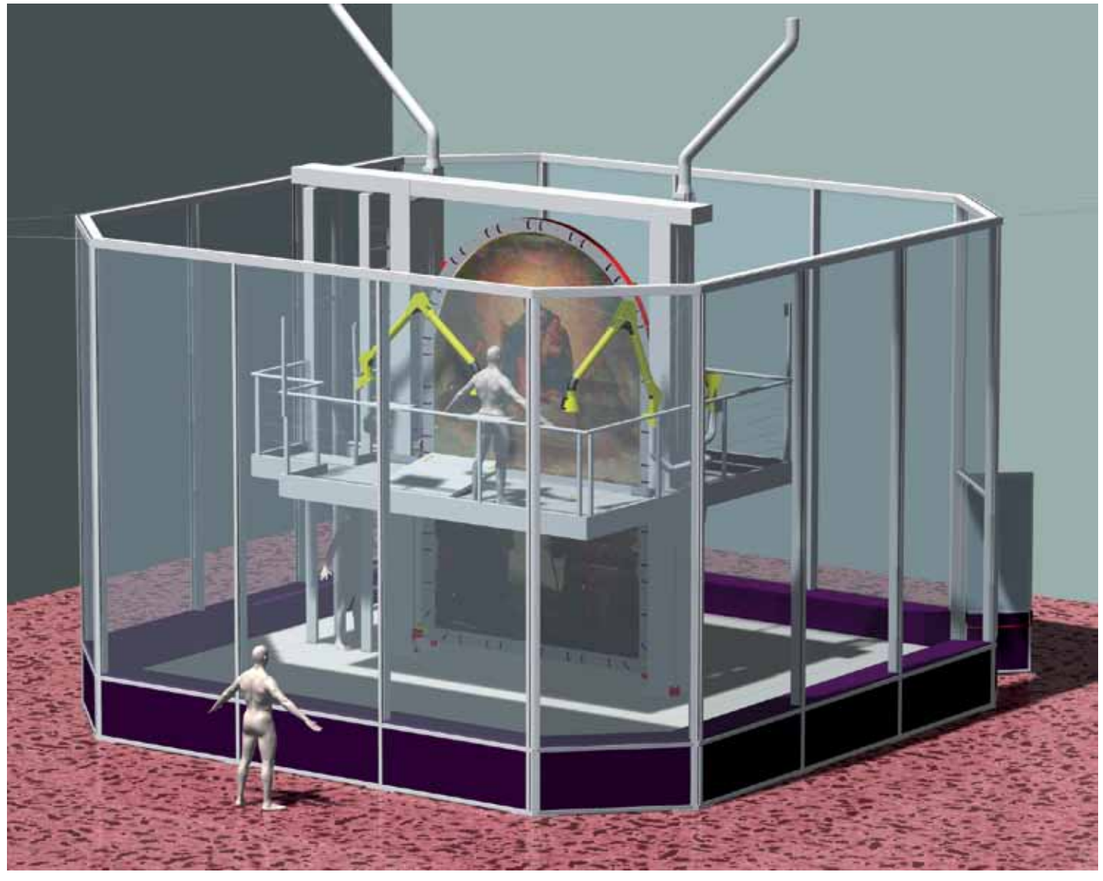
Since the original restoration concerned both the paint film and the wooden support, the platform is symmetrical, such that the same spacing was maintained on both sides of the work. The structure also allowed lateral interventions on the thickness of the wooden support. The entire system was enclosed in a transparent surround measuring approximately 9 meters wide, 9 meters deep, and 5 1⁄2 meters high. A security system ensured that only authorized personnel could gain entry to the enclosure. The structure included a four-point ventilation system that could be positioned to reach any part of the work area for quick, yet non-invasive, removal of any dust or solvent fumes the restoration produced.
The restoration of the Savoldo Alterpiece was such a success from both a conservation and public standpoint that the structure remains in place and is used as a visible restoration studio for other works in the collection.

Client Soprintendenza per il Patrimonio Storico, Artistico e Demoetnoantropologico per le Province di Milano, Bergamo, Como, Lecco, Lodi, Pavia, Sondrio, Varese

Exhibition Design Ettore Sottsass, Studio Sottsass ed Associati, Milano

Project Data Exhibition units: 1; length of the exhibit fronts: 10 m





2002 - 2003 **Pinakothek der Moderne, Die Neue Sammlung, Munich, Germany**

The Beaubourg in Paris, the Tate Gallery in London, and the Pinakothek der Moderne in Munich, designed by Stephan Braunfels, are the three major European sites for the display and exploration of the visual arts of the 20th and 21st centuries. The Pinakothek gallery of design, with its 45,000 objects, is one of the largest, most comprehensive, applied arts collections in the world. The centerpiece of the gallery is a huge illuminated display case, almost sixty meters long and seemingly suspended in mid-air (the director, Florian Hufnagl, has christened this case "sarcophagus of Snow White", to highlight the pure beauty of the glass).

The challenge

Goppion had to design and construct two long display cases, measuring 26 m and 33 m in length respectively, made entirely of glass, with base, sides and top daringly suspended using a system of steel cables. This was an engineering challenge that no other firm was prepared to take on. Goppion was able to deal with the extremely high demands of a museum dedicated to Design and fulfilled, at the same time, the preservation requisites of the objects as instructed by the Restoration Department.

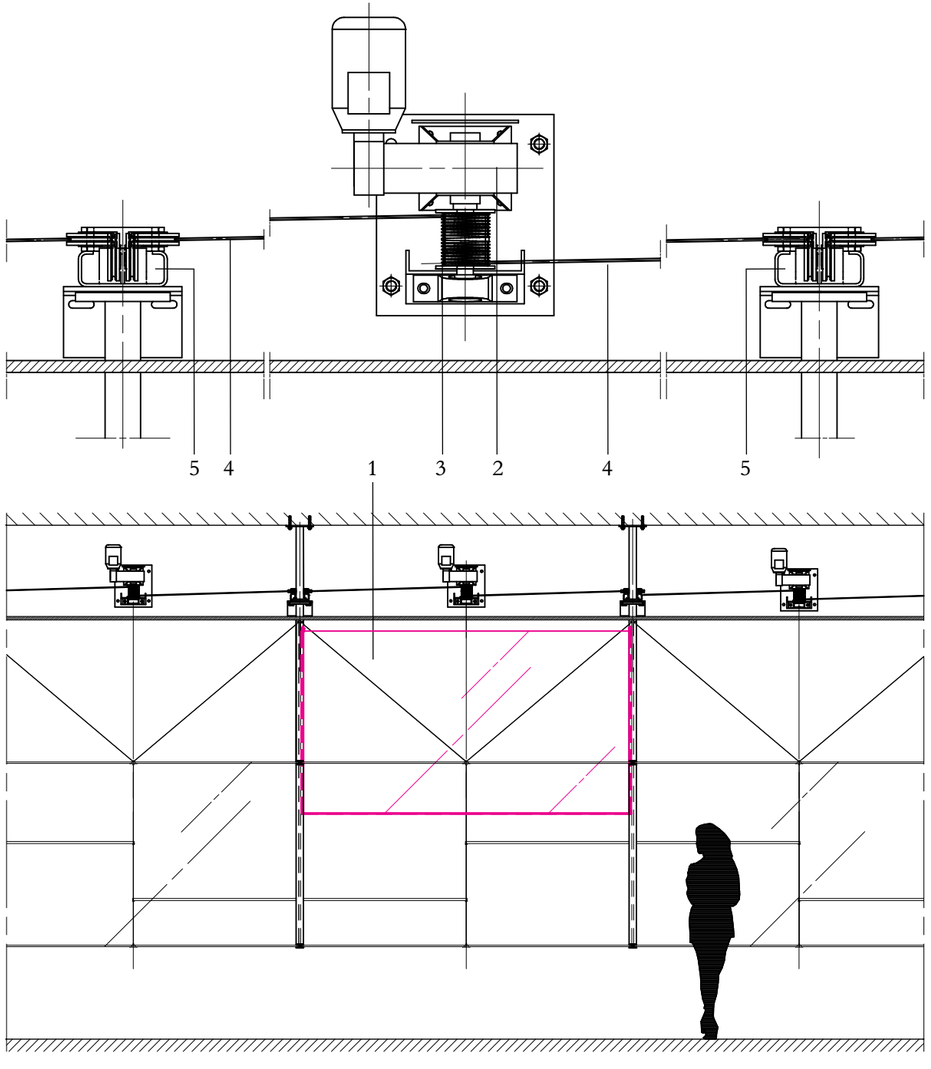
Goppion's Solution

It took over two years to design, prototype, test, and produce the transparent "gallery", of which only two months were devoted to production and assembly. The "gallery" is both a container for the perfect preventive conservation of objects and an extraordinary object in its own right: an important technological and aesthetic contribution to the new museum. The two display cases are long horizontal prisms made entirely of glass, suspended by a system of steel cables alternating with engineered steel support structures suspended from the ceiling.
Minimized steel uprights conceal a vertical lifting system that opens the front glasses of the display cases. Each moveable section is nearly three meters long and opens using a system of cables and gears powered by individual electric motors. The shelves are also made entirely of glass and suspended by metal cables. Thus the artwork seems to float in space, offering the viewer unparalleled visual access to this incredible collection.

Prof. Dr. Florian Hufnagl
Director of Die Neue Sammlung
State Museum of Applied Arts and Design Munich

"Not only has Goppion been able to understand our idea of a museum and to develop this idea into projects and designs, it has also been able to translate such concepts into reality, both upon a technical level as well as upon an aesthetic level – in a period of time that has been relatively short."

Client Pinakothek der Moderne
Building Project Stephan Braunfels, Munich
Exhibition Design Florian Hufnagl, Director of Die Neue Sammlung, Munich
Project Data Exhibition area: 1,000 m²; exhibition units: 2; length of the exhibit fronts: 59 m



The special display case has a special sliding door motorized opening system, composed of: 1, sliding door; 2, engine unit; 3, winch; 4, steel cable; 5, pulley.

2003 **The British Museum, London, United Kingdom**
The Wellcome Trust Gallery

Dedicated to Sir Henry Wellcome (1853-1936), the great collector and benefactor of the museum, the Wellcome Trust Gallery contains the British Museum's prestigious ethnographic collections. Inaugurated in 2003 as part of the celebrations marking the British Museum's 250th anniversary, it was designed to host exhibitions of long duration displayed according to the concepts of modern social anthropology. Thus it exhibits objects from various cultures and different geographical areas together, fostering their interplay and highlighting the commonalities of human experiences.

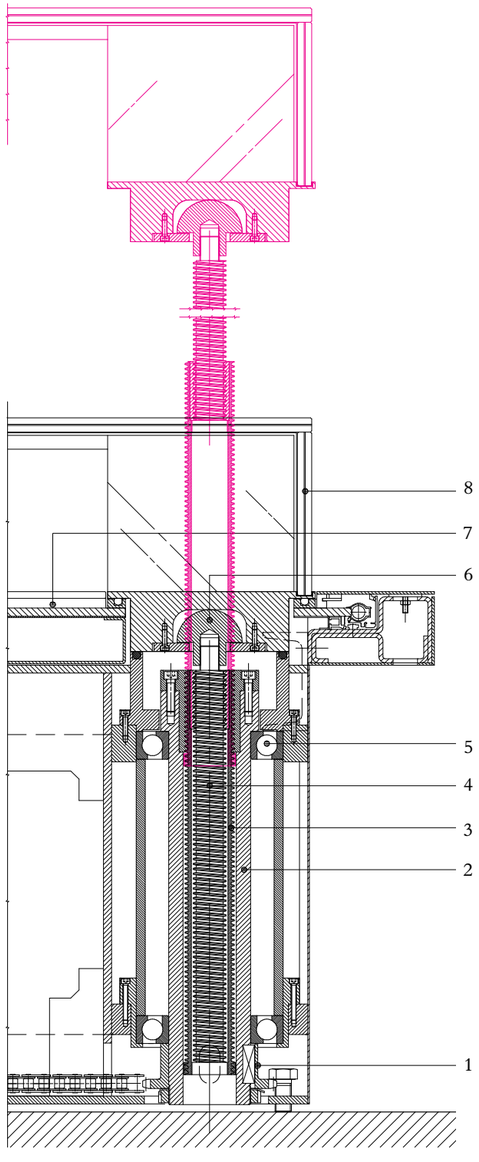
The challenge

The structure of the galleries was intended to evoke Cabinets of Curiosities such as 17th century scholars and explorers would have used to show off their finds, and which many see as the precursors to the ethnographic museums of today. Display cases set against the wall are reminiscent of the original shelves of the Cabinet, and a table in the middle of the room holds various objects for display, contemplation, or study, reminding one of an ancient scholarly sanctuary. The key challenge of this project, however, was the scale of the structures required: the wall cases stand 5 meters tall, while the center table spans 13 linear meters, entirely encased in glass.

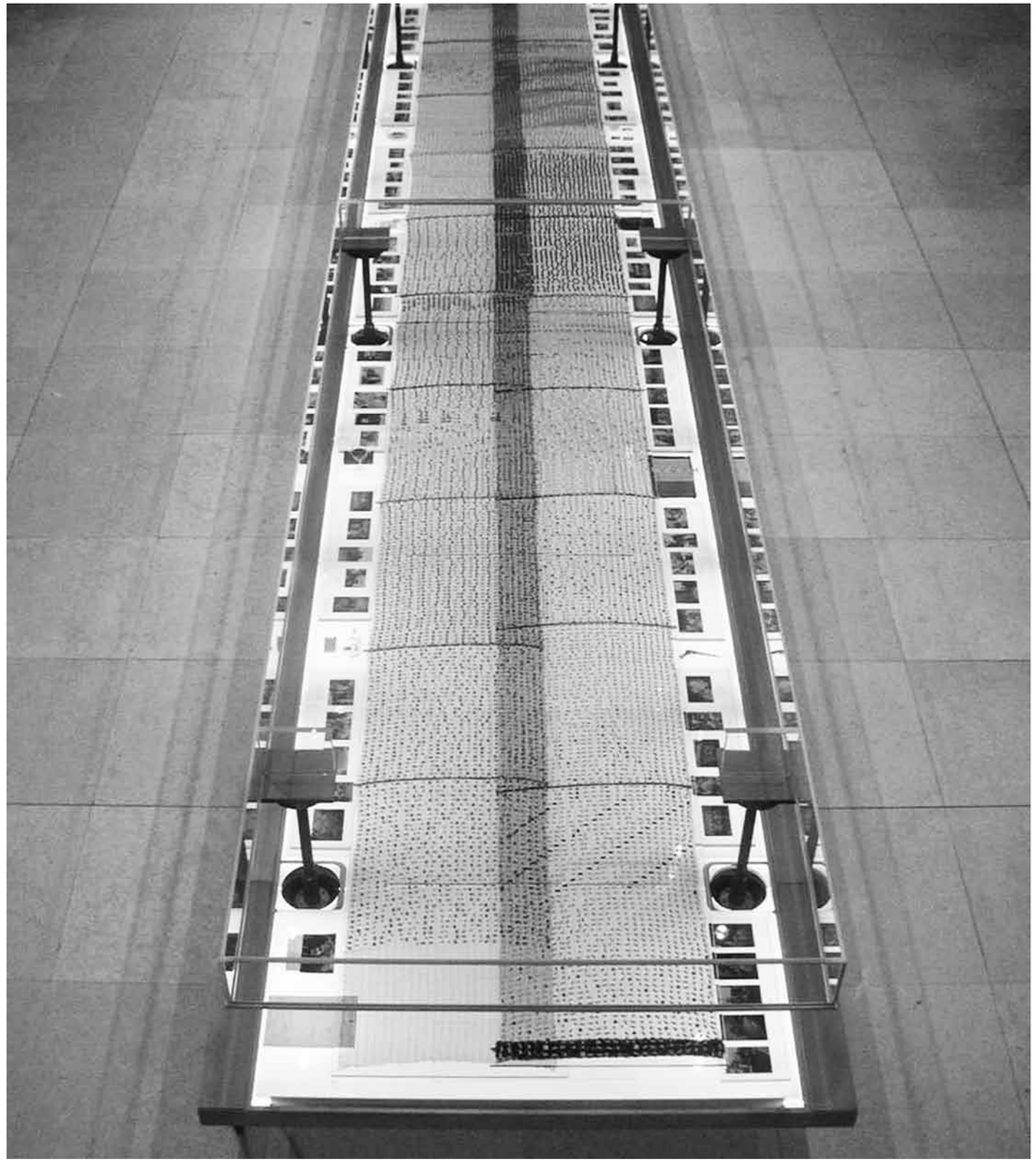
Goppion's Solution

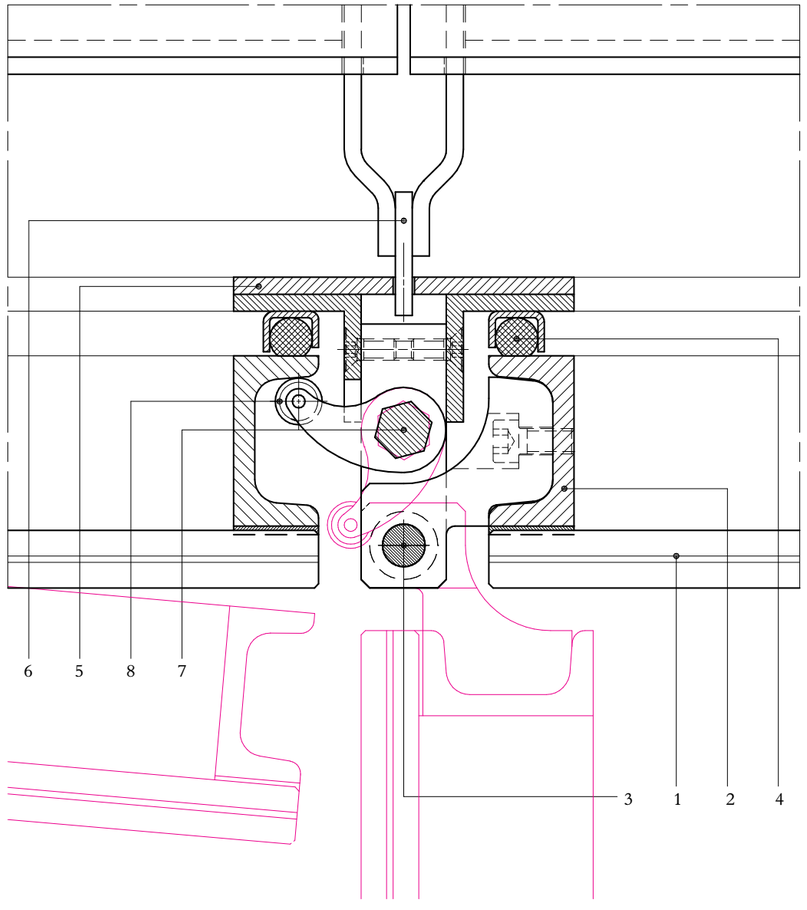
The large doors of the wall display cases open almost effortlessly. To protect and conserve the delicate objects within, we fit the cases with centralized climate-control systems to stabilize relative humidity and other environmental factors. To compress the seals completely, a hexagonal shaft operates barrel-headed cams that rotate simultaneously to press the door frame to the striking surface. This system both achieves a tight seal and provides high security by mechanically locking the door at several points along its perimeter. To allow unimpeded viewing of the items in the table display, the table is entirely encased in a glass bonnet with a spectacular opening system: the 13-meter long bonnet is raised using a system of eight telescoping screws operated simultaneously by a transmission shaft. The glass hood can thus be raised above the table legs, allowing curators to easily reach objects on the display surface. Goppion now holds a patent on this system.

Client The British Museum
Exhibition Design Geoffrey Pickup, The British Museum Design Office, London
Project Data Exhibition area: 892 m²; exhibition units: 3; length of the exhibit fronts: 42 m



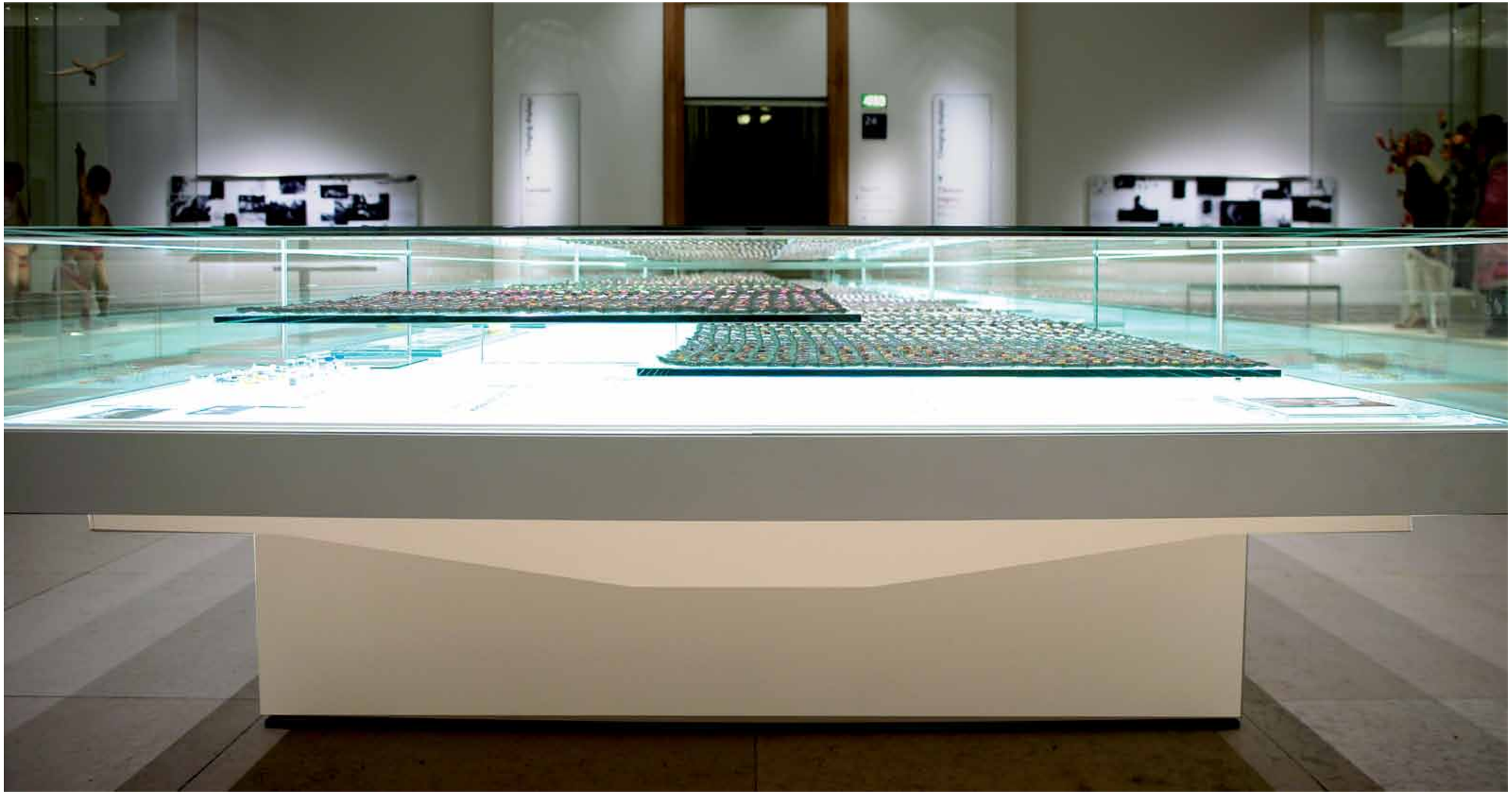
A partial section of a leg of the large table display case is represented in the figure and the following are highlighted: 1, pinion unit to operate the screws to lift the glass box; 2, 3 and 4, group of special coaxial trapezoidal screws; 5, ball bearings; 6, spherical head; 7, etched glass system for back-lighting the exhibition surface; 8, glass box.

