# THE STAINED GLASS WINDOW OF THE TRADING FLOOR

## AT THE BANCO DE ESPAÑA

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COORDINATED BY
VÍCTOR NIETO ALCAIDE

MADRID, 2014

BANCO DE ESPAÑA
Eurosistema

This publication, which shows the sequence of the work carried out to restore full splendour to the great stained glass window over the Trading Floor, built in the thirties, is also a tool that will help all those interested in the applied arts to understand the processes involved in a project of this magnitude.

The aim of the intervention was to restore value to a historic work of art whose original purpose was to flood a large public area with natural light. In pursuit of this objective, which could have been achieved in a number of different ways, the planner moreover proposed the use of a great mosaic of multicoloured transparent glass, which would enable an extensive additional programme of ornamentation and symbolic figures. The images of various activities related to social progress in the first third of the 20th century are therefore distributed across the vast surface of the window in the form of allegories of agriculture, commerce, industry, mining or communications. The skilfully composed window also abounds with purely decorative elements, basically geometrical, filling the transparent ceiling with the eclectically exuberant colours characteristic of art deco. Not for nothing was this the predominant style in the West during the years of the triumph of speed and machines.

However, in addition to traditional glassmaking technology, which has left works of unique interest in many periods of the past, the project would have been impossible, owing to the sheer size of the window, without a great specially designed iron structure. It is this structure, from which the whole vault over the so-called "Clock Floor" is suspended, that supports the enormous cupola, closes off the space and protects it from the outside weather.

However, time took its toll on the conservation of this prodigious work of art, and it finally became necessary to carry out full restoration and give it back the meaning it was originally intended to convey. The intervention has been long and complex, yielding excellent results thanks to the quality of the materials used in the construction of the building.

This book may therefore be understood as a testimony to the three essential aspects of the process of restoring the roof of the Trading Floor: architecture, structural engineering and craftsmanship. The work was carried out by a team of fine professionals from all three areas.

I should therefore like to express gratitude to them all, since their work helps to ensure the survival of this great work and its future enjoyment by generations to come.