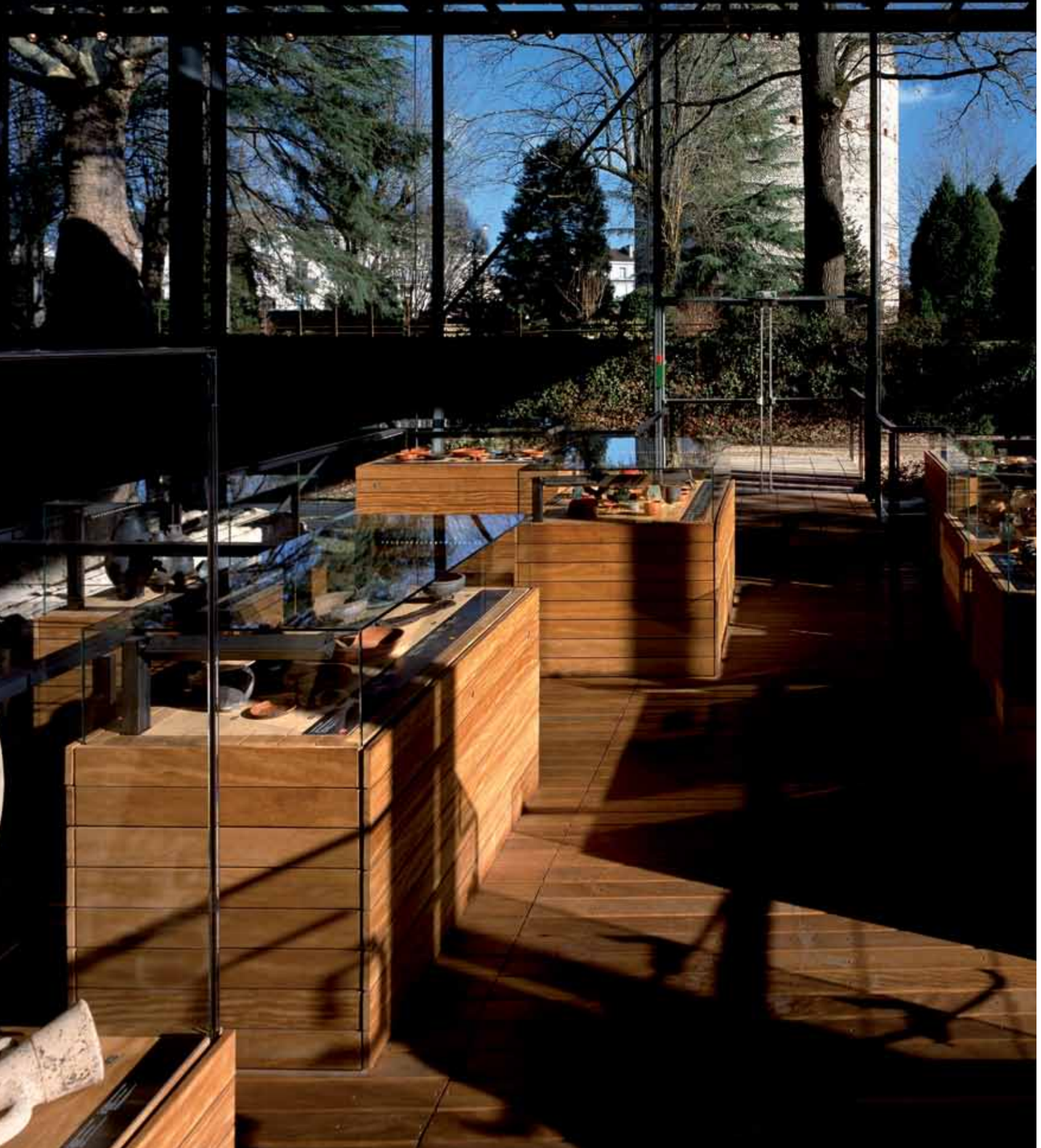




Detail of the central upright of wall case and view in horizontal section highlighted: 1, large glass plate of the door; 2, structural steel rear structure to strengthen the glass door; 3, special hinges; 4, o-ring seal; 5, stop surfaces of the seals with housing for the racks supporting the shelves; 6, supporting structure for shelves; 7 and 8, mechanical compressors.


Living





2003 - 2004 **Vesunna, Site-musée gallo-romain, Perigueux, France**

The Périgueux Archeological Museum lies in the heart of the ancient city of Vesunna. Built on the remains of a large Gallo-Roman domus, the museum had to both protect the ancient site and display its most important elements. The large and remarkably well-preserved domus was built during the first half of the 1st century AD around a generous peristyle and extensively restructured over the course of the following century. The site is renowned for the liveliness and beauty of its frescoes, still in their original location. The city of Périgueux selected the renowned modernist architect, Jean Nouvel, to design a decisively contemporary museum structure of steel, glass and concrete to emphasize by contrast the relationship of the museum to the ancient monuments surrounding it. The domus is the centerpiece of the museum in that a spectacular view of the ruins greets visitors as they enter the site. Balconies overlooking the site contain the exhibition galleries. The layout of the lower level features wooden walkways that echo the ancient structure, both maximizing and facilitating access to the complex.

The challenge

The display cases needed to be integrated into the installation using the same wood and finishes as were embodied in the museum's design. To suggest the position of the artifacts at the moment they were found during the excavations, Nouvel designed the cases as glass bonnets without visible frames and dramatically lowered the display surface. The lighting fixtures had to be contained in the display area without being visible to the viewer. Our challenge was to seamlessly integrate and conceal complex engineering into Nouvel's highly specific design for contextualizing the excavation.

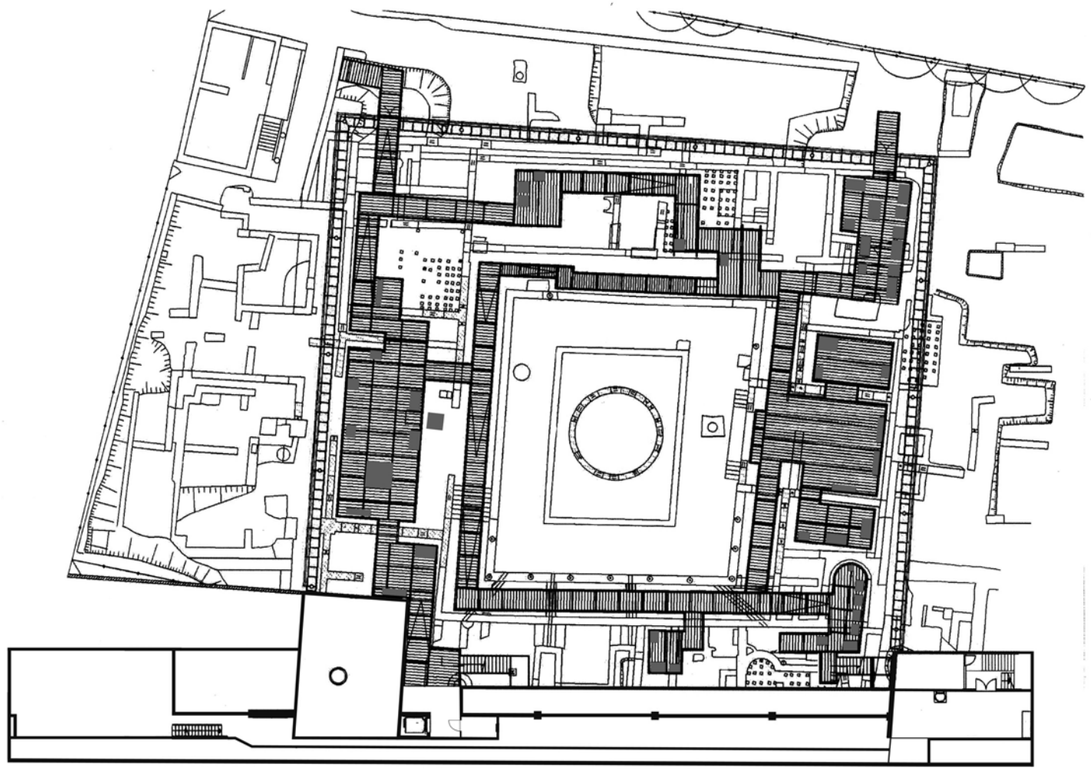
Goppion's Solution

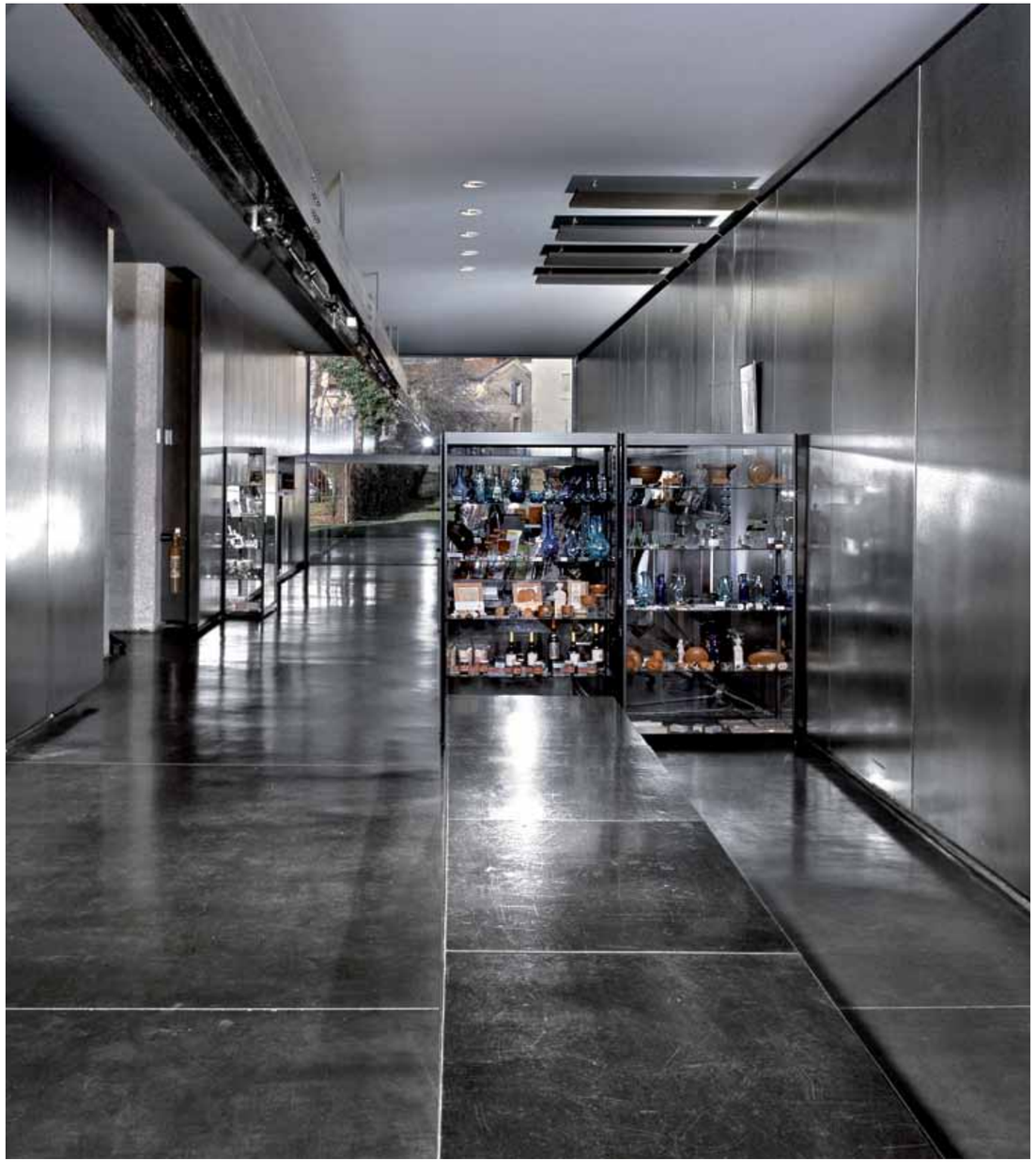
Goppion built countertop display cases with top-mounted bonnets. Because reducing the height of the base limited the extent to which the bonnets could be lifted by conventional means, we installed telescopic hydraulic pistons that easily and fluidly raise and lower them to the necessary height by a single handle. The lighting uses optical fibers, locating their terminals inside the adjustable square-section tubes to ensure the maximum modulation. All of this complex engineering is hidden behind panels of rare wood that seamlessly meld with the walkways and other furnishing elements within the new museum.

Client
City of Périgueux

Building project and Exhibition Design
Atelier Jean Nouvel, Paris

Project Data
Exhibition area: 1,000 m^2; exhibition units: 43; length of the exhibit fronts: 50 m





80 Vesunna, Site-musée gallo-romain

81 Vesunna, Site-musée gallo-romain

2003 - 2004 The Compton Verney House, Warwick, United Kingdom

Compton Verney, an 18th-century country home in Warwickshire, instigates an intense dialogue between the original architecture and the contemporary interior design based on reciprocal respect. Built between 1711 and 1728, then restructured around 1760 by Robert Adam, the house stands at the center of a vast lawn as a shining example of architectural self-awareness and a refined exponent of Neoclassicism. After a long period of neglect, the home's new owner, philanthropist Sir Peter Moores, launched a renovation project in 1993 that converted Compton Verney into a museum. The Compton Verney House hosts a permanent collection centered on themes that are generally underrepresented in museums and galleries of British art and also offers a rich program of specially designed seasonal exhibitions.

The challenge

The installation, designed by Stephen Greenberg, physically and symbolically integrates the existing structures into the central English countryside. Thus, not only the floors, but also the display cases and other exhibition facilities needed to be sheathed in natural oak boards. The built-in display cases had to be completely unobtrusive, so only the glazed fronts were left visible.

Goppion's Solution

Goppion created display islands, each comprised of a high base and an upper glass case to delimit the exhibition space. So that there would be no visible hardware, Goppion devised a system for lifting the glass cases that consists of a central screw driven by an electric motor, with four stationary cylindrical guides located on the case's corners. The whole mechanism operates from a single, central screw, so there's no need to contend with corner screws or transmission equipment, making it easy to operate and maintain the system. A facing of natural oak slats masks the entire plinth and slides open to allow easy access to the interior of the case. The niche cases set into the walls are faced by large panes of hinged glass, which can be easily and safely opened by just one person.

Client A. Edmonds & Co. Limited
Exhibition Design Stephen Greenberg, Metaphor, Londra
Project Data Exhibition area: 500 m^2; exhibition units: 14; length of the exhibit fronts: 12 m

2003 - 2004 The Byzantine and Christian Museum, Athens, Greece

The Byzantine and Christian Museum of Athens is one of the most important public institutions in Greece. It was established in 1914 to collect, study, preserve and exhibit the Byzantine and Post-Byzantine artefacts so vital to the cultural heritage of the Hellenic territory from the 3rd century AD to the late medieval era. The museum's extensive collection includes nearly 30,000 of works of art including icons, sculptures, ceramics, ecclesiastical textiles, paintings, jewels, coins, frescoes, and mosaics.
The museum reopened to the public in June 2004, after a period of closure to enable an extensive renovation and the addition of a new wing. It reopened to the public in time for its 90th anniversary and the 2004 Athens Olympics. The renovated museum displays the permanent collection in two main parts: "Byzantium" contains 1,200 artefacts from the 4th-15th century AD and "From Byzantium to the modern era" presents 1,500 artworks dating from the 15th to 20th century.

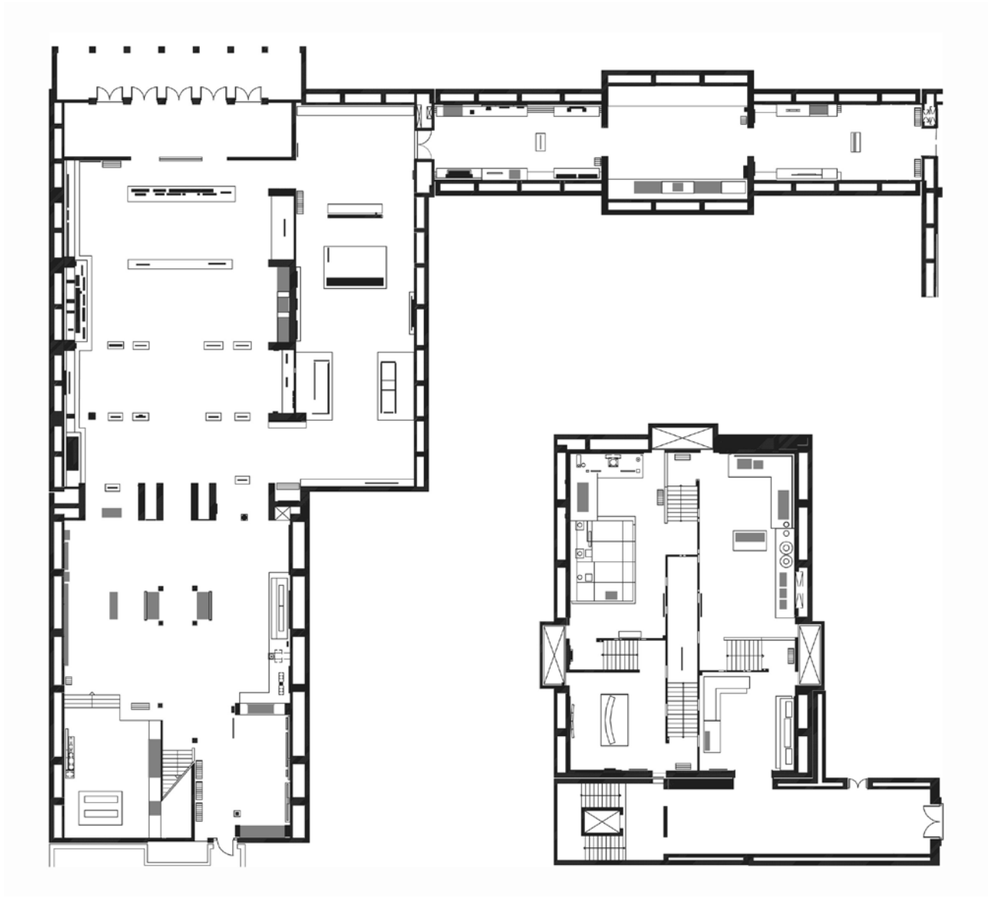
The challenge

The Byzantine and Christian Museum of Athens houses one of the most important collections of Byzantine Art in the world, many of it in delicate condition. Creating caseworks to display and conserve the works on paper and coins presented the greatest challenges.

Goppion's Solution

The exhibit design called for an integrated, climate-controlled display system that would include vertical wall-mounted cases, inclined cases, and "herringbone" cases with diagonal openings, all of glass and with etched glass panels.
To enable precise climate control of the cases intended for books and manuscripts, Goppion developed a special sealing system for the work: all of the glass panels were seated to the cases with silicon gaskets and magnets to achieve an airtight seal over the entire perimeter.
Custom-made display mechanisms within each case use chemically compatible and inert materials: for instance, narrow shelves of Plexiglas with fiber-optic cables embedded in them angle the light to render the coins perfectly legible while isolating them from any other potentially damaging material.

Client Hellenic Ministry of Culture, Byzantine and Christian Museum
Building Project Manos Perrakis
Exhibition Design Eleni Stefanou Katsanika, Athens, with the collaboration of Dimitrios Tsonis, Elena Bairaktari, Alexandra Ntounis
Project Data Exhibition area: 2,000 m²; exhibition units: 30; length of the exhibit fronts: 45 m




Ο δημόσιος βίος
Public life

2003 - 2005 **Musée du Louvre, Paris, France**
Salle des Etats, “Monna Lisa”

The “Monna Lisa” by Leonardo da Vinci is a masterpiece among masterpieces, the pinnacle of the Italian art of the Renaissance, and the centrepiece of Louvre Museum. In 2005, following four years of exhibition in the Pink Room, the Monna Lisa was returned its original exhibition space in the large Salle des Etats (Room of the States). The Salle des Etats was restored and transformed to give Leonardo’s painting a display environment befitting its masterpiece status, offering peerless protection yet maximum transparency.

The challenge

The greatest challenge of all was to allow viewers to appreciate the beauty and mystery of the Monna Lisa, seemingly without impediment. We were inspired to rise to the emotional challenge of protecting so vital an emblem of our cultural heritage and the technical challenges of so doing. The exhibition case itself was unusually large; its single door alone measured 2.2 x 3.5 meters. Security elements were of the highest order and conservation characteristics had to protect the precious poplar wood panel of the painting from sudden changes in relative humidity and from pollutants brought in by the approximately six million visitors that crowd in front of the masterpiece each year. Goppion was uniquely qualified to assemble a team with the advanced, specialized technical skills the project demanded.

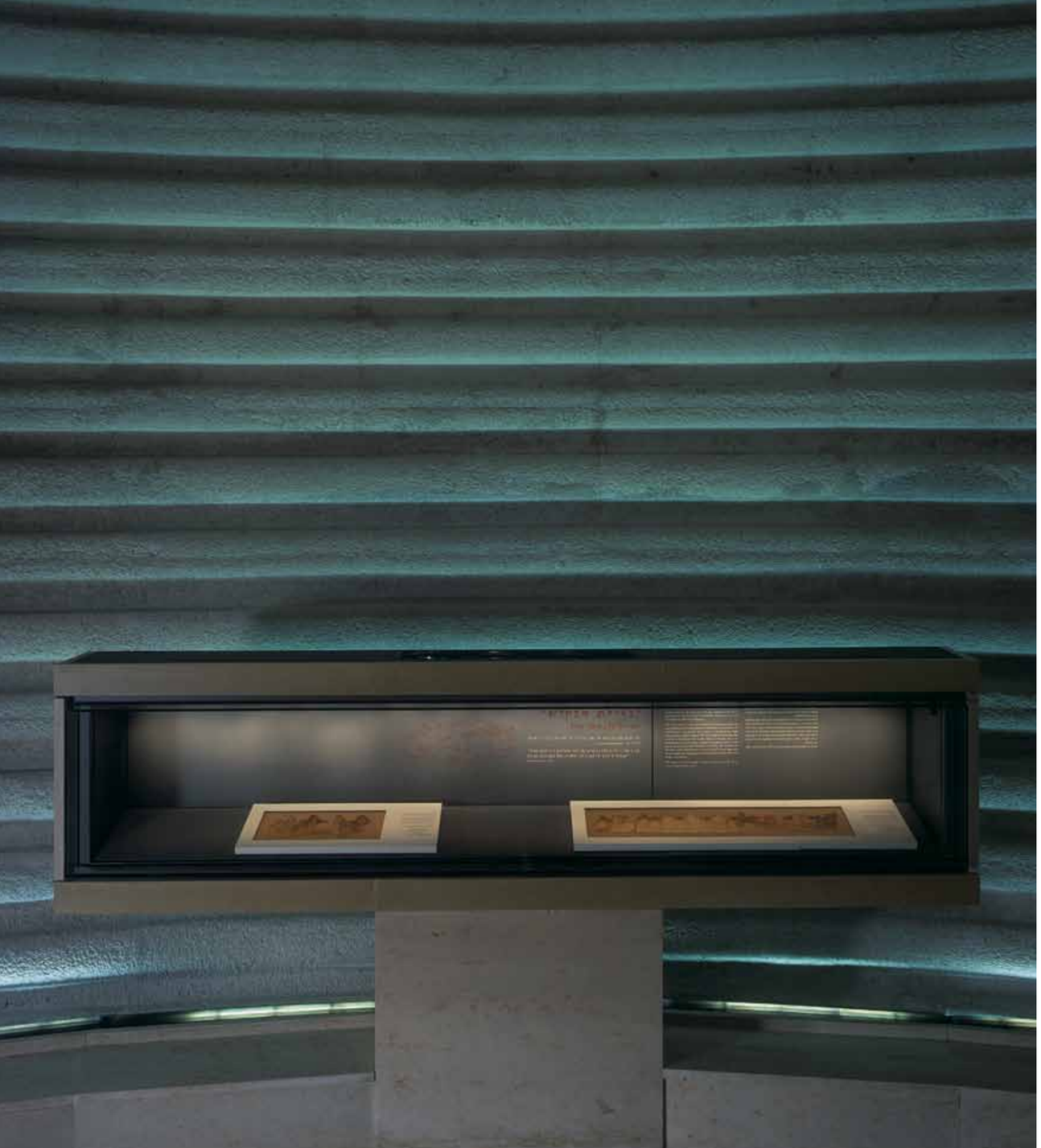
Goppion’s solution

We designed and commissioned a transparent yet virtually impermeable anti-glare glass face composed of multiple, alternating layers of glass and PVB sheets. For security, the display case is made of high-thickness steel and further protected by rear armour-plating of high-resistance steel. Only a further weaker light source was added to the light from the ceiling - merely 50 lux - that comes from the shelf at the bottom of the picture. A particular shade of color has been studied to enable the colors in the painting to be interpreted more easily. The opening system for the door, which weighs approximately one ton, uses a large articulated four-bar hinge. The painting’s support system allows the Museum staff to remove it quickly in the event of emergency. A compression system seals the perimeter at multiple points, achieving a higher-than-requested level of security and airtightness. To address the unique climate-control issues the project presented, we worked with Cesare Maria Joppolo, professor at the Polytechnic University of Milan, to design and build a complex, combined passive/active, system to both stabilize relative humidity and filter the air within the case. The system includes two completely independent and redundant units; if one fails the other takes over automatically and immediately.

Michel Antonpietri
Direttore D.A.M.T. - Direction architecture, muséographie-technique

"As part of the restoration project of Lorenzo Piqueras's Salle des Etats, Goppion created the case to protect the museum's best known masterpiece. The company's exceptional engineering and construction capabilities were determining factors in this endeavor. From the preliminary studies, testing and fine-tuning in the laboratory, and all the way to the final installation, everything was done to ensure perfection. The result is a prototype in itself, an object without equals in terms of aesthetics, functionality, security and microclimate control."

Client Etablissement Public du Musée du Louvre
Exhibition Design Lorenzo Piqueras, Paris
Project Data Exhibition area: 450 m^2; exhibition units: 1; dimensions: l = 220 cm; d = 60 cm; h = 460 cm



2004 - 2005 **The Israel Museum, Jerusalem, Israel**
The Shrine of the Book

The Shrine of the Book was built in 1965 to conserve and exhibit the manuscripts of Qumran, the *Dead Sea Scrolls,* the ancient and precious biblical texts that have been dated between the 3rd century BC and the 1st AD. The building, designed by the architects Bartos and Kiesler, is a milestone of modern architecture and resonates with symbolism and spirituality. Forty years after its opening, the Shrine of the Book has been restored and renovated in order to optimize the display conditions for the visitor and bring the security and conservation technologies to modern standards for objects of this value.

The challenge

Critical to this project was the creation of new display systems which would remain faithful to the original Kiesler-Bartos experiential design intent while also meeting exacting conservation standards for the display of the Scrolls. Goppion faced a tripartite challenge: security, conservation, and sensitivity to the original design. The cases had to allow the artefacts to be quickly removed in case of emergency yet provide top level physical security at all times. Microclimate control and lighting engineering had to meet exacting performance specifications to perfectly conserve delicate manuscripts of parchment, papyrus, leather and copper. And Goppion had to meet these needs while respecting the landmark form of the original project from the 1960s.

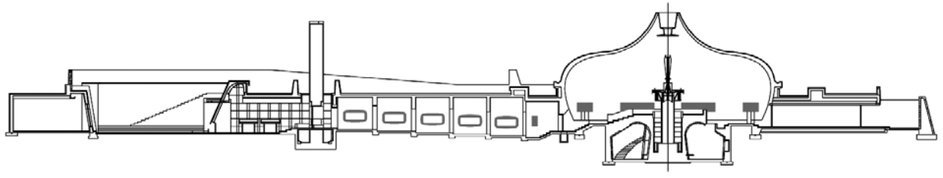
Goppion's Solution

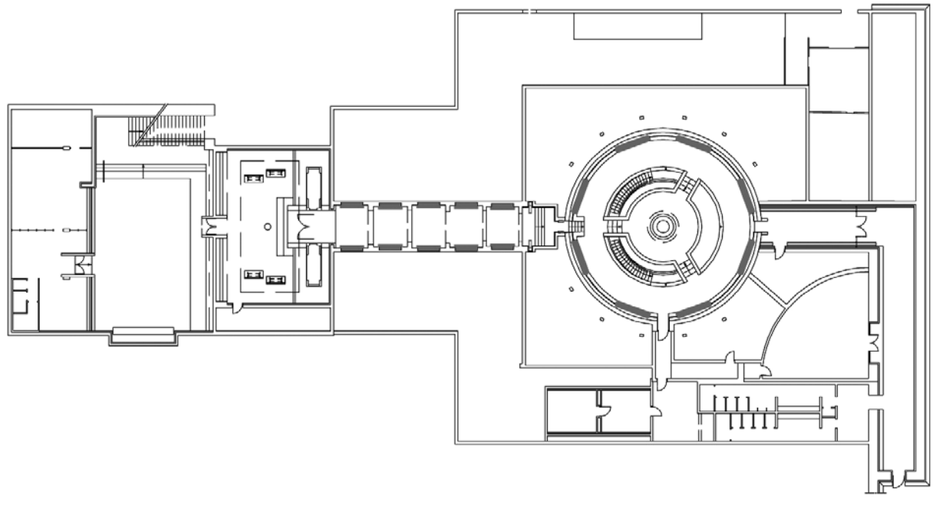
Goppion contributed to all aspects of the design and construction of the display cases, which had to be capable of maintaining a completely airtight seal to control environmental conditions (such as relative humidity), and maximize security. Opening systems were designed so a single operator could easily manage them. Goppion was committed to respecting the gallery's original design throughout the definition and engineering phases of the project. The built-in display cases in the gallery are thus reminiscent of the original furnishings: only the front, consisting of a large glass door back-painted with rounded corners, is visible.

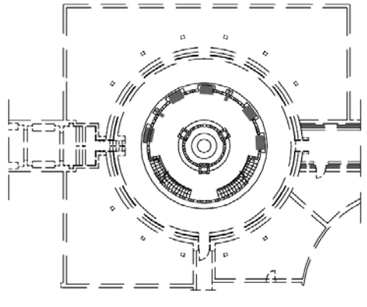
James S. Snyder
Director
The Israel Museum

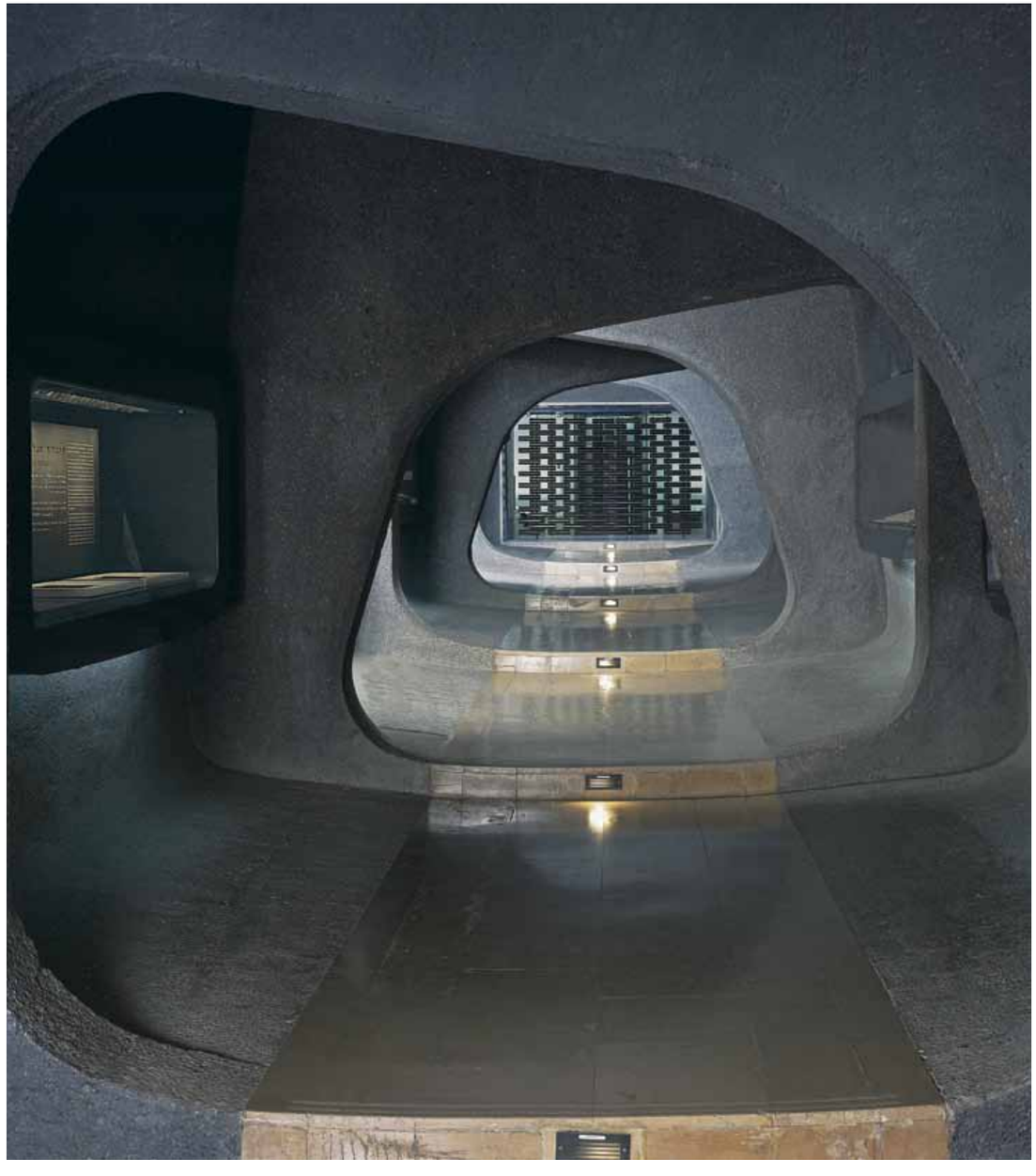
"Sandro Goppion appreciated from his first visit the unique nature of the assignment – housing patrimonial heritage of the greatest significance in the history of the western world in a landmark architectural setting of special significance for the history of modernist architecture – and the level of his professional and personal involvement was exceptional in our experience. Goppion's team worked closely and well with our local team, both on our site and at Goppion's facility in Milan, and at no time did we encounter obstacles arising from distance, language, or cultural or behavioral differences."

Client The Israel Museum
Building Project Armand Bartos and Frederick Kiesler
Exhibition Design Rachel Lev, Jerusalem
Project Data Exhibition area: 520 m²; exhibition units: 32; length of the exhibit fronts: 35 m










הסעודה המשותפת
The Communal Meal
"After this purification, they assemble in a private apartment . . . pure now themselves, they repair to the refectory, as to some sacred shrine"

2003 - 2006 **Musée des Arts Décoratifs, Paris, France**

The Marsan Wing of the Louvre, housing the museum's extensive collection of decorative arts, reopened in 2006 after a twenty years closure. The wing's new, expansive layout encourages visitors to experience the history of the decorative arts chronologically or thematically. The chronological route begins with an exploration of a spectacularly restored Late Gothic church and traces the development of the decorative arts from that time to the present day. The thematic route includes galleries devoted to a single style, such as Rococò, Liberty, or the trends of the 2000's, while Period Rooms, such as the 18th century Salon Talairac and Salle Barriol, display the works of art by placing them in their original context. The Dubuffet Gallery showcases a significant collection of thematically organized sculptures and drawings that Jean Dubuffet donated to the Louvre in 1965. A whimsical gallery of dolls, marionettes and toy cars shows the history of art in miniature, using children's objects.

The challenge

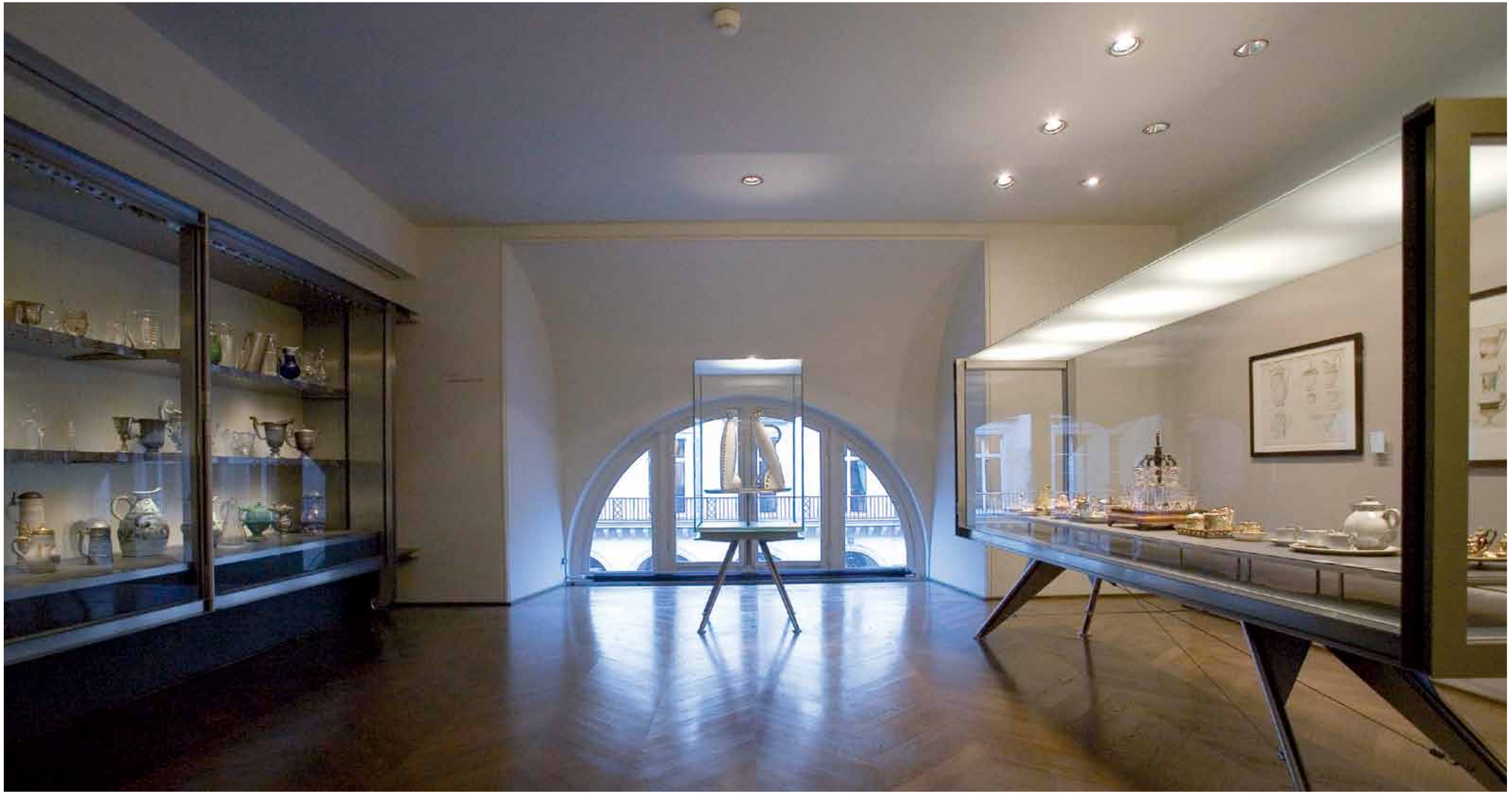
The key challenge Goppion faced was developing several parallel projects simultaneously, each of which rested on a different concept of how the casework would operate and appear. The galleries designed by Bernard Desmoulin and his group called for architecturally distinctive cases which, by promoting the visibility of the mechanics, entered into a dialectic with the objects on display. Conversely, those designed by Moinard and Tusquets called for cases that would seemingly disappear in order to highlight the objects on view. In all, Goppion and the various design teams collaborated to create 142 display cases as well as panels, bases, and other display apparatus, for the 25,000 square-meter exhibition area. The installation phase presented its own challenges. Despite delays in the overall museum restoration, the opening date could not be postponed. To meet the significant time constraints, Goppion devised a flexible installation strategy that coordinated the efforts of ourselves and the exhibition design teams in the form of a frequently adjusted deliverable program that could be titrated in response to the variability of the building completion process.

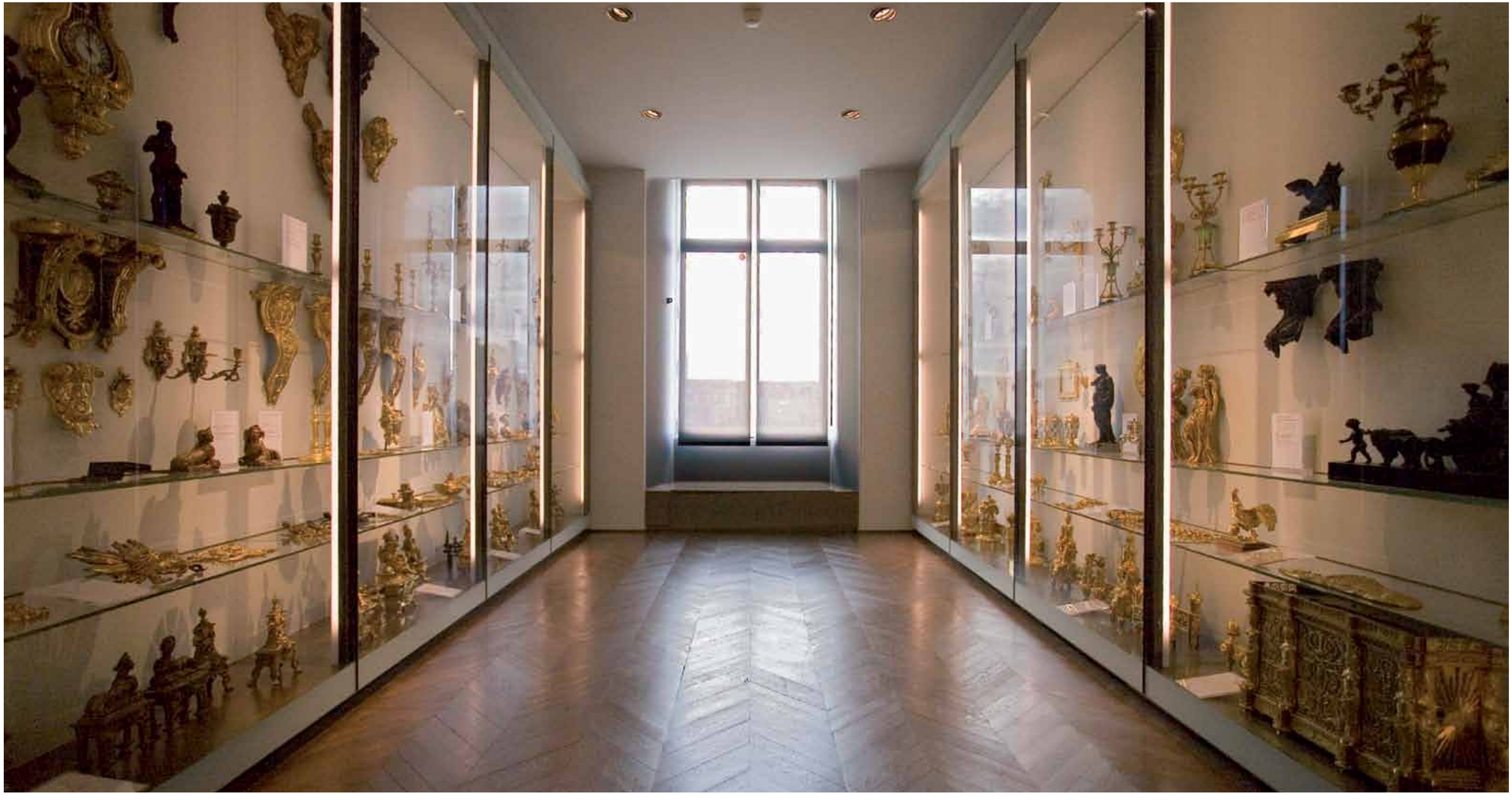
Goppion's Solution

Two exhibition design teams worked on this vast project, each creating galleries with distinct identities, materials, and forms. From a technical standpoint the key challenge was developing and producing the technical equivalent of two different projects within one space and time. Prototyping the most significant elements and analyzing the solutions with the design teams and Museum management was fundamental to the project's success. Only through extensive 3-D modeling were we able to strike the right balance between architectural and functional requirements. We had to devote particular attention to the doors, sealing systems, and fiber optic lighting equipment, coming up with varied solutions to

meet the requirements of the many different case styles. Within the toy gallery we suspended a display case and then used an innovative tensioned cable system to make this attractive icon safe for the many children who might, in their excitement, stress the case in unexpected ways.
Additionally, as noted above, Goppion faced logistical challenges managing the scope and scale of the project within a time frame that was compressed by building issues outside of our control.