LUIS MARÍA LINDE DE CASTRO
GOVERNOR OF THE BANCO DE ESPAÑA

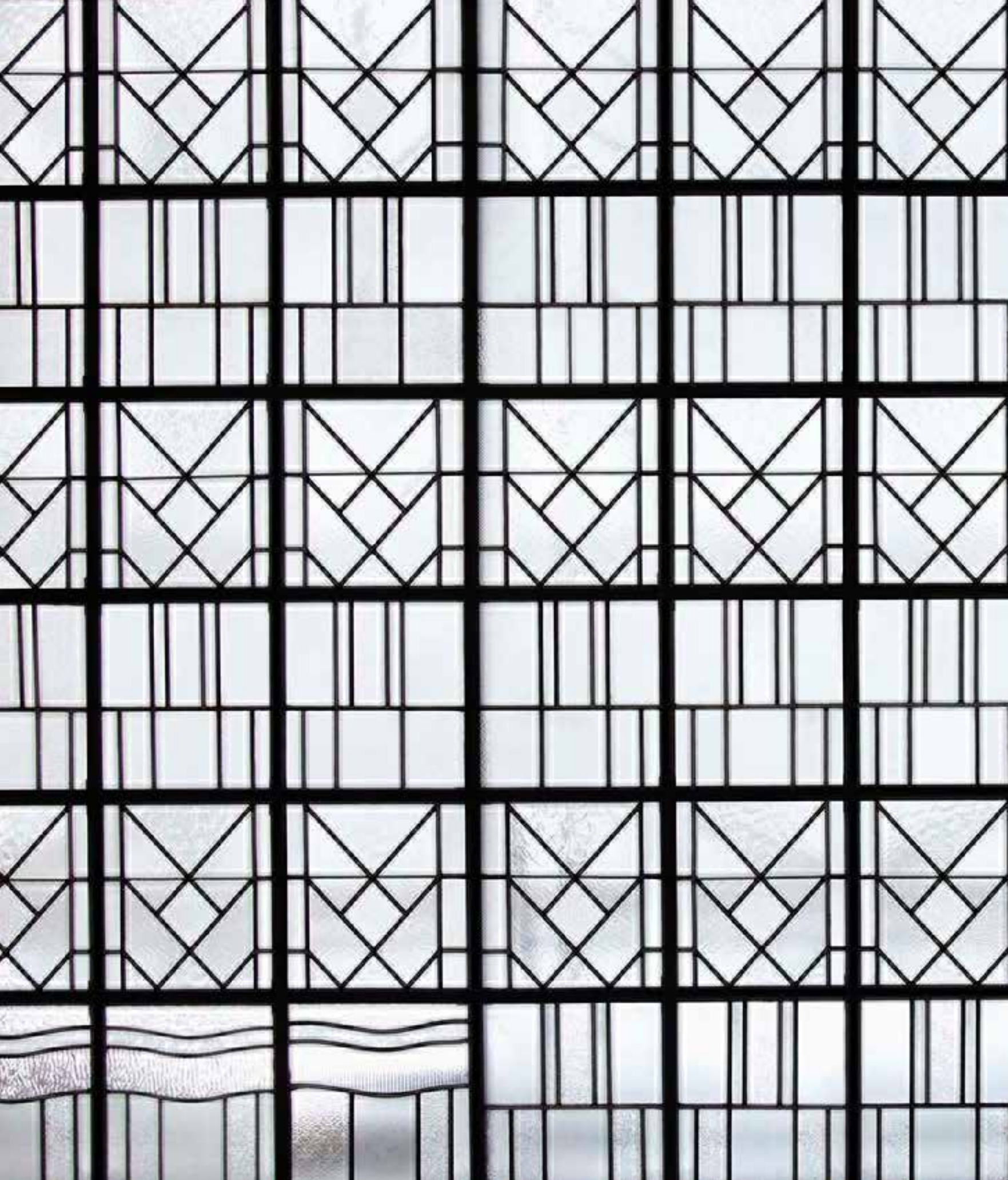
# PROLOGUE

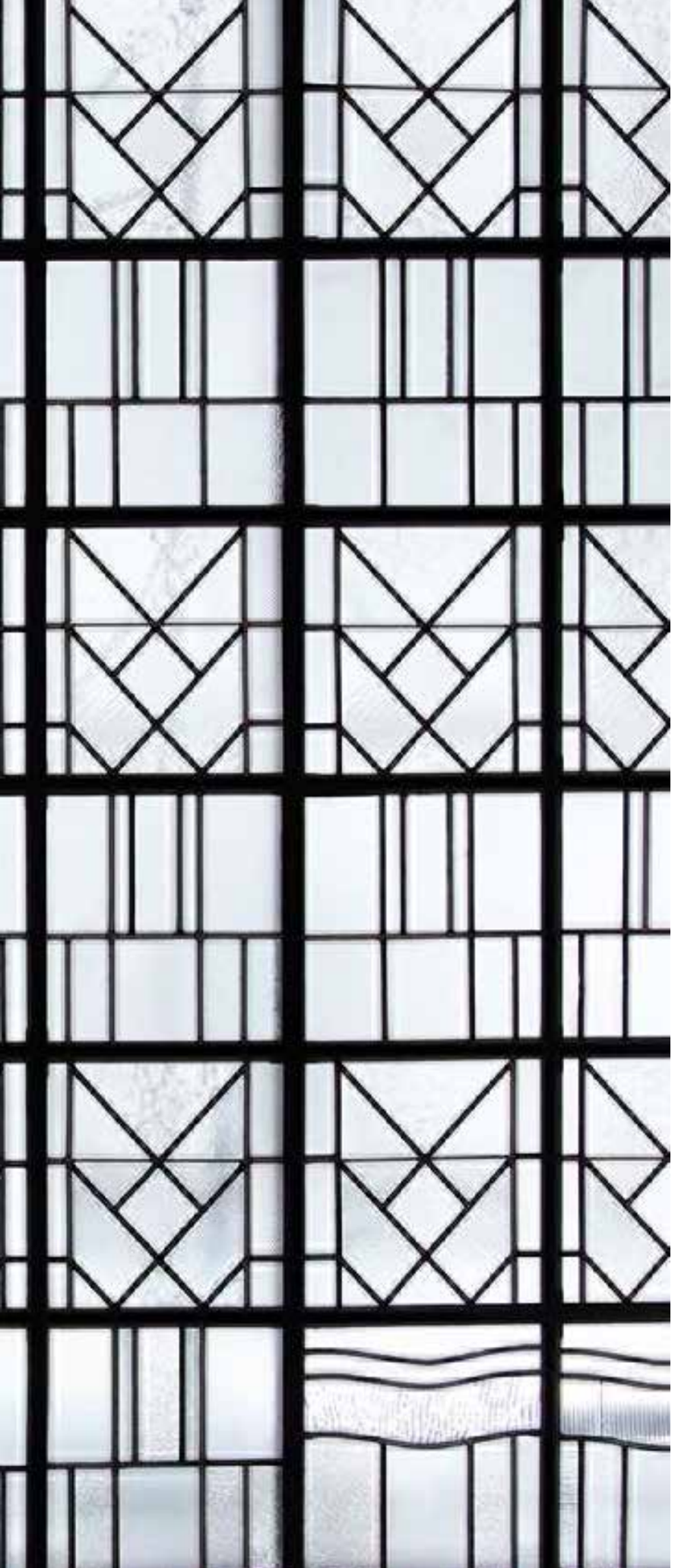
The building of the Banco de España in Madrid possesses one of the most important sets of symbolist and art deco stained glass in Europe. The first cycle was made for the original building by Mayer, a Munich firm. Afterwards, one of the most outstanding groups of art deco stained glass windows in Europe was made by the Maumejean studio for the extension designed by the architect Yarnoz. All this demonstrates that stained glass received uncommon attention in the building policies followed by the Banco de España, for not only were these cycles designed on a grand scale, but their execution was ordered from the leading specialised workshops of the time, and the forms applied represented innovations in the field.

This attitude towards the art of the stained glass window has also governed the maintenance and conservation of both cycles. Maintenance for the purpose of preservation is a policy that has not frequently been applied to works of this type, whose fragility, if a suitable conservation policy is not adopted, could easily add them to the list of great art that has been lost.

The restoration of the stained glass window manufactured by Maumejean for the Trading Floor was a task as complex as its execution had been. Far from being a standard commission, this was an ambitious project from a technical point of view as well as a cultural and artistic one. The result was the production of a set of art deco pieces that are unparalleled in the stained glass of those years. Their restoration was carried out by Vetraria, whose director, Carlos Muñoz de