Client ÉMOC, Etablissement Public de Maîtrise d'Ouvrage des Travaux Culturels
Exhibition Design Oscar Tusquets (TD&A) & Bruno Moinard (4BI) Associated Architects; Sylvain Dubuisson; Bernard Desmoulin; Daniel Kahane; François-Joseph Graf, Paris
Project Data Exhibition area: 25,000 m²; exhibition units: 142; length of the exhibit fronts: 509 m



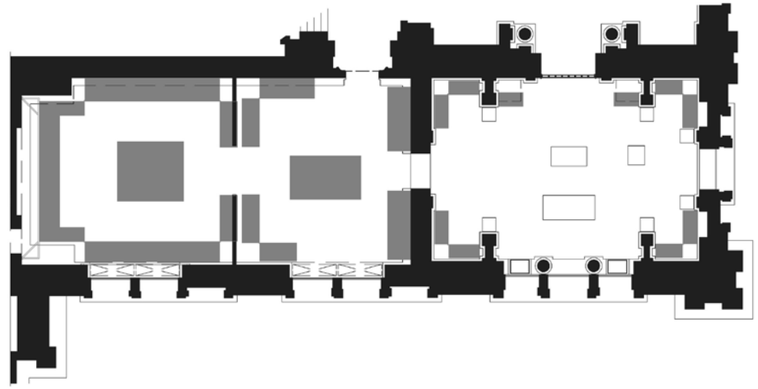


2004 - 2006 **The Fitzwilliam Museum, Cambridge, United Kingdom**
The Egyptian Galleries

The Fitzwilliam Museum is "one of the most important art collections in the nation and a monument of primary importance" (Great Britain's Standing Commission on Museums & Galleries - 1968). It was founded by Richard Fitzwilliam, 7th Viscount Fitzwilliam of Merrion, who left his artistic and literary works to the University of Cambridge in 1816, together with the funds needed to build a museum to hold and display them. The original bequest has progressively expanded since then, thanks to new excavations, donations and acquisitions as well as the generous support of numerous patrons. The museum's collection of Egyptian art, considered one of the finest in Britain, has been extensively renovated and the layout of the museum entirely redesigned by Iain Langlands and BLB Architects of London. The Egyptian Galleries now occupy two large rooms in the northwest corner of the building and display a large collection of artefacts in widely varying forms, sizes, and materials.

The challenge

The sarcophagi are the centerpiece of the Egyptian collection. They had to be displayed in an islanded configuration that would afford viewing from all sides yet be protected from exposure to harmful environmental factors.



Goppion's Solution The old casework was removed and replaced with new cases made by Goppion. The redesigned exhibits and new structural elements improve sightlines, enable optimal control of the internal environments for conservation, and organize the exhibits to make better use of the space. Each sarcophagus is held within a large glass enclosure that rests on a steel plinth; additional steel framing hidden beneath the trunk structure supports the considerable weight of the sarcophagi and holds fiber-optic cables that unobtrusively illuminate them. The enclosing cases are easily accessed for maintenance and conservation.

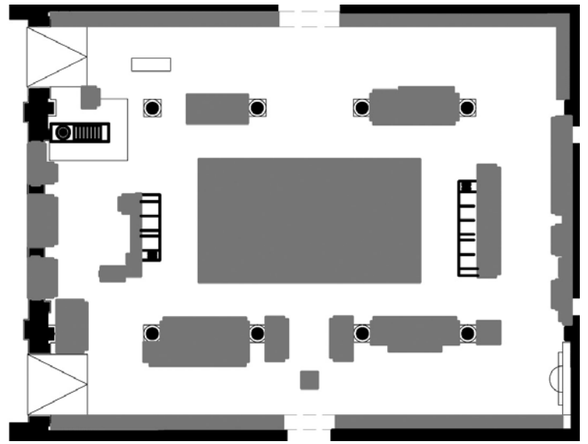
Client University of Cambridge, The Fitzwilliam Museum
Exhibition Design Iain Langlands, BLB Architects, London
Project Data Exhibition area: 300 m^2; exhibition units: 25; length of the exhibit fronts: 55 m

2005 - 2006 **Victoria and Albert Museum, London, United Kingdom**
The Jameel Gallery of Islamic Art

The Jameel Gallery at the Victoria & Albert Museum is one of the largest, most comprehensive, and prestigious collections of Islamic art in the world including more than 400 masterpieces that span 1000 years of history. The restructuring of the Jameel Gallery, which was a continuation of the renovation program initiated in 2001 with the British Galleries, reflects the renewed interest and elevated status accorded Islamic art by the world's major museums.

The challenge

The centerpiece of the collection is the Ardabil, a masterpiece of Iranian craftsmanship and the largest carpet in the world. To display this extraordinary artefact the designer envisioned a glass room which would display the carpet horizontally at floor level, but left it to us to sort out how to realize this vision. The perimeter exhibition cases could have no metal uprights nor plinths and were fronted by massive single doors standing nearly six meters tall, yet had to allow a single operator easy access. The display layout itself presented significant challenges as well: the larger cases had to be engineered such that they could be supported on raised floors with limited load-bearing capacity. The mechanics of operation had to be concealed behind marble pilasters, themselves slender operable access panels with invisible mechanisms. We had to meet exacting conservation standards and

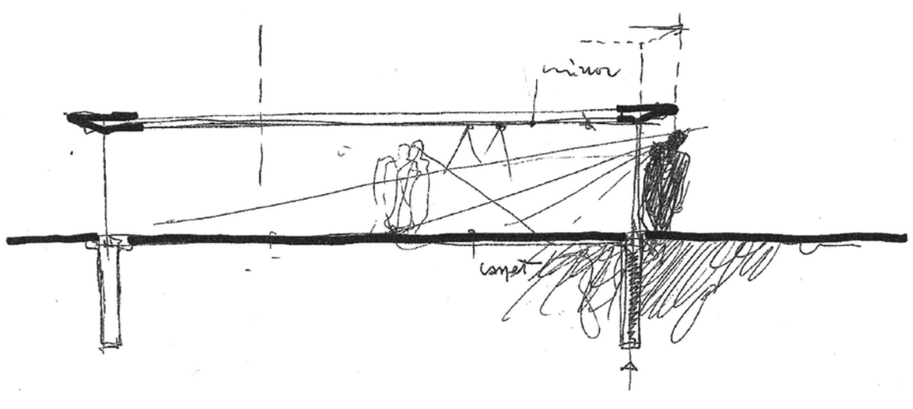


deliver air-tightness levels at more than ten times normal specifications. Moreover, we had to complete the entire process – from engineering through prototyping to installation – in just twelve months.

Goppion's Solution

The Jameel's carpet collection is second-to-none. For the core artefact, the Ardabil Carpet, we developed a special exhibition case – a virtual room 7 x 11 meters in plan and 3 meters tall – that perfectly realized the designer's vision. Although the original design called for a simple door in one of the faces, in early development it became clear that the access path that would have to be left around the carpet would not only make the case too large but would force visitors away from the optimal view. In response, Goppion engineered and designed an innovative system for raising the entire 36 meter perimeter exhibition case by means of chain-driven, telescoping screws concealed below the floor. As a result visitors are afforded unparalleled visibility while curators can more easily maintain this priceless piece. This award winning construction is a testament to the vision and skill of all involved.

To show the larger carpets to their advantage, the designer envisioned vertical cases with doors – some as large as 6 meters high by 3 meters wide – that could be operated by a single individual. Not only did we have to create exceptionally robust articulated four-bar hinges to carry these loads, but initial prototyping revealed that we would have to engineer structural aluminium door frames, pretensioned with steel cables and shafts, to maintain the rigidity required to safely hold the huge glass sheets. Our patented solution enabled the doors and frames to be assembled on-site. We thus resolved the far-from-insignificant problems of getting the display-case doors (which were larger than the doors to the museum) into the gallery; reducing the weight of the doors themselves, and, above all, preventing dangerous flexing and cracking of the glass plates.



Awards

V&A, Softroom Architects and Goppion for Ardabil Carpet Display Case, have won the "Best Commercial Fixture" award at 2006 FX International Interior Design Awards.

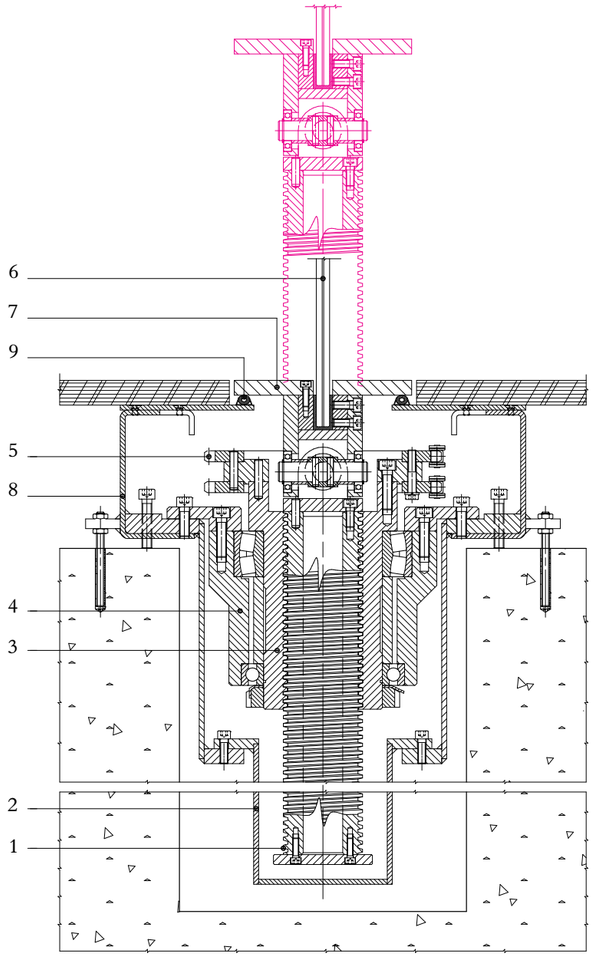
Oliver Salway
Director, Softroom Ltd

"The visual design intent for displays, had been quite clearly defined at an early stage, although the engineering challenges had yet to be solved. It is to Goppion's credit that they took the explicit decision to respect exactly the original vision of the design and find the engineering solutions to achieve this, rather than seek to impose standardised systems which could have altered the appearance of the cases."

Client
Victoria and Albert Museum

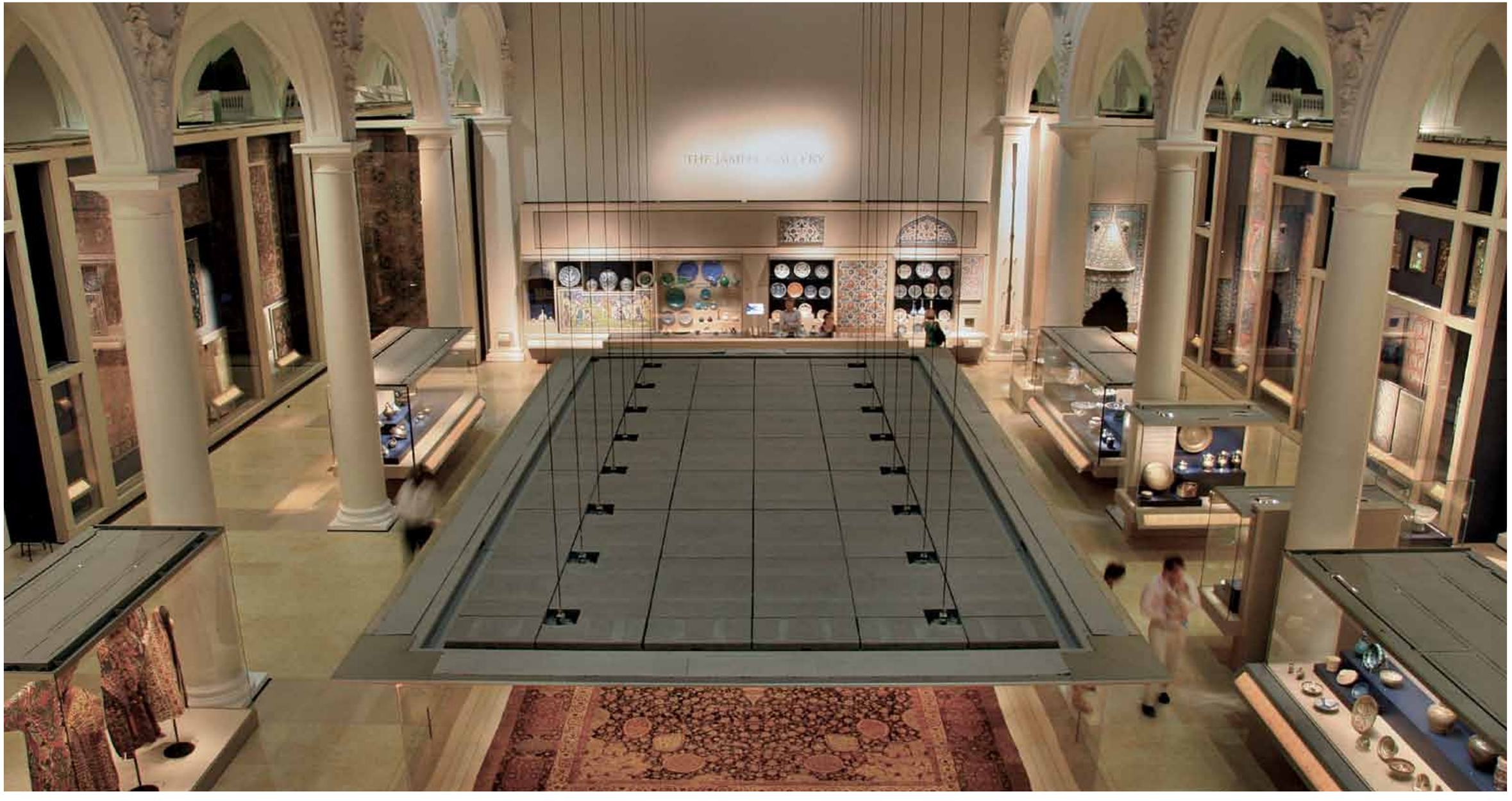
Exhibition Design
Oliver Salway, Softroom Architects, London

Project Data
Exhibition area: 660 m^2; exhibition units: 42; length of the exhibit fronts: 127 m



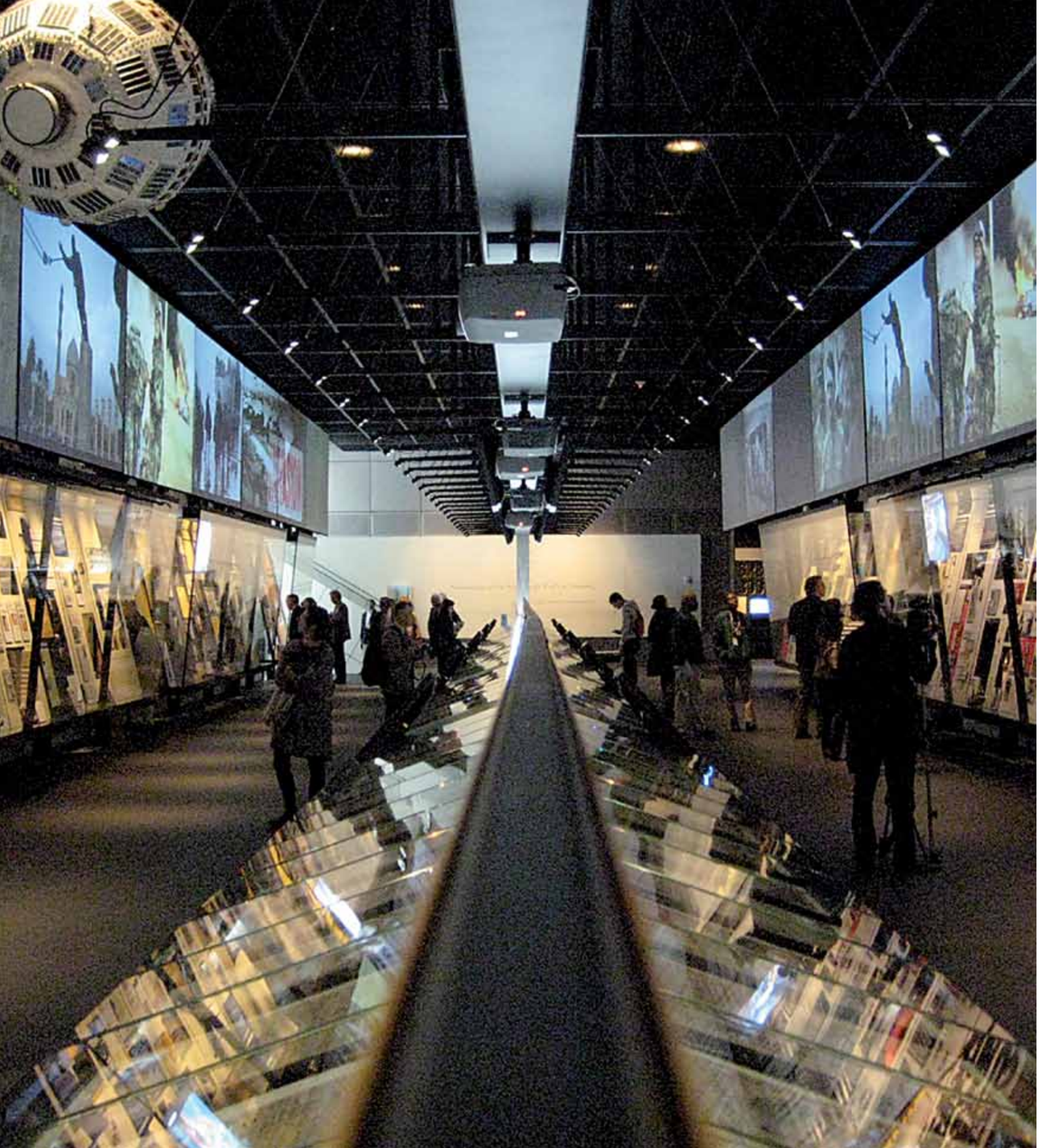
One of the 10 screw lifting units used to open the glass part of the large Ardabil display case located in perforations made in the floor of the museum. Highlighted in the enlargement are: 1, trapezoidal screw, protected by a metal sleeve, 2; this is moved by large nut screws 3, operated by gears, 5, moved by an epicycloidal-type gearmotor unit, this too located in a housing under the floor; the transmission is double chain; 4, supporting structure. These complex lifting units are fixed to a metal frame, 8, around the perimeter of the display case. The vertical glass plates, 6, are fixed to a drawn steel plate frame, 7. In the closed position these are sealed against the stop plates recessed in the floor by means of a double o-ring gasket, 9.


South Asia



142 Victoria and Albert Museum, The Jameel Gallery of Islamic Art

143 Victoria and Albert Museum, The Jameel Gallery of Islamic Art



2004 - 2008 The Newseum, Washington, D.C., United States of America

Inaugurated in April 2008, Washington D.C.'s Newseum is the largest museum in the world devoted to information and the history of the news media, from its origins to the digital era. Housed in a new building on Pennsylvania Avenue between the White House and the Capitol, it sits in the historical and political heart of the city.
The seven-story, 23,000 square-meter building includes exhibition galleries, multi-purpose areas, theaters, commercial spaces, interactive workstations and visitor facilities. It exhibits over 6,200 objects associated with significant events in the history and evolution of the media, 35,000 front pages of daily newspapers, periodicals from all over the world, and a vast collection of photographs that together comprise the history of journalism.
The building's façade symbolizes the "window on the world" that the press represents: the text of the US' First Amendment engraved in huge bronze letters on marble blocks stands above an imposing glass wall. The glass invites passers-by to see the activities within the museum, while museum-goers look out to the White House and Capitol, potent symbols of the U.S. throughout the world and the source of much of the news the museum highlights.

The challenge

The size of the project was a considerable challenge – 42 cases arrayed over 100 meters of exhibit front as well as a central 'spine' with 344 exceptionally specialized display drawers. Most of the constructions were challenging due to their dimension, angularity, or mechanical complexity; especially the display drawers that comprise the central spine. The drawers had to be fully transparent and aesthetically beautiful, yet highly secure. Moreover, given that much of what they display - such as newspapers, magazines, and other print media - is imminently degradable, high performance conservation technology had to be incorporated in every drawer.

Goppion's Solution

Working in close association with Ralph Appelbaum Associates, the studio responsible for the exhibition design, Goppion engineered, built and installed the exhibition cases for the entire museum. The large, asymmetrical forms of the primary display cases are fully integrated with the building's architecture but presented considerable challenges.
Goppion engineered and produced a triangular glass case with canted sides that embodies a one-of-a-kind opening system that allows a single operator to lever the top of one side clear of the case so that it can be slid out of the way on tracks concealed in the floor. Structural calculations and definition revealed that the unusual shape of the case would require using thicker-than-usual glass plates which were ground to millimeter tolerances at our facility in Italy then assembled in place on site.

The wall display cases in the main gallery have operable single glass faces, some six meters in length and nearly three meters tall, that angle outwards at the top. Goppion developed a motorized opening system for these cases that rotates the huge glass plates open along their length, improbably providing easy staff access. For the central spine, Goppion designed and created 344 self-closing drawers, each with an integral damping and deceleration system and an airtight, passively controlled, display environment. It took 7 prototypes to arrive at this incredibly elegant solution.

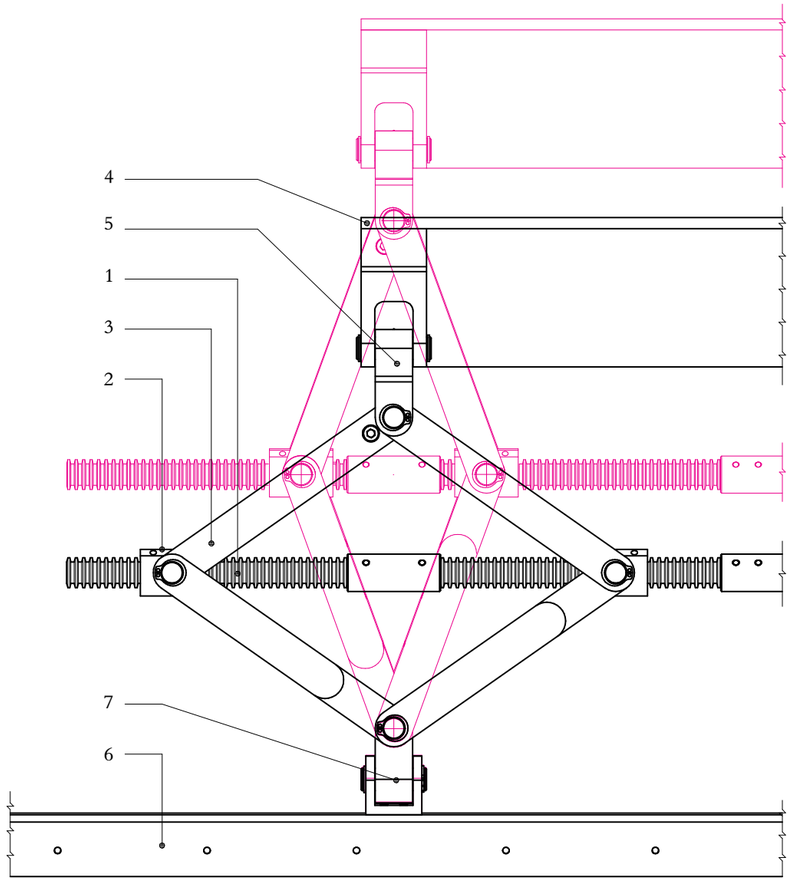
Awards

In 2009 Newseum wins SEGD Design Awards.

Christopher Miceli
Senior Associate
Ralph Appelbaum Associates

"The concepts developed for the display cases stretched the boundaries of what is considered to be achievable in terms of scale, access and structure. Goppion accepted the project with enthusiasm and directed their creative energies to engineering the solutions. That is exactly what separates them from their competitors. They are willing to accept the challenge, they are willing to innovate, and they have the creative engineering capabilities to deliver."

Client The Freedom Forum
Building Project Polshek Partnership Architects, New York
Exhibition Design Ralph Appelbaum Associates, New York
Project Data Exhibition area: 7,897 m²; exhibition units: 359; length of the exhibit fronts: 155 m



The special irregular-shaped display cases have a special door extraction system. In the detail, a quadrilateral extraction unit, composed of: 1, operating screws; 2, nut screws with pins; 3, steel quadrilateral arms; 4, support bar for the glass of the door; 5 and 7, joints with hinge; 6, anchoring strip for the glass box system of the display case body.


Tranzit
Beograd
Banja Luka
Tuzla
Zenica


FREEDOM TO PETITION
FREEDOM OF ASSEMBLY
MODERN ISSUES
PIVOTAL POINTS
ORIGINS
REPEAL


DAILY NEWS


HEADLESS BODY
IN TOPLESS BAR
EXTRA
1930
1955
Wirephotos Appear
A President Chats
With a Nation

2005 - 2009 **The Nelson-Atkins Museum of Art, Kansas City, United States of America**
The Ceramic Gallery
The African Gallery
The American Indian Gallery
The Egyptian Gallery

The Nelson-Atkins Museum of Art, founded in 1933 to provide cultural enrichment for the growing community of Kansas City, is located in a large Neoclassical building in the heart of the city. Expanding rapidly, it came to international attention thanks, above all, to its noteworthy collection of Asian art.

In 1999, the museum decided to expand as the existing structure was no longer able to meet its exhibition needs nor its ambitious educational and cultural objectives. The New York architect Steven Holl was commissioned for the project. He designed a new structure, the Bloch Building, situated along the eastern side of the museum within the Kansas City Sculpture Park. The innovative, lean and luminous structure harmoniously contrasts with the original Beaux-Arts building. Five "lenses" constructed of layers of glass emerge from the ground and generate an engaging link between architecture, landscape and art. Along with the Bloch Building, the project encompassed the restoration of the old complex and of the Sculpture Park and a refurbishment of the permanent galleries. The expansion increased the area of the museum by over 70% and created five different levels of exhibition galleries.

The challenge

The Nelson-Atkins Museum of Art commissioned Goppion to make the display cabinets for a number of departments in collaboration with the museum's own exhibit-design office. In the process, we developed a working method based on project-based synergy. The method was so successful in meeting the museum's unique requirements and fostering innovative solutions to its challenges that we came to apply the collaborative model to our work with other institutions – and became famous in the industry for it. For the most part, the display cabinets were of large size and were closely integrated with the fabric of the building, which itself required the realisation of major supporting structures.

Goppion's Solution

Among the ingenious engineering solutions Goppion created is a large case in the African Gallery. The long glass display bonnet, set against the wall (6.5 m long by 2.5 m high), opens upwards on hinges with the assistance of damped springs and gas pistons. This solution satisfied the museum's request for a broad, uninterrupted glass display envelope with no visible supports or hardware, easily operable by staff.

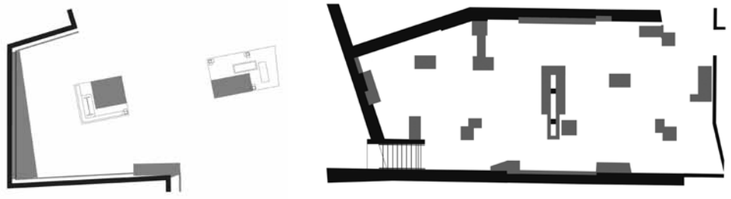
Client The Nelson-Atkins Museum of Art

Exhibition Design Steve Waterman, Rebecca Young, The Nelson-Atkins Museum Exhibition Design Department, Kansas City; The Ceramic Gallery: George Sexton Associates, Washington, D.C.

Project Data Exhibition area: 4,575 m²; exhibition units: 65; length of the exhibit fronts: 235 m

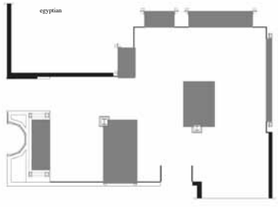
On the left: The Ceramic Gallery

On the right: The African Gallery



The American Indian Gallery

The Egyptian Gallery



2006 - 2010 The Museum of Islamic Art, Cairo, Egypt

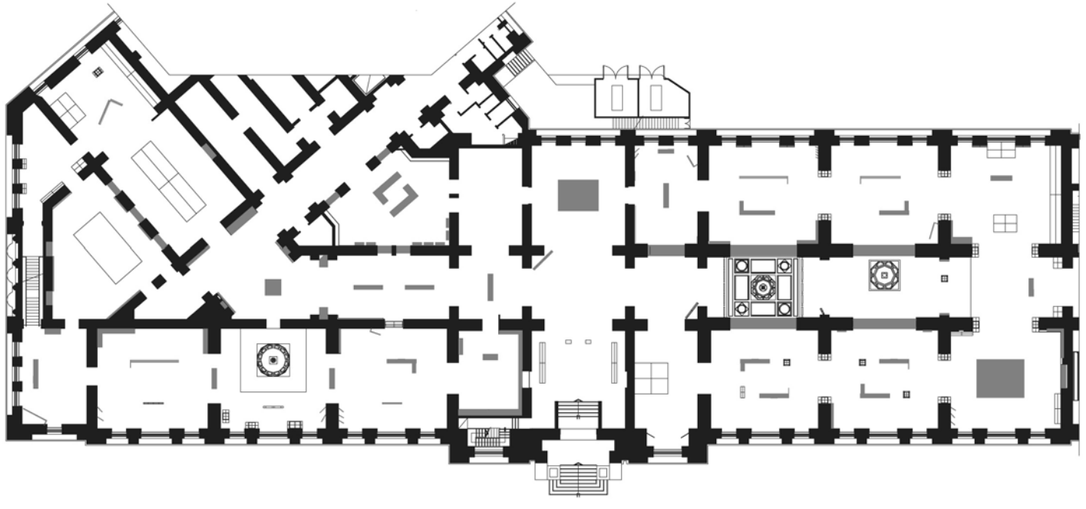
Cairo's Museum of Islamic Art is considered one of the greatest in the world with its exceptional collection of rare woodwork and plaster, as well as metal, ceramic, glass, crystal, and textile objects of all periods and areas of the Islamic world.
Following years of neglect, in 2003 the museum undertook a comprehensive restoration not only of its building and interior design, but also of its exhibition design and displays. French designer and museographer Adrien Gardère drew up the master plan for the renovation and new exhibition design in cooperation with the Islamic Department of the Louvre Museum in Paris, which advised on the reorganization of the museum's collections.
Reopened to the public in 2010, the new museum is divided into two large wings: The North wing takes a chronological approach to the art and history of the Islamic Egyptian Dynasties, from the Fatimid, which founded Cairo, to the Ottoman. In addition to the Islamic art of Egypt, this section invites visitors to discover Cairo's vivid history through the lens of architecture and personal histories. The South explores Islamic Art outside Egypt. Highlights include the Turkish Ottoman collection and the incredibly large Iranian collection. The entire museum thus introduces – through time and geography – the universal themes of Islamic art: Funerary Art, Epigraphy and Calligraphy, Lights and Colors, Water and Gardens, Geometry and Numbers, and Medicine.
The 25 galleries exhibit 2,500 artefacts of great artistic or historic value, chosen from the archival collection of over 100,000 items. Among the treasures on display are a gold-inlaid key to the Kaaba, the massive building that houses the black stone in the Grand Mosque in the holy city of Mecca, and the oldest dinar coin ever found, dating back to the year 697. Rare manuscripts of the Koran can also be seen, along with Persian carpets, Ottoman-era ceramics, and ancient instruments used in the sciences of astronomy, chemistry and architecture.

The challenge

The museum is housed in one of Cairo's notabler registered historic buildings. Exhibit design and caseworks thus had to be seamlessly integrated into the existing structures while giving the magnificent forms and colors of the objects full exposure.
Visitors could see only glass and stone of Turkish gray, matching the floors; no structural elements could impede views of the artefacts. Yet the large display cases, some up to five meters long, had to be easily operated by even inexperienced personnel. Moreover, coordination among the Louvre, the exhibit designers, the museum, the local craftsmen, and Goppion presented its own challenges.

Goppion's Solution Goppion technicians worked in close synergy with designers in the project work phase to implement the formal requirements in detail, always taking care to respect the functional demands of conservation, security and ease of use.
We followed the prototyping process that has proved so successful in many of our projects, allowing museum curators and exhibit designers to model and test every case for its functionality before installation.
We also developed specialized support systems for the objects and the lamps to be suspended from the ceiling. In this fashion every aesthetic and functional challenge was addressed.

Client Supreme Council of Antiquities
Exhibition Design Adrien Gardère, Paris
Project Data Exhibition area: 3,100 m²; exhibition units: 125; length of the exhibit fronts: 268 m

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2006 - 2010 **Musée des Beaux-Arts de Limoges, Limoges, France**

The Limoges Museum of Fine Arts, housed in the beautiful 18th century Palais de l'Evêché in the heart of the Medieval city, faces the modern-day city from a series of terraced gardens along the banks of the Vienne River. Its collections relate to the history, culture and influence of Limoges enamel and also collections of sculpture, paintings and drawings that are part of the city's historical legacy and once adorned its public buildings. The permanent collections are located on the three floors of the main building; the first floor includes exhibits of Egyptian art, archaeology, and history of Limoges, the second houses the museum's extensive collection of paintings, and the top floor is devoted to enamel, gold, and silver. The path through the museum is conceived of as an indoor promenade where light and décor play a leading role in fostering moments of intensity, pause and inspiration.

The challenge

The unifying concept of the project was to embrace the finely equilibrated original composition of the former Episcopal palace. To honor the spirit of the place, the exhibit designers strove to ensure that the interior arrangement and casework would not overwhelm the residential character of the building, While indispensable to the optimal exhibition and conservation of the collections, the museographic elements had to be nearly invisible, bringing into view only the works and the setting without removing anything of their essence. Though minimalist in its graphic expression, the project represents a major technical achievement of construction and conservation. Casework had to include climate control using silica gel trays, integrated temperature and humidity sensors, close-protection devices (PRO), opening mechanisms, and large dimension glass elements.

Goppion's Solution

True technical mastery lies in achieving imperceptibility. The exhibition design thus relies on minimalist glass-and-metal showcases and stands that invite a dialogue between the contemporary museography and the stone architecture of the lower levels of the Palais and evolve into more decorative expressions on the upper floors. To maintain a focus on the works of art along the path through the museum and to integrate the display apparatus into the overall décor of the halls, Goppion created high-quality museum furnishings that meld seamlessly into their setting while making no compromises in terms of the technology indispensable for protecting and conserving the works. Working in collaboration with the architects and exhibit designers, Goppion applied its renowned method of prototype research to fine-tune showcases that push the envelope in exhibition technology (height adjustable, tilting supports, removable and interchangeable internal fittings, etc.). The adaptive flexibility of the resulting display apparatus represents an invaluable asset for the museum.

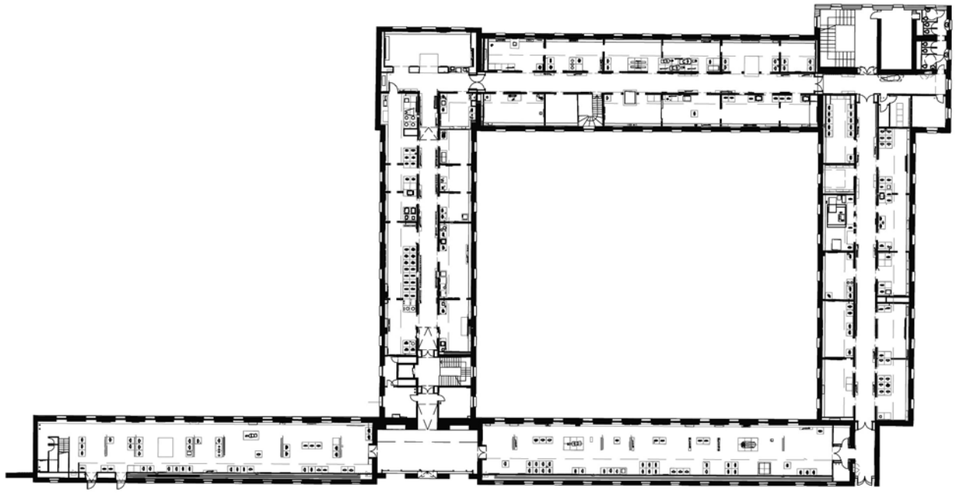
Client Ville de Limoges
Exhibition Design Fabrice Mazaud, Dubois et Associés, Paris
Project Data Exhibition area: 6,500 m²; exhibition units: 160; length of the exhibit fronts: 350 m

2007 - 2010 Musée de l'Armée, Département Moderne, Paris, France

In the spring of 2010, the East Wing of Paris's Musée de l'Armée reopened to the public following a ten-year, 68 million-euro renovation. The East Wing offers a fascinating and spectacular tour through French history. First to open were galleries celebrating the campaigns of the French armed forces from the 17th century to the Second Empire. With the subsequent opening of a second series of galleries covering periods up to the Commune, visitors can now journey though French history from the middle ages to the present day. Two former soldier's mess halls have also been reimagined as exhibit spaces. One recreates the hall as it appeared originally and includes educational materials on the mess's history; the other displays the Musée's impressive collection of cavalry uniforms of the 18th century.

The challenge

In 2007, the Musée de l'Armée engaged us to renovate the galleries of Departement Moderne. The challenges were considerable: we had to undertake a vast, technically complex project and integrate the layout design with the existing building structure in a relatively short time. To build exhibition cases spread out over



a surface area of over 2000 square meters, we used over 262,000 kg of steel, 2250 square meters of glass, 3350 meters of seals, and prepared over 7,000 construction and coordination drawings.

Goppion's Solution

Our work fosters and highlights the interplay among the layout design, the display cases, and the building. According to Adeline Rispal's museum design concept, broad showcases, based on an anthropomorphic grid pattern, contain the prestigious collections lined up in an orderly fashion that recalls troops on the march. Mirrors at the back of the showcases multiply the number of uniforms to produce a mass effect and to show the soldiers from all sides. The showcases pass through the partitions between the rooms, either virtually or in actual fact, to express army corps moving across ever vaster stretches of land.
A modular, unitized structure of metal and glass panelling was used in the galleries, completely covering the masonry and forming wall linings and false ceilings to conceal the technical installations. The back panels of false walls contain built-in display cases, while the false ceilings both contain the accent lighting units and form the upper elements of the display cases.
Over 200 exhibition cases thus disappear from sight, allowing patrons to see the content and supporting educational materials without any apparent barriers. Goppion's expert application of mechanical and structural engineering, electronics, and climate-control technology allowed us to realize the vision of the museum and exhibit designers. Goppion's rigid quality control processes were personally vetted and approved by the Museum Director, General Robert Bresse.

General Robert Bresse
Director of the Musée de l'Armée

"Goppion, among other things, has been able to deal with a series of modifications and difficulties that inevitably occur within an area classified as a historic monument. It has coordinated to the utmost levels the job at hand with the work being carried out by other sectors working on the project."

Client
Musée de l'Armée

Architecture and Exhibition Design
Adeline Rispal, Réperages Architectures, Paris

Project Data
Exhibition area: 2,000 m^2; exhibition units: 400; length of the exhibit fronts: 360 m

2007 - 2010

Museum of Fine Arts, Boston, United States of America
Art of the Americas Wing
The Egyptian Gallery
The Greek Gallery

The MFA, Boston, is one of the world's preeminent art museums. In the fall of 2010 the MFA opened its Foster & Partners designed New American Wing, a $500 million project ten years in the making.
The project has enriched the ways in which visitors encounter the Museum's great works of art, improved navigation through its galleries, and enhanced and increased space for the MFA's encyclopedic collection (400,000 objects), educational programs, conservation facilities and special exhibitions.
For the first time since the Museum's founding in 1870, the art of North, Central and South America are presented together in the New American Wing. The American Wing's four levels of galleries have been arranged in a broad chronology, beginning with objects from the earliest prehistoric Native American and pre-Columbian collections on the lowest level and traversing through time and genre until visitors experience mid 20th century works, in all media, on the top floor.
Flanked by two pavilions, one north and one south, the New American Wing incorporates large areas of glass, making the Museum more transparent and welcoming to neighbouring communities, as well as complementing the Museum's historic architecture.

The challenge

Goppion was engaged for the engineering design, prototyping, cost control, production and installation of the cases for the New American Wing. Working along with the Museum Design Office of the MFA, Goppion has contributed, and continues to contribute, to the renewal of many other galleries in the existing building.
The ultimate goal and challenge of this project was to collaboratively utilize the creative talents and energies of a diverse team to create a superior product and, ultimately, a truly unique visitor experience. Given the scale of the project – over 175 major constructions arrayed over 13,000 square meters and four levels of galleries - the challenge was also to deliver a very large and complex project on budget and on time, integrating for each group of cases the conservation requirements of the Museum, while simultaneously striking the right balance between the concept design of the architects and the needs of the curators. Despite the geographical distances among The MFA, Foster & Partners and Goppion, these goals were achieved by developing a common reference, electronic platform, and 'case language' that allowed each member of the team to play its role at the right time and in strong integration with the others.

Goppion's contribution

This huge project represented an opportunity for Goppion to further refine its collaborative method of engineering design as one of the key selection criteria and core principles was the fostering of cooperation between the various parties.
The MFA and F&P developed preliminary design concepts and defined the overall

project budget. Once we were on board, the gallery design team worked together with Goppion to complete the design and finalize the budget as part of the design development process. During the initial phase Goppion also worked with the MFA on defining the conservation, security, and maintenance criteria. Other considerations such as lighting, case access, object mounting and label installation were further refined with the team as part of the design development process. This process took almost one year. Once the definition of the major case types and "families" was complete, Goppion began the process of prototyping to better understand the physical realities of the various design concepts and the limitations embodied in all the considerations that go into the fabrication and assembly of display cases. As each prototype was completed and evaluated by the team, the design, which had only existed on paper and in drawings, became real.
Following prototyping and final approvals, the production and the installation were organized in relation to the priorities given by the Museum. Technically, some of the case types for the MFA are among our most sophisticated and finest work to date. Glass 'boxes' of exceptional scale house ship models, Eames chairs and pre-Columbian art with equanimity. Wall mounted cases with 6-meter-long hoods weighing nearly a ton can be operated by a single curator. Gossamer thin top hinges on the jewel-like display vitrines are invisibly integrated into recesses machined in the top glass.
Ultimately, the completed casework stands as a tribute to the ingenuity, skill, and cooperation of the entire team.