Pablos, is a glazier who had his initial training at the Maumejean workshop, where he met the artists who made these windows and learned about the complexity of the technical procedures employed. This has guaranteed a rigorous restoration with respect for modern criteria and a profound knowledge of stained glass as a historical phenomenon. The choice of this studio is also in tune with the Banco de España's original choice of workshops for the manufacture of the sets of stained glass windows. Equally suitable is the policy of heritage conservation adopted by the Banco de España for this extremely complex artistic speciality, which has not always been valued in keeping with its importance.

VÍCTOR NIETO ALCAIDE
CHAIRMAN OF THE SPANISH COMMITTEE OF CORPUS VITREARUM





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# The Stained Glass Windows of the Extension Building (1933–34). Progress and Art Deco

VÍCTOR NIETO ALCAIDE

Chairman of the Spanish Committee of Corpus Vitrearum

## THE STAINED GLASS WINDOW AND BANK ARCHITECTURE

From the 19th century onwards, the growing importance of banking led to the construction of buildings that would not only meet mercantile requirements but create an image of prestige combining tradition with the dynamics of modernity. It therefore became habitual to resort to models of the past, and specifically to palatial typologies.[1] Among the complex architectural forms exhibited by these constructions, a severe and modernised classicism therefore predominates. Appreciable alongside this is the incorporation of abundant decoration such as sculpture, wrought iron and stained glass, the purpose being to furnish the buildings with ostensible and sumptuous magnificence.