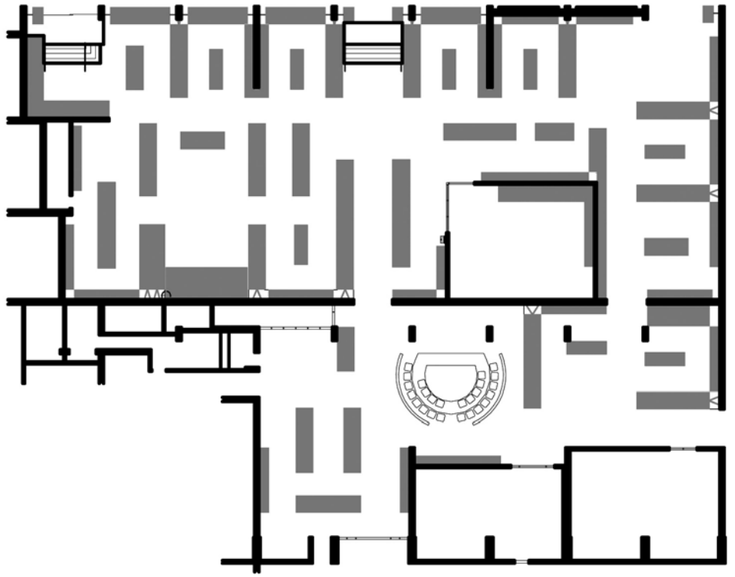
Tsugumi Maki Joiner
Manager of Gallery Planning & Installation
Exhibitions & Design

"Goppion's understanding of art historical theory and conservation practices, leads them to appreciate the need for non-standard cases that are unique to the objects. They do not believe in a "standard" product and would much rather cater to the individual needs of the client. (...)
The technical engineering of the cases is quite impressive as well. Goppion is thoughtful of structural and conservation concerns, all to minimize the potential issues thet can arise as cases are constructed and installed. The engineering staff are willing to work in partnership with designers, curators, conservators and architects to manufacture casework that not only looks tremendous, but is exceedingly functional. (...)
As a project manager however, my main concerns lie with installation scheduling and management of the site and product. Goppion has listened carefully to my concerns and strives endlessy to improve the overall project schedule. They understand the of the magnitude of our undertaking and continue to add resources as necessary. The MFA's project has been multifaceted with over 200 hundred pieces of casework produced by Goppion. And even in this climate of complexity, they remain a very organic company that grows and transforms quickly to meet the ever-changing demands of our project."

Client Museum of Fine Arts
Building Project Foster & Partners Limited, London
Exhibition Design Foster & Partners Limited, London; MFA's Department of Exhibitions and Design, Boston
Project Data Exhibition area: 7,200 m²; exhibition units: 295; length of the exhibit fronts: 670 m

2008 - 2010 **Museum of Anthropology at The University of British Columbia, Vancouver, Canada**
The First Nations Gallery

The UBC's Museum of Anthropology is one of Canada's foremost teaching museums, renowned for its Northwest Coast collections and its collaborative approach to working with First Nations and other cultural communities. Now, a major renovation and expansion has extended its role as a public and research institution. The project, by bringing 50% more of the museum's holding into view, has created unprecedented opportunities for research, teaching, and public enjoyment. Accessibility was the driving force of the renovation and now UBC's expanded "visible storage" allows scholars, students, originating communities, and the public to easily explore the collections' interpretations.
The environment had to create aesthetically pleasing yet densely packed displays. The UBC awarded the contract to Goppion, finding us uniquely qualified to create the casework, exhibit furnishings, and fixtures they needed.



The challenge

UBC's Museum was looking for a "partner" that could provide a superior display product and rise to the intellectual and design challenge of conceptualizing and building a new type of display system for the First Nations exhibit, representing the core of the museum's collection and mission. The MOA entered its relationship with Goppion with a clear concept of what the cases were meant to achieve, yet were unsure of how – or even whether – it was possible to realize their vision. Case interiors had to be easy to reconfigure to accommodate the vast number and sheer variety of objects on display – everything from a seal-bone fishhook to a cedar canoe. We had to create cases for the 1,400-square-meter gallery under exceptionally rigorous time and budgetary constraints. The installation was further complicated by the simultaneous renovation of the building itself, the needs of the many stakeholders, and the logistics of international shipping and customs. Over the course of a year, Goppion and the MOA held numerous site meetings in Vancouver and Milan, out of which arose the elegant, customized design-build solution represented in the pages following.

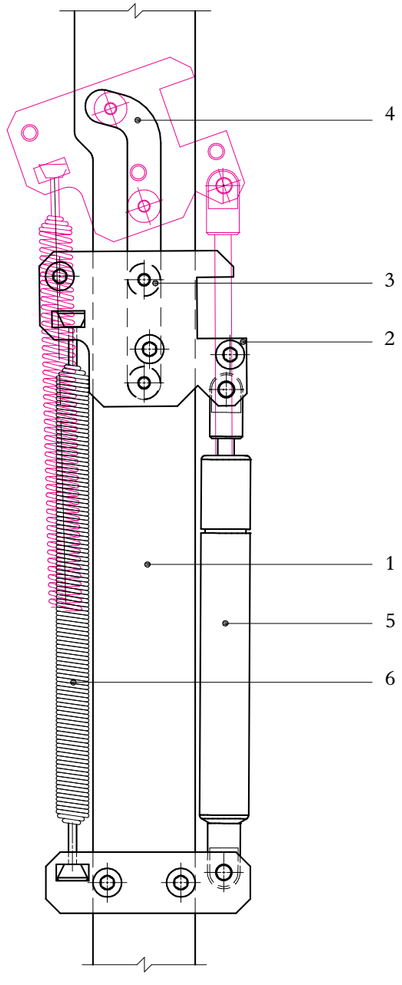
Goppion's Solution

Although the Study Collection for the MOA had been successfully displayed for some time in an early and effective "open storage" implementation, the museum clearly understood that the vastly expanded exhibit would require reimagining both the drawer and glass-faced case systems. Goppion's custom solution arose from our unique ability to understand the client's needs and our unparalleled ability to design and adapt the case form and function to meet them. We took the initiative to develop a unique anti-racking, damped closure, progressive opening, drawer glide system for the 3-meter-wide x 1.5-meter-deep drawers used throughout the exhibit. Ultimately, our engineered solutions met and exceeded conservation and security requirements. The display environments, both drawers and glass-faced cases, support simple and rational access by both museum staff and authorized researchers. Throughout the process, Goppion designers and project managers used video conferencing and face-to-face meetings to share 3-dimensional models and files. The skills and expertise of the design team, working in concert with the client, resulted in unique and creative solutions to the myriad challenges of design, manufacturing, and installation noted above.

Skooker Broome
Senior Exhibit Designer, MOA

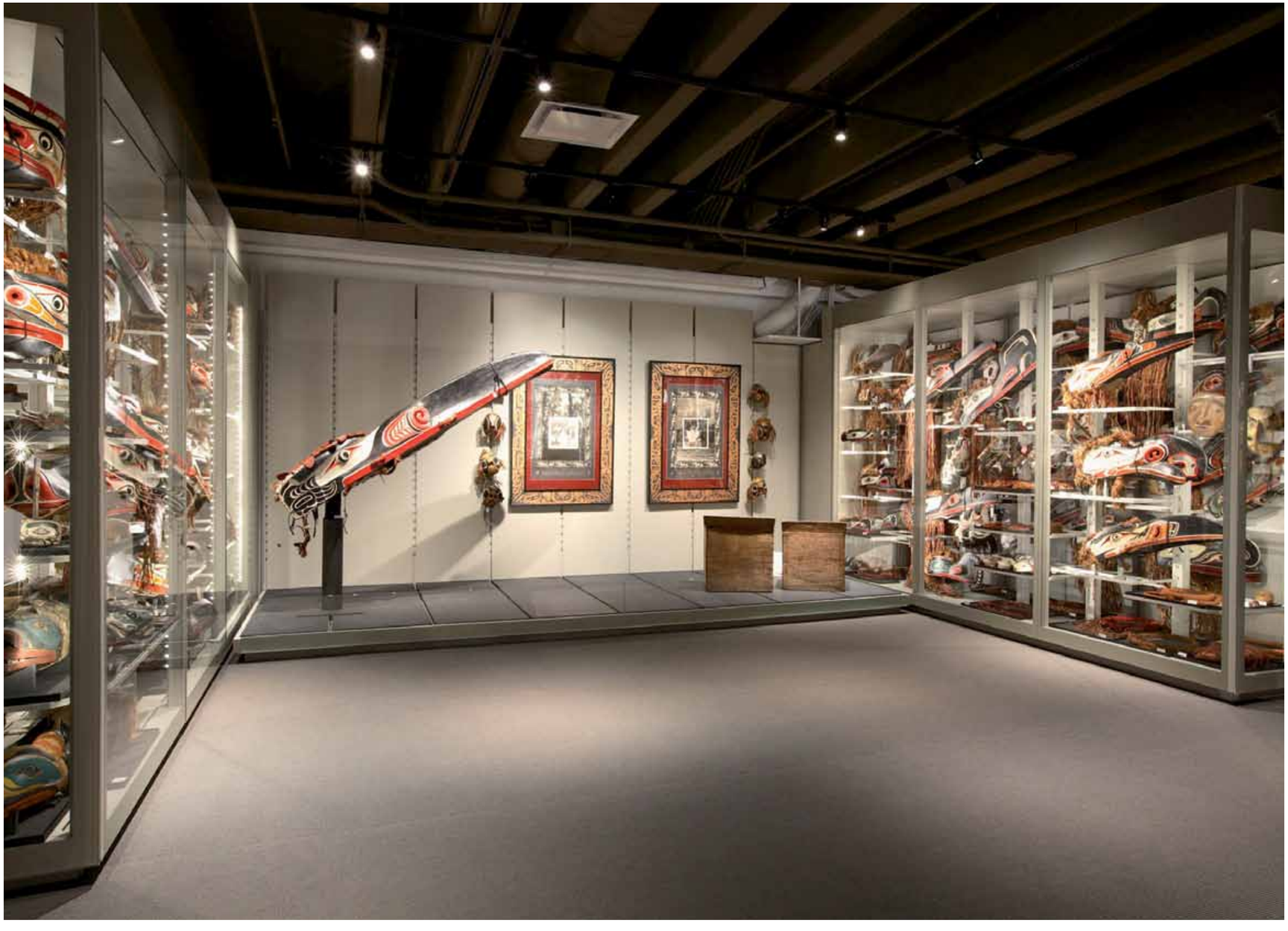
"The client relationship developed with Goppion was one of the most rewarding and professional of my 25-year career in Museum design."

Client
The University of British Columbia
Building Project
Stantec Architecture, Noel Best, Vancouver
Museum Renewal Project
Graham Downes Architecture Inc., Steven Hoard, San Diego
Exhibition Design
Anthony Shelton, Skooker Broome, David Cunningham, MOA–Vancouver
Project Data
Exhibition area: 1,670 m²; exhibition units: 76; number opf drawers: 536; length of the exhibit fronts: 407 m



The large, heavy drawers built for this museum are fitted with high-performance guiderails. If not controlled, the mass in movement takes on considerable inertia, which would cause impact at the end-of-stroke in the closing phase. To eliminate this problem and to ensure perfect soft closure, we created special dampers that return the drawers to position in the final phase of closure. In the design a partial detail of this mechanism, composed of: 1, main unit; 2, cursor with hook; 3, ball bearings; 4, guide slot of the cursor; 5, gas damper; 6, spring return.


EXIT




EXIT
62

2008 - 2010 **Museo Galileo, Florence, Italy**

At the end of a restoration process that has revolutionized the exhibition space and its furnishings, the Institute and Museum of the History of Science has reopened to the public with a new name: Museo Galileo. The name accentuates the importance of Galileo's legacy to this museum, an institution with an inestimable wealth of instruments and experimental devices. A museum and at the same time a research and documentation institute. The restoration has significantly enhanced it architecturally and subtly amplified its emotional impact.

The challenge

"Customization" for the Museo Galileo had to be taken to its extremes. A calibrated use of light, colors and materials enhance the presentation of the objects and provide coherence to the path of the visitor. The pursued aim was to create a connected universe of presentation that unified its surrounding architecture with the conservation and display of this stunning collection.

Goppion's Solution

Goppion's elegant new-generation showcases have been designed with innovative case fittings and materials that serve to not only enhance and elevate the aesthetic quality of the objects contained, but also guarantee a perfect conservation. A special rear-illuminated case hosts the core of the collection of the Accademia del Cimento, a collection of historic glass instruments of inestimable value. The visitors view of its precious content remains uninterrupted by virtue of a uniform glass of almost 6 meters length at a weight approaching 450 kg, which is still openable by a single person. Because of logistical limitations on the construction site, more than 580 square meters of glass and 46 tons of steel for all caseworks were brought into the Palazzo through a single window on the first floor of the building.

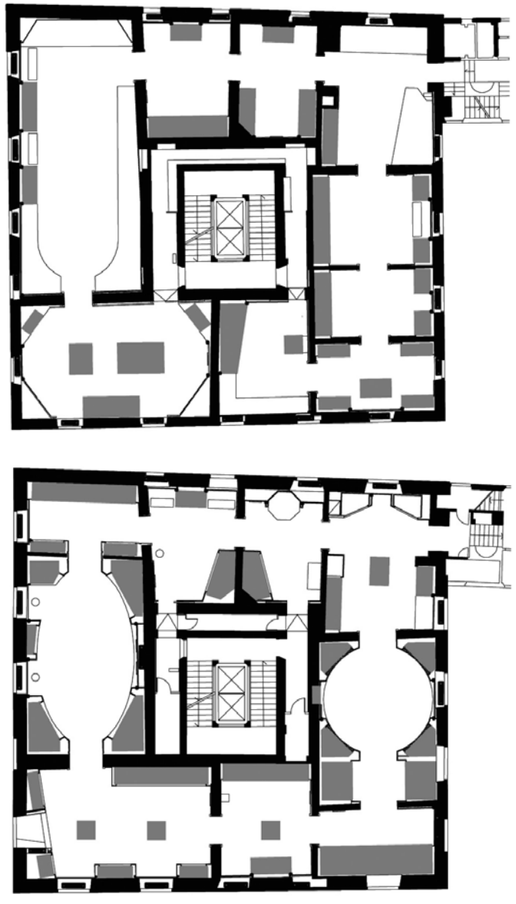
Awards

The Museo Galileo has been awarded The 2011 European Museum Academy Prize.

Paolo Galluzzi
Director of The Institute and Museum of the History of Science, Museo Galileo

"The showcases are state-of-the-art both in terms of conservation and in simplicity of use. Impressive machines, in balance between design and technology."

Client Museo Galileo
Exhibition Design Studio Associato Guicciardini & Magni Architetti, Florence
Project Data Exhibition area: 1,500 m²; exhibition units: 60; length of the exhibit fronts: 160 m



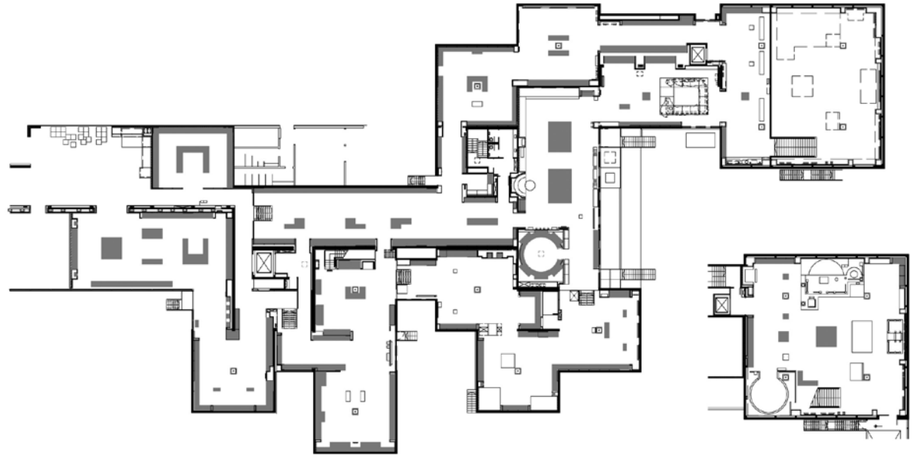

L'astronomia e il tempo

2008 - 2010 **The Israel Museum, Samuel and Saidye Bronfman Archaeological Wing, Jerusalem, Israel**

Israel's most important cultural institution has collected more than 500,000 objects of archaeological, anthropologic and artistic importance, spanning the timescale from prehistory to today. In the summer of 2010, the collaborative team of US architect James Carpenter and Efrat-Kowalsky and A. Lerman Architects of Tel Aviv completed the reorganization of the museum campus, with an area of 280,000 square meters at a total cost exceeding $100 MM which has transformed the three main galleries completely, expanding their exhibition space and improving every facet of their appearance. In the spirit of the museum's founders, the curator's intention was not only to modernize the museum and to make it more accessible but, first and foremost, to suggest interesting connections between objects and contexts within the museum's exhibition (ancient and modern, sacred and secular) and to underline the affinity between the diverse Judaic cultures as well as to frame the arc of the Hebrew culture in the wider spectrum of global history.

The challenge

Goppion developed and manufactured the casework for the Bronfman Archaeological Wing. The design, by Daniel Weil and John Rushworth of Pentagram Ltd., is noteworthy in that the interior architecture and finishes have been organized



within a three-dimensional grid, harmonically integrating the 200 transparent 'modules' that are formed by the display cases with the finished concrete surfaces of the existing architecture.

Goppion's Solution

The necessity to conform to the strict geometries of the three dimensional external grid required exceptionally rigorous, millimeter level, tolerances of our constructions, challenging the entire process from manufacturing to installation. As the museum has to be able to modify the position and division of the internal case fittings over time, Goppion has designed and manufactured a grid of threaded holes concealed within the backwall of the cases which enable this flexibility. The showcases in the Bronfman Wing are an addition to the cases installed by Goppion in 2004 in the Shrine of the Book.

Client
The Israel Museum

Exhibition Design
Daniel Weil and John Rushworth, Pentagram Design, London;
Rivka Myers, The Israel Museum, Exhibition Design Department, Jerusalem

Project Data
Exhibition area: 4,000 m^2; exhibition units: 276; length of the exhibit fronts: 700 m

2008 - 2010 **LaM - Lille métropole musée d'art moderne, d'art contemporain et d'art brut, Villeneuve-d'Ascq, France**

Situated in the leafy Villeneuve d'Ascq park on the outskirts of Lille, the Lille Métropole Museum of Modern Art houses an extensive and varied collection of 20th century and modern art. Fervent art aficionado Roger Dutilleul (1873-1956) started collecting avant-garde artwork in the early 1900s. He was one of the first to appreciate Cubist art, buying works by Braque and Picasso when they were still relatively unknown. He also had a strong interest in figurative work (Modigliani, Buffet, Dodeigne). Dutilleul's nephew, Jean Masurel, started collecting in the 1920s and inherited the majority of his uncle's collection. In 1979 he donated the 219 drawings, paintings, engravings and sculptures to the city of Lille, which built the museum to receive the collection. Since its groundbreaking opening in 1983, the museum has built on this original donation to create a strong collection of contemporary art, and, in 1995 received a substantial donation of art brut, including work by Carlo Zinelli, Paul End and Madge Gill. The museum grounds also include an enchanting sculpture park, which boasts Picasso's Femme aux bras écartés. The existing building maintains a close dialogue with the park in which it stands; the new volumes make use of a resolutely contemporary architecture respectful of the old volumes, which they do not seek to copy, but whose scale and principles of relationship with the surroundings they borrow.

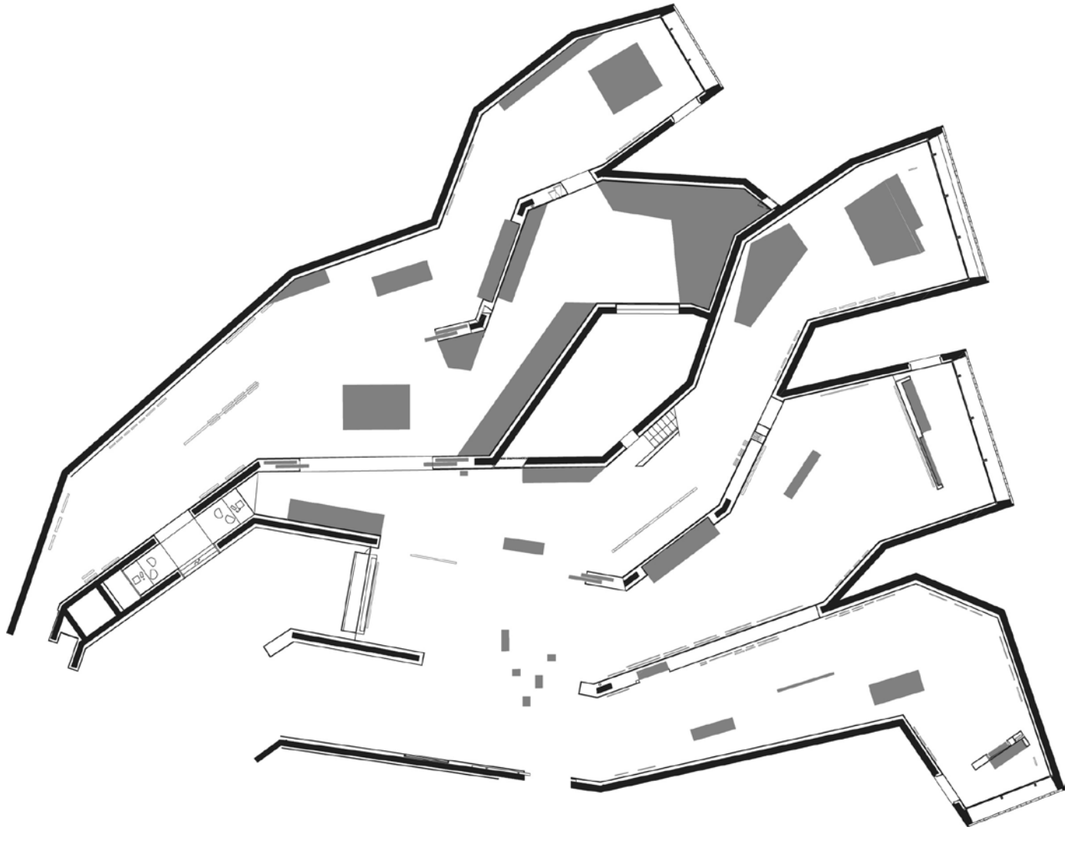
The challenge

The layout of the art brut collection makes full use of the open spaces and offers different perspectives on the works to instigate surprising dialogues between them and the viewers. The exhibit design intentionally recedes to show the works themselves to best effect. Soft light plays over the volumes, the walls of which are all painted in the same light tone. Goppion's challenge was to integrate its casework with this quiet aesthetic.

Goppion's Solution

Goppion has made the museographical part efficient by hiding all necessary technology and revealing only the elegant appearance of the fine materials. The pedestals and stands, made with a high-performance reinforced concrete, seem to emerge from the walls and floors of the same material. Seamless glass display cases all but disappear from view, while the central cabinets have frames of etched glass that echo the architectural screens.

Client Lille Métropole Communauté Urbaine
Exhibition Design Renaud Pierard, Paris
Project Data Exhibition area: 2,250 m²; exhibition units: 33; length of the exhibit fronts: 100 m



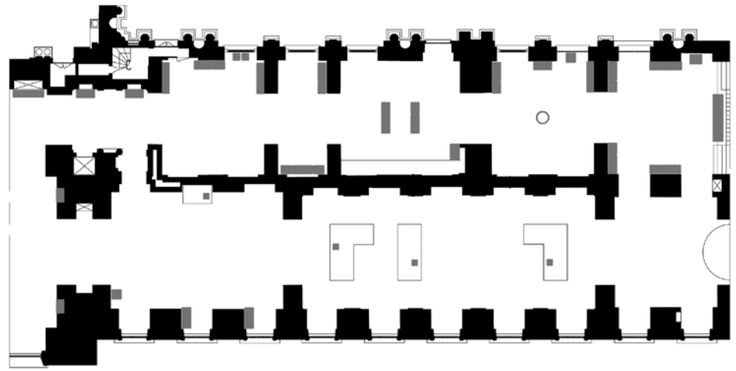

3

2009 - 2010 **Musée du Louvre, Paris, France**
Galerie de la Vénus de Milo

In the summer of 2010, following some significant renovations, the Musée du Louvre re-opened the galleries dedicated to classic Greek and Hellenistic art to the public. The complex is articulated in two galleries, formerly part of the ancient royal apartments, and extend to the famous Galeries des Cariatides. The geographically structured North gallery constitutes a real journey through Greek artwork from the age of Parthenon to the Roman conquest and features some of the most famous masterpieces of this genre: a splendid diadem made of gold and enamel, a vase with Medusa's head, paintings representing Alexander the Great and Cleopatra, and the enormous vase of Pergamo. The South gallery, sited in parallel to the North gallery, displays replicas of lost Roman masterpieces in a thematic walk-through dedicated to the Gods and the heroes of Greek mythology. The show culminates in the gallery of the Venus de Milo (the most visited object after the "Monna Lisa"). Following a long and detailed conservation, this piece of art has been placed where it was exposed after its discovery in 1820.

The challenge

Goppion has collaborated with the Direction Architecture-Muséographie-Technique of the Musée du Louvre in order to develop a case design vocabulary that maintains the traditional line and form while integrating the state-of-the-art in display environment, preventive conservation, illumination and flexibility of use.

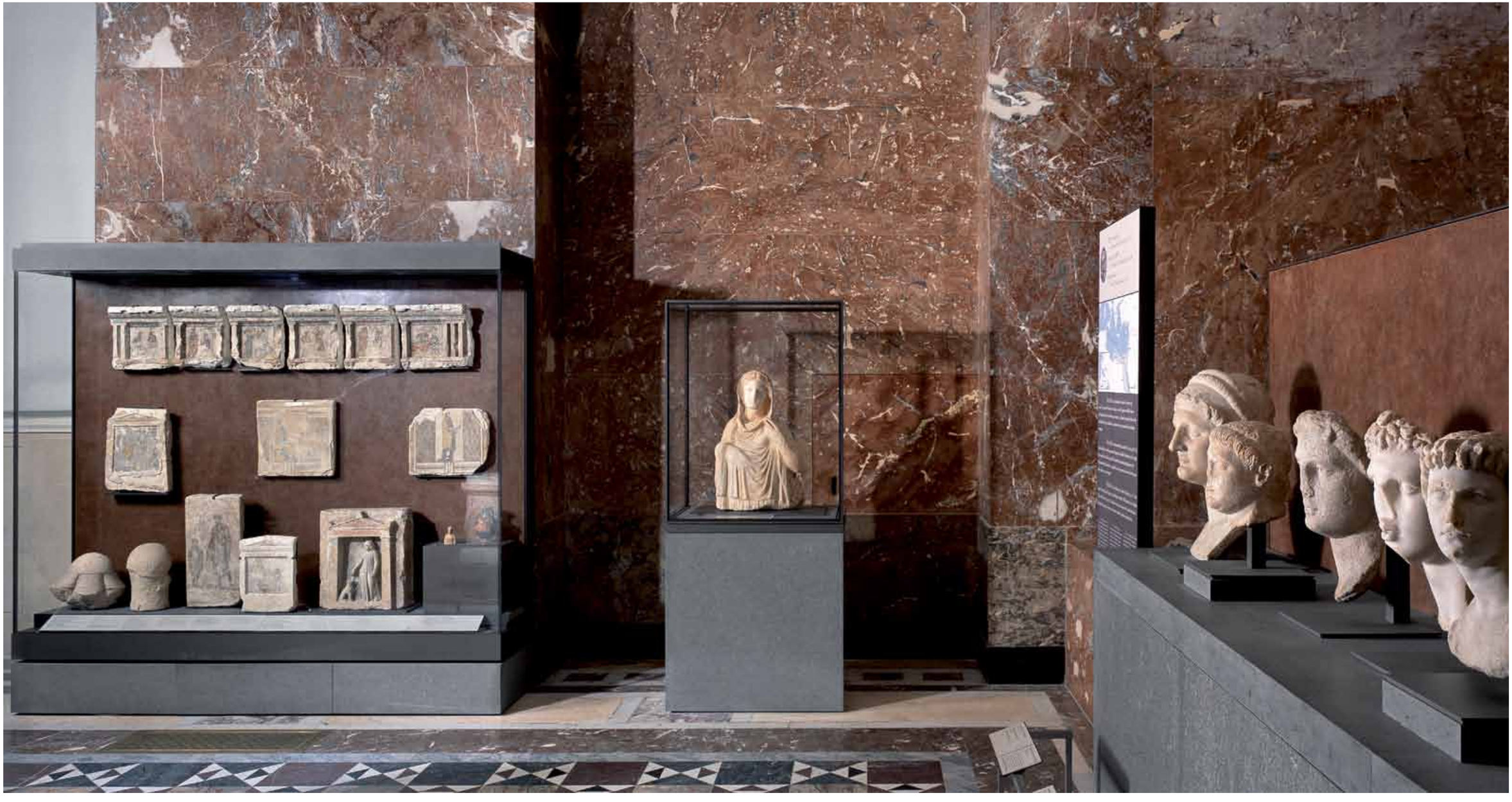


Goppion's Solution The development of the special metal mounts for the glass cases was a relevant aspect of the way Goppion contributed to the project. In this project, Goppion's clients were demanding both in terms of the product's performance as well as in exhibit design. The aforementioned mounts incorporate the LED lighting devices and were designed to be able to evacuate the heat produced by the spotlights and in order to guarantee the maximum usefull capacity of the exhibition space within the case. The final solution was the result of a lengthy creative process during which Goppion demonstrated the utmost degree of proactivity in the ongoing improvement of these devices right up to their assembly. In the end, thanks to the inclusion of special light-protective grills on the individual LEDs, Goppion was able to reduce the effects of light glare and reflection on the glass surfaces of the cases and marble walls of the exhibition rooms. During the renovation work the Gallery was open to the public as normal.

Client Etablissement Public du Musée du Louvre, Paris

Exhibition Design Direction Architecture-Muséographie-Technique, Musée du Louvre, Paris; Exhibition designer in charge: Sonia Glasberg

Project Data Exhibition area: 1,000 m²; exhibition units: 33; length of the exhibit fronts: 70 m



2009 - 2010 Musée Tomi Ungerer, Strasbourg, France

The Musée Tomi Ungerer opened in November 2007 at the Greiner Villa, a house dating to the end of the 19th Century located within an exceptional architectural environment in the historical heart of Strasbourg. The museum, which bears the name of Tomi Ungerer, the renowned artist and illustrator from Strasbourg, offers a museographic tour based primarily on the display of paper works that have been donated to his native town over the past 35 years. It aims to show his prolific work to the entire world, in all its aspects, from children's books to satirical drawings, posters, commercial art and some sculptures. Beyond this monographic tour, the museum is also presenting artworks from other international illustrators and artists of the 20th Century.

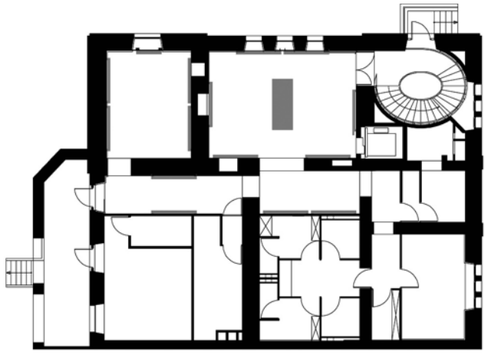
The challenge

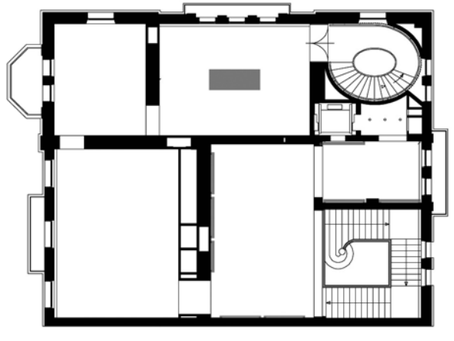
All in all, the collection is comprised of eight thousand original drawings that have to be presented to the public in rotation. The designer conceived the display cases as "glass bubbles" that would, by their transparency, provide an unimpeded view of the artwork while, simultaneaosly, protecting the fragile works on paper from degradation.

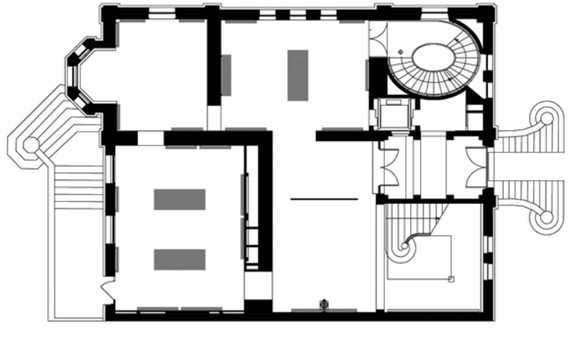
Goppion's Solution

Goppion helped make possible the realization of the full concept; we delivered the requested 'bubble' cases, a superior display envelope, and the flexibility necessary to change out the content several times a year.

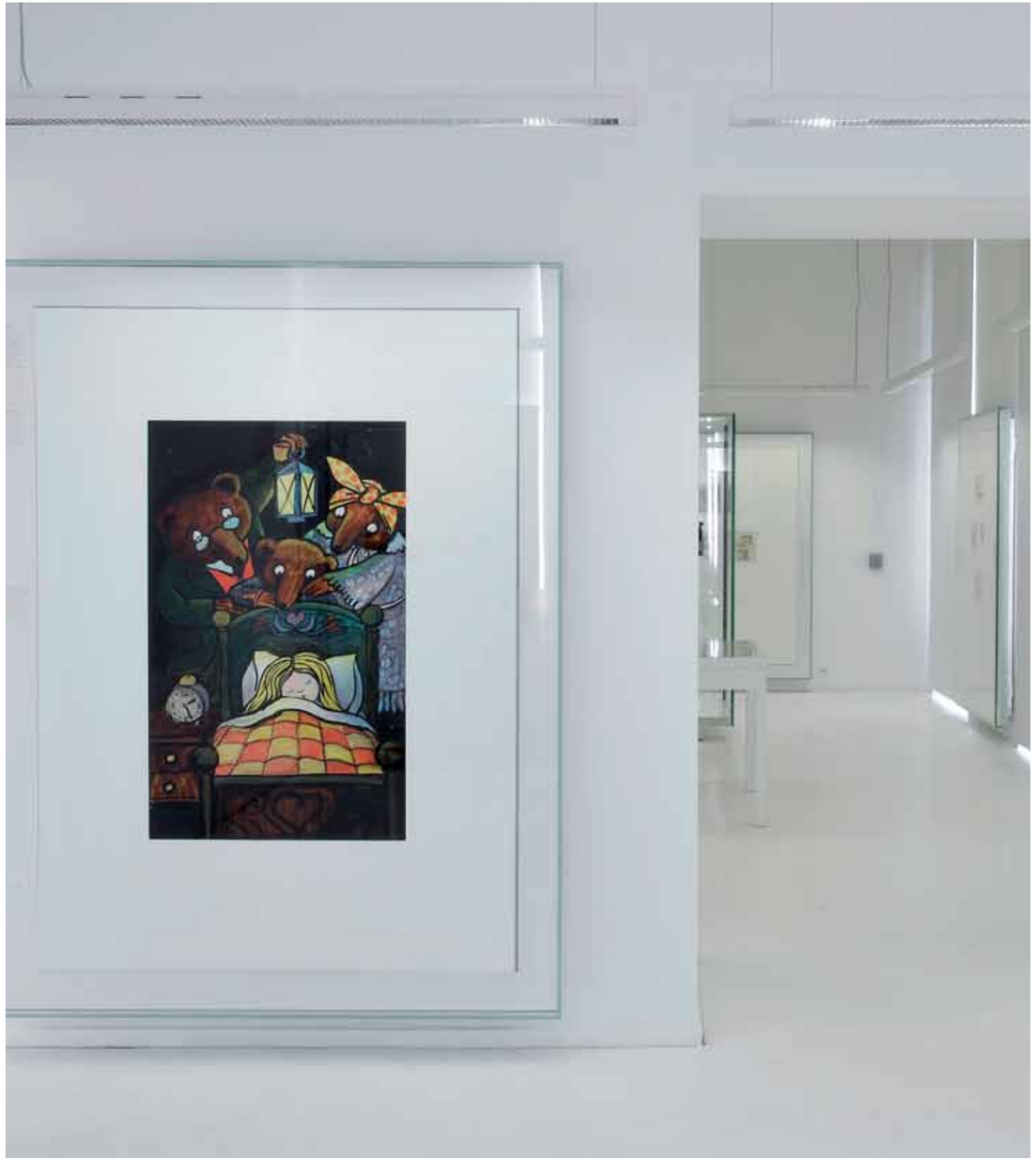
Client Ville de Strasbourg
Restauration Emmanuel Combarel, Paris
Exhibition Design Roberto Ostinelli, Paris
Project Data Exhibition area: 1,500 m²; exhibition units: 47; length of the exhibit fronts: 100 m








Les années canadiennes de Tomi Ungerer. 1971-1975
"Here Today, Gone Tomorrow"
BLACK POWER



2009 - 2010 **Smithsonian Institution, The National Museum of the American Indian, George Gustav Heye Center, New York, United States of America**

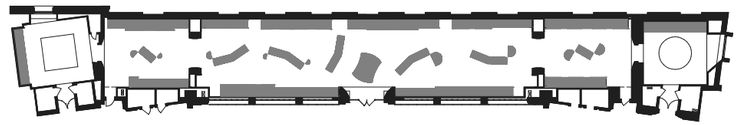
The National Museum of the American Indian (NMAI) houses one of the world's great cultural resources, with collections representing the Native peoples of the Americas from their earliest history to the present day. With 825,000 objects from over 1,200 indigenous groups from Canada, the U.S., Mexico, South America and the Caribbean, the museum retraces the 12,000 year history and culture of these peoples. On October 20th, 2010 the "Infinity of Nations" exhibition opened to the public, placing nearly seven hundred carefully curated objects of particular cultural, historical, and aesthetic importance on view at the at the museum's George Gustav Heye Center in New York City .

The challenge

Modular wall cases, the largest of which stand 3.65 m tall and run up to 13 m long, were central to the exhibit deign. These cases, despite their minimal visible framing, structural glass mullions, glass tops, and exceptionally large doors, had to have the structural integrity to maintain a completely airtight seal yet still be visually clean and easy for a curator to open singlehandedly. Another challenge was engineering the special 3 m x 2.4 m x 1 m "Buffalo Hide" case, which included precision bent and pattern-cut glass and a sophisticated electrical lifting mechanism. Adding to the significant case engineering challenges, all pieces had to be sized and modularized so they could be delivered through a complicated logistic path that began at Goppion's workshop in Italy, to a warehouse in Long Island City, to the historic Custom House in Lower Manhattan, and finally, rigged up through an interior stairwell to their assembly point in the second- floor galleries.

Goppion's Solution

All display cases were custom-engineered in close collaboration with Imrey Culbert LP and NMAI New York's Exhibition Department. The design documents had been completed to a 65% stage, ideal for completion utilizing Goppion's collaborative design assist process. With the help of an FEM structural analysis, Goppion engineers developed alternative solutions, introducing the O-Ring principle to the design. The developed engineering solutions were then implemented, presented and evaluated on a full-size prototype. Ultimately, the adaptations the team developed through the prototype process hewed to the original design intent while warranting that the cases would be sound from both a structural and curatorial standpoint.

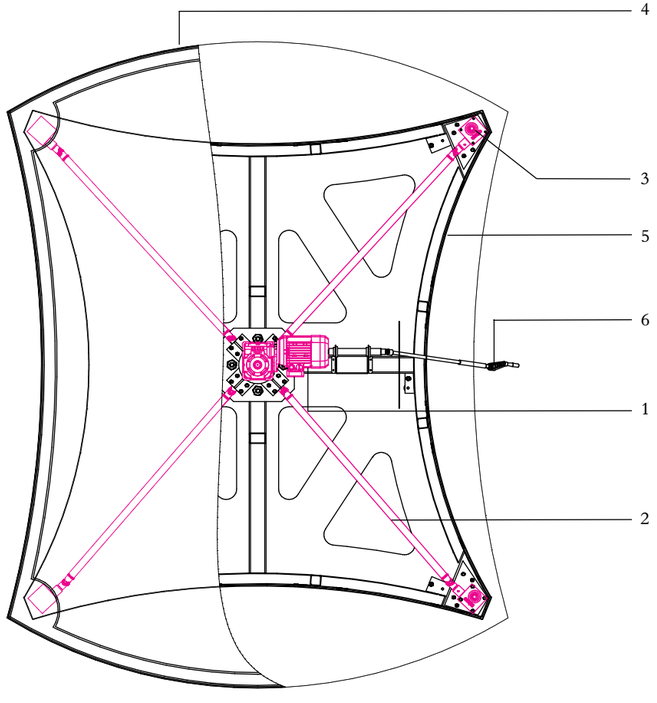


Having solved the technical challenges, Goppion was able to implement the engineering design such that no pieces bulkier than a carefully calculated maximum bounding box or heavier than the maximum load capacity of the projected handling equipment found their way inside the containers bound for the US. Over the course of 12 weeks, 14 containers were imported, unloaded, rigged, and their contents installed, in tight coordination with the museum and their other contractors.
Ultimately, by applying Goppion's unique prototype-based working method to the development of the engineering and our skilled craft to the production, the beautiful display cases that comprise the "Infinity of Nations" exhibition successfully deliver the combined design vision of Imrey Culbert and the NMAI, the full measure of the display environment envisioned by the Smithsonian, and the superior conservation performance demanded by the collection itself.

Client Smithsonian Institution

Exhibition Design Celia Imrey, Imrey Culbert LP, New York; Gerard Breen, NMAI – Exhibitions Department, New York

Project Data Exhibition area: 600 m²; exhibition units: 34; length of the exhibit fronts: 170 m



Detailed plain view with a section of the "Buffalo Hide" case: 1, Motorized lift-up system for the glass hood; 2, transmission axle; 3, deviation shaft; 4, glass hood with precision bent and pattern-cut glasses; 5, steel base; 6, handle for manual lift-up of the glass hood in case of emergency.


pachamama
"mother earth and light of the sun"
– AYMARA


oyate tamákoce

2010 MAXXI Museo Nazionale delle Arti del XXI Secolo, Rome, Italy

The MAXXI National Museum of the Arts of the XXI Century is the first national institution dedicated to contemporary creativity designed to be a learning center for culture. Housed in an innovative and spectacularly designed Zaha Hadid structure, Rome's MAXXI houses two museums: the MAXXI Arte and the MAXXI Architettura. The activities it carries out - from exhibitions, workshops, conferences, laboratories, shows, film-showings, educational/training projects – express its vocation for being not only a place where objects from our heritage are preserved and exhibited but for being a place where, above all, artistic experimentation can take place along with cultural innovation, study, and research.
If we posit an awareness that it is important to promote the expressions of creativity of a country – like Italy, characterized by centuries of artistic and architectural excellence - we have to establish a means to advance this core excellence into the future.
The MAXXI aims to be a centre of excellence, an interactive junction in which a very wide range of expression, productivity and creation will converge, mingle and reproduce. At the same time, if we accept that art and architecture are essential components in the image and perception of a country abroad, the MAXXI must therefore be a sort of "communication engine" that transmits what's going on in Italy to abroad and also receives what's going on culturally on foreign shores.