In Madrid, where there was a notable development of bank architecture from the end of the 19th century on, stained glass became a fundamental element in the banks' architectural programmes. The most important of all these was the programme at the Banco de España, dedicated to the exaltation of science and knowledge.

The cycle of stained glass windows was produced in London by Mayer, a firm based in Munich. The commission was settled on 17 August 1889, and the windows were dispatched in August 1890. Work finished on the programme in March 1891.[2] From the start, the set of windows became an example to be retained as a model for the Banco's later extension. The quality of this first programme of windows made the building into what we have called a "cathedral of finance and a temple of money",[3] and became a visible referent of the institution's prestige and significance.

Fig. 1 Figure of Mercury on the stained glass window over the Trading Floor of the Banco de España

In 1906, shortly after the completion of that programme, Juan Bautista Lázaro, the architect responsible for the restoration of the stained glass windows of León Cathedral and a great driving force behind the art of stained glass in Spain, wrote that "civil" and domestic stained glass had flourished enormously in recent decades, and that it was

> applied also to public buildings ... [with] friezes of interlaced ribbons, inscribed wherein are celebrated names and dates, and allegorical figures of the sciences, of the arts, of law or of philosophy, in whose hands, or acting as borders, or applied on cartouches, there are maxims, axioms and other appropriate inscriptions to be read, in the same way as the precepts and maxims of the holy scriptures appeared on religious stained glass windows.[4]

The text evidently contains a direct reference to Mayer's recent programme of stained glass windows for the Banco de España, and to its secular allegories.

In the ceiling over the main staircase is an allegory with Fortune in the centre, the four continents in the corners, and the three Graces and the Fates on the shorter sides. The staircase used to be closed off by the so-called *Retable of Wisdom*,[5] which was moved with the construction of the extension of 1930–34 to the rotunda linking the two buildings. Designed as a triptych, the central panel of the retable shows Minerva and St Jerome, allegorical symbols of wisdom and erudition. The figures on the left wing represent Mathematics and Engineering, and those on the right Chemistry and Astronomy.[6]

On the mezzanine, the programme displays allegories of the virtues conducive to success, such as Vigilance, Love, Friendship, Glory, Felicity and Labour. Represented on the stained glass windows of the first floor are allegories of the Major Arts – Poetry, Sculpture, Painting, Architecture, Music and History – and above them the senses of Smell, Hearing, Taste, Touch, Sight and Knowledge. As we have indicated elsewhere,

> Science presides over all knowledge and wisdom, intellectual access to which is gained through the Major Arts and also, primarily, through the senses. The senses and reason, science and knowledge are the keys to *Wisdom*, the foundation of *Progress*.[7]

## "MODERN STYLE" STAINED GLASS

This first programme of an allegorical and didactic nature, devoted to demonstrating the benefits of the conjunction of knowledge and science with progress[8] as a secularised form of *salvation*, became the paragon for the second programme of stained glass windows, applied to the extension.

In the extension to the Banco, built between 1927 and 1934, the cycle of stained glass windows was positioned on the vault of the large Trading Floor, the staircase and the vestibule on Calle de Alcalá. Here too, a programme was developed whose aim was to sublimate the myth of progress through labour, rendered in this case with forms responding to a modernity framed within the concepts of art deco. Art deco was a trend that was later to acquire this name, but was known in its day as the "modern style".[9] Such a language was appropriate to the idea behind the programme, which was the exaltation of modernity and labour as the current forms of progress.

When the set of stained glass windows was made for the extension, there was a keen awareness of the abyss separating the modern from the traditional. The historic avant-gardes had accentuated that gap, and although there was no desire to reject classicism outright, it was very much borne in mind that the set had to establish the idea of the triumph of the new and the modern, though without allowing the modern to displace the classical altogether. Yarnoz's extension was therefore designed with architectural forms of a modernised classicism. Within it, the stained glass integrated the categories of the classical and the modern, and accentuated its monumental dimension.

The extension to the Banco de España building was commissioned