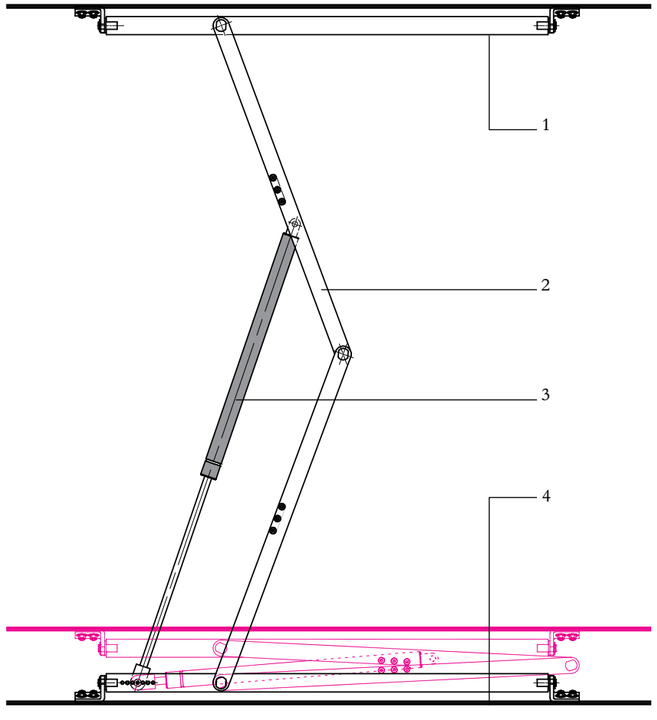
The challenge

The primary challenge of this exhibit was to develop a modular display system consisting of individual table case units that could be arrayed in varying configurations in order to create a unified display. As each module would be transparent at its edges, the hinging and hold-opens had to be concealed at the front and rear rather than on the edges as is more normal.

Goppion's Solution

The case design, by Aldo Aymonino of the Seste Engineering Studio, called for "origami" bases of folded steel supporting the table case modules. Goppion engineered the nesting base components to resist the load of the heavier case on top with a lightness of form that belies their strength. The modular center cases have transparent glass ends with back-painted bands front and back concealing specially configured gas-spring actuators and hinges respectively. LED lighting washes the exhibit environment and is concealed behind the back-paint at the rear. The cases can be assembled in multiple configurations each of which appears to be purpose built due to the transparency between modules and the graceful design of the base and cases themselves. The ethereal lightness and neutrality of the structures is enhanced by the white powdercoating on all visible steel.

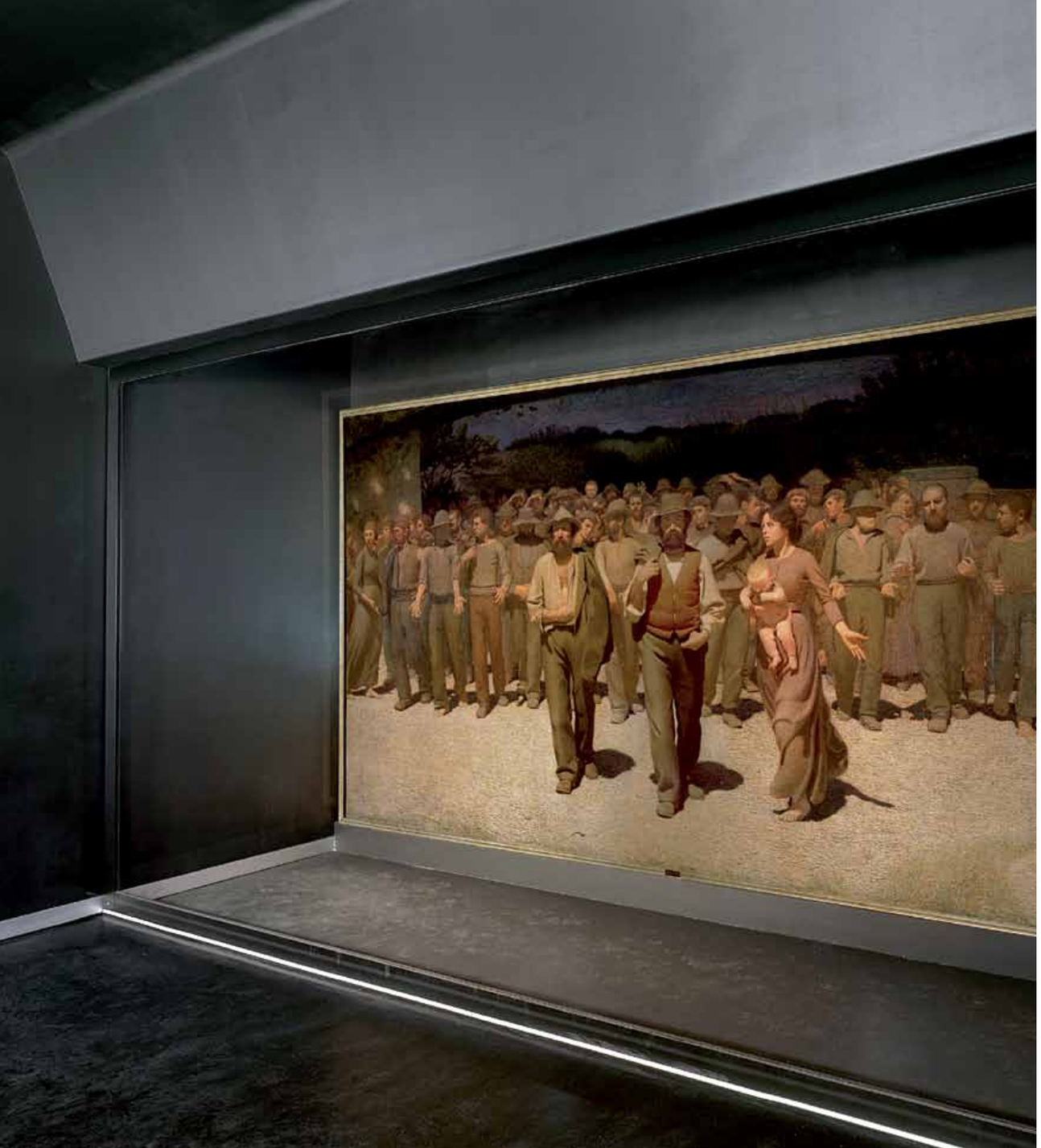
Client Fondazione MAXXI
Building Project Zaha Hadid, London
Exhibition Design Aldo Aymonino, Seste Engineering, Rome
Project Data Exhibition units: 67; length of the exhibit fronts: 101 m



The opening mechanism is composed of two connecting rods, which constitute a hinge - fixed to the glass panel (1) on one side and to the showcase (4) on the other side. The system is supported by gas struts (3), which keep the door open in its final opening position.


1965
Moretti e i su
contemporan
ITALIA
CONTESTO INTERNAZIONALE
Eventi/Editoria
SPAZIO
SPAZIO
SPAZIO
SPAZIO


1907
1980
ontemporanei
/ Editoria



2010 **Museo del Novecento, Milan, Italy**
Glass protection for "Il Quarto Stato" by Pellizza da Volpedo

The extensive art collection of the City of Milan has recently found an ideal home in the Arengario, an ambitious but incomplete palazzo in the Fascist style overlooking Piazza Duomo. Designed in 1936 and later converted by one of Italy's most original contemporary architects, Italo Rota (with Fabio Fornasari), the newly renovated Museo del Novecento ('Museum of the 20th Century') includes over 4,000 square meters of dedicated exhibition space distributed over three floors, as well as an equal amount of space devoted to services and offices.
Directed by Marina Pugliese, the renovation cost 22 million Euro and spanned three years. White walls and light parquet floors cleanly define the exhibition space and a rigorous chronological layout integrates galleries devoted to single artists (including Morandi, De Chirico, Martini, Melotti, Burri, Manzoni, and Fabro) with a rich illustrative program.
Open escalators connect the three floors of the museum and large windows offer splendid views of Milan's historic and contemporary architecture. A spiral ramp, Futurist in tone, connects the subway to the museum entrance. Halfway up this ramp stands a painting that symbolizes the transition between the 19th and 20th centuries: "Il Quarto Stato" (1902) by Pellizza da Volpedo. It depicts Piedmontese farmers on strike, marching toward the "sun of the future", and has become an icon of the social struggles of "the Short Century." The emblematic painting, placed under glass in a black recess that faces the ramp, both greets visitors to the museum and is visible from its exterior.

The challenge

The most challenging aspect of this installation was unquestionably transporting and installing the enormous protective glass panel that fronts the painting.

Goppion's Solution

To protect the "Il Quarto Stato", Goppion created a glass facing sheet measuring 5.50 x 2.80 meters, set at a distance of 1.80 meters from the canvas on a sliding track that ensures the proper conservation of the work while also facilitating access for ordinary maintenance operations.

A team from Goppion brought the glass into the building through the balcony of the Arengario. The huge laminated glass sheet, weighing more than half a ton (550 kg), was lifted 11 meters by a crane using a system of suction mounts and carefully maneuvered into the building. Too large to be transported along the walkways used by visitors, the glass was hoisted through the open space defined by the spiral ramp, with the help of a temporary steel gangway that was removed at the conclusion of the operation.

Client Comune di Milano
Exhibition Design Italo Rota, Fabio Fornasari, Milan
Project Data Exhibition units: 1; dimensions: l = 550 cm, h = 280 cm

Afterword

To conclude this volume—a gathering of some of our most significant projects—we would like to give a brief description of the engineering-design process and Goppion's interaction in the exhibition-design phase. We hope these pages will be useful to readers who may be about to tackle a complex museum project.

Identifying the design's primary objectives

The primary objectives of each project must be clearly identified ahead of the design process and must be kept in mind throughout the project up to and including the construction phase.
Independent of the cultural message and specific features of every museum project, the construction of a single case or complete exhibit installation should be guided by the following objectives:

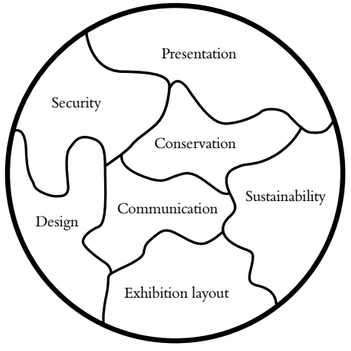
a. The product should meet the functional requirements of the Client or User (Curator and Keeper) with respect to exhibition content and available gallery space.
b. The project should be feasible within the confines of available methods and resources.
c. The project must be completed on budget and on time.

Project goals interact and may sometimes be incompatible. It is therefore essential that they should be clearly visible throughout the project, and ranked by priority.

Holistic approach and knowledge transfers: the special role of engineering design in Goppion's organization

Interaction

At Goppion, every project begins with a discussion panel in which all the issues and objectives are identified and assessed. The best way to take decisions on construction choices is to define the main requirements and reach agreement on them. This dialogue enables us to propose solutions that meet requirements by combining experience, creativity, and enthusiasm. Goppion's holistic working method ensures that the concerns of each working-group member are taken into account, and that the outcome will exceed the sum of all the inputs.
Awareness of the interaction between project goals will ensure that a change in one project requirement will entail a reassessment of all the others.



Interactions can take place in every phase and for every aspect of the project. Think of a good project as a puzzle in which all the pieces (the systems and components) interlock to form the whole picture. If a part changes shape, it will no longer fit into the puzzle unless one or more adjacent pieces are changed too.
To find satisfactory solutions, it is essential to maintain close and continuous dialogue between all project players from the very outset.
The user must also be able to physically evaluate various features, in particular by testing on prototypes. For example, the Israel Museum, during the prototyping of the vast Bronfman Archaeology Wing (over 300 display modules), sent its own handling manager to our Laboratorio in order to assess the solutions identified and applied not so much for technical quality but—above all—for functionality and ease of use.
Similarly, senior staff members of the Museum of the American Indian, the New York branch of the Smithsonian Institution, came to the Laboratorio to test the efficiency of the lighting systems. From the U.S., they brought reproductions of the objects to be exhibited and samples of the visual displays.

Innovation

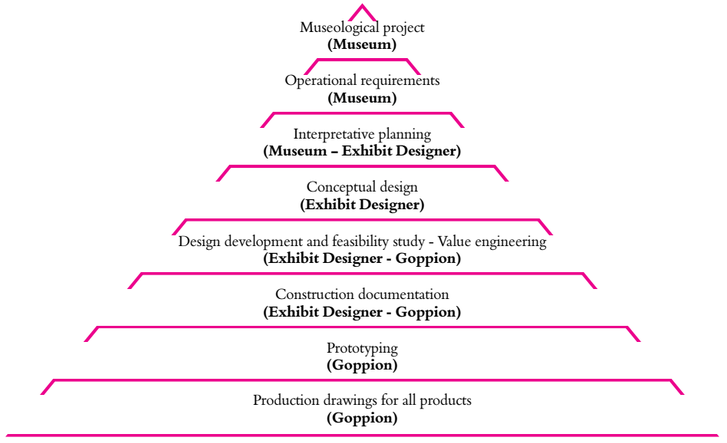
Since its inception, the Goppion Method has relied on balanced interdisciplinary and interpersonal cooperation. It encourages creativity and innovation, which we regard as crucial to attaining project quality and objectives. In this respect, Goppion stands clearly apart from its competitors, who are more inclined to fit museum demands into their standard product range.

Design to cost or cost effectiveness

The principles of "value for money" or "cost effectiveness" are key elements in Goppion's engineering-design process. In some cases, significant spending limits oblige us to develop the project on a "design-to-cost" basis. While this constraint influences the project, the result is not necessarily inferior if the budget ceiling is incorporated into the design process from the very start along with the other main factors.

The engineering-design process

We can depict the engineering-design process as a layered pyramid, to be read from the top down. Each stratum shows a phase that needs to be factored into the development of the entire project. However, the scope of each phase can vary according to the entity involved and the characteristics of the individual project.
We have chosen the pyramid shape to emphasize the key role of the museological project and operational requirements—expressed by the Museum—with respect to the other project phases.



1. Museological project

At the apex is the initial definition of the cultural/museological project by the Museum's administrative and curatorial staff. This involves a "presentation of ideas" and the choice of the objects to be displayed at the exhibition (Binni, Pinna, 1989). The project states the Museum's "mission" and institutional objectives.

2. Operational requirements

The Museum's conservation, security, and education departments define in parallel the requirements for the exhibition installation and display cases, such as airtightness, security, lighting, and relative-humidity (RH) control. Object-conservation requirements must be clearly stated at the start of the process, as they will impact the museological project. For example, they can influence the type of lighting, the spaces to be set aside for micro-climate control systems, the arrangement of the exhibition space (e.g. a particularly delicate fabric should be displayed only in a horizontal position or, at most, on an inclined plane, but not vertically), and the inclusion of anti-seismic features.

3. Interpretative planning (Museum - Exhibit Designer)

In close cooperation with the Museum, the Exhibit Designer prepares a comprehensive proposal for the collection to be displayed and reaches agreement on the aesthetic principles. This phase is supplemented by a series of plans of the exhibition levels showing how the objects will be distributed. These plans will become the exhibition development and design manual.

4. Conceptual design (Exhibit Designer)

In this phase, the Exhibit Designer prepares 3D visuals of the content as outlined in the interpretative planning documents. Special attention is devoted to spatial relationships in order to enhance the visitor experience and maximize the capability of the museological project to help viewers understand the items on display.
The concepts are submitted for approval to the Museum in the form of sketches, drawings, and floorplans. The approved concepts are incorporated into the exhibition space and serve to generate a schematic set of architectural drawings.
At this point a preliminary budget and work schedule are prepared.

5. Design development and Feasibility study (Exhibit Designer - Goppion)

The conceptual design approved by the Museum is now developed and refined. This phase consists of defining and detailing the construction, which must comply with the visual language agreed upon earlier. The Exhibit Designer specifies an initial combination of materials and finishings, and draws the arrangement of exhibits in the cases.
It is at this point that Goppion experts become involved. They will work with the Exhibit Designer to define construction solutions.
This is a critical phase, in which the technical and operational requirements are combined with structural and dimensional specifications. For example, if an active-type RH stabilization apparatus is planned, the base of the display case must be large enough to house it . This could require a tradeoff, in which all participants must be involved and fully aware of the pros and cons of each alternative, so as to obtain the optimal solution.
In this phase, the Exhibit Designer cooperates with Goppion engineers to specify the technological systems and equipment, and to position them in the overall exhibit plan.
Participating specialists analyze construction issues as and when they become relevant—such as structural strength, airtightness, and lighting-system performance. Synthetic overviews are produced, with technical drawings where appropriate.
One eloquent example of this dialogue-and-synthesis approach concerns the Nelson Atkins Museum of Art in Kansas City. The Museum's exhibit designer made several extended visits to the Laboratorio Goppion Engineering Department, working on the project with Goppion designers and conducting real-time tests by means of prototypes, mock-ups, and samples.
In this phase, Goppion's Cost-Estimating Office monitors project progress to ensure compliance with the initial budget.
A more detailed project work schedule is prepared.

6. Construction documentation (Exhibit Designer - Goppion)

The construction details proposed during design development (phase 5) are now refined and specified more fully. The team prepares complete visuals of the display, fuller descriptions of critical sections, and visuals of all the galleries. If needed, we produce a written document with technical specifications.
We conduct more detailed engineering and specialist studies to confirm or finalize the construction principles. We then execute detailed layout drawings to check that all the necessary apparatuses and systems are properly positioned in the defined configuration.At the end of this phase, the Goppion design team issues the construction drawings for approval.

Improving performance

The studies performed in this phase may indicate the desirability of enhancing project performance in certain areas. The Client may then decide to accept the recommendations, bearing the costs if needed.

This occurred with some leading museums that decided to invest in high-end or particularly innovative exhibition fittings. For example, at the same time as its display cases were being produced, the Getty Research Institute in Los Angeles commissioned a study on lighting systems from Laboratorio Museotecnico Goppion that led to an order for special fiber-optic terminals with adjustable optics. Similarly, during the construction of the Jameel Gallery of Islamic Art, the Victoria and Albert Museum expressed its desire to achieve specific objectives in terms of preventive conservation, accessibility, and visual elegance. To this end, it agreed to team up with Goppion to meet the challenge of engineering a glass display case for the Ardabil Carpet. Measuring over 60 square meters and automatically raised to offer total access, it is currently the largest glass display case in the world. In 2006, it won the FX International Interior Design Award.

Demonstrating production capabilities

For Goppion, this is the point at which we show the Client our production capabilities, both quantitative and qualitative, through visits to our manufacturing facilities. By making the visit as early as the bidding phase, the Client can avoid serious errors in assessing the supplier's qualifications.
One recent example concerns the Tomi Ungerer Museum in Strasbourg (France). The contract was awarded to a supplier whose products, once installed, were deemed below specifications. The Museum requested their dismantling and was obliged to issue a new call for bids. This entailed heavy management, administrative, and curatorial costs, in addition to the need to close the show shortly after its reopening.

7. Prototyping (Goppion)

The approval drawings are submitted to the Exhibit Designer and the Client. They aim to ensure that all design and operational requirements have been incorporated into the construction drawing. The prototype, on the other hand, is a key instrument that serves (1) to verify the product's feasibility; (2) to give all players (Museum director, curators, keepers, donors, designers, and others) a means to confirm that the product meets their individual demands and expectations. To allow the most comprehensive and "mature" examination possible, the prototype, in some exceptional cases, can be installed in the Museum itself and filled with facsimiles of the objects to be exhibited.
Dialogue is of crucial importance even in the prototyping phase, not only for the engineering-design process, but also in the subsequent prototype fabrication and testing. These steps will yield firm conclusions that, in turn, will make it possible to move swiftly and decisively to the final phase: the manufacture of all the products.
Prototyping comprises six phases:

1. Phase 1: The Goppion prototyping engineer applies his craftsmanship experience to analyze and interpret the completed studies and prepares draft illustrations of the components.
2. Phase 2: The prototyping engineer works with the mechanical, structural, and kinematics designers and other appropriate specialists to reach agreement on the engineering features of the components. This leads to the preparation of complete drawings for verification calculation.
3. Phase 3: When the drawings are ready, there is a further round of discussion with the prototyping engineer to make sure that the solutions developed are consistent with our manufacturing experience.
4. Phase 4: The components are produced and assembled into the working prototype.

5. Phase 5: The prototype is tested and inspected for compliance with all operational requirements, in the presence of Museum representatives in each special field and the Exhibit Designer.
6. Phase 6: Tests and inspections enable us to identify criticalities. This process leads to new solutions, which we engineer and put through new tests. If needed, we repeat the previous phases until the prototype requirements are fully met. If so, the prototype becomes number "0" of the production line.

In some cases, however, the Laboratorio leaves the prototypes partly assembled so that clients can complete the assembly themselves and thus test alternative options directly. For example, when an exhibition was being prepared at the Nelson Atkins Museum of Art in Kansas City, the director spent several days in the Laboratorio in order to personally experiment the various case-lighting solutions, adjusting them by hand.

One could object that the project does not end even here, but continues with prototype implementation and later trial runs. True, these later steps often lead to modifications in the project, from which we obtain information that can be used for further display cases in the same category, as well as data for future projects.

8. Production drawings for all products (Goppion)

After the prototype has been checked and any adjustments have been incorporated, we launch the production drawings for all products.

The Laboratorio as a "living venue"

Problems and criticalities do not become evident until the project is developed and put into practice. In this sense, the Laboratorio continues to act as a living venue, where everyone lends a hand, where dialogue is not confined to drawing tables but is transmitted—at least ideally—from each team member to those who will follow. All these players form an unbroken chain of experiences, challenges, and opportunities, such as the ones showcased in this catalogue.

Holistic empirical method

From the above description, the reader will have deduced that the Laboratorio's working method is interdisciplinary, for it is our daily practice to deal with and analyze complex systems characterized by ever-changing components and properties.

As an engineering company, part of our maturing and growth into a "global player" has consisted in adopting a "holistic" approach. In a continuously evolving and ever more complex world, we have been inevitably led to implement a project- and product-development system that is broader and interdisciplinary—and centred on the human dimension. This philosophy makes it a priority for us to treat the Laboratorio as a meeting-place and a forum for comparing skills, experience, and knowledge.

The holistic concept is based on sharing and integrating knowledge. Do not take anything for granted, but tackle every problem and challenge with an open mind: this attitude broadens our prospects and develops the ability to think critically, analytically, and "outside the box." The successes obtained in the most complex and demanding museum installations are born from a comparative process that rests on the experience and ideas of specialists, designers, and technicians. These successes result from laboratory experimentation and trials to verify, test, and adjust projects, as well as to develop new solutions and products.

Goppion combines the spirit and practice of craftsmanship with a modern organization, fit to compete in the new global environments where the pursuit of quality over quantity is still recognized as a formula for excellence.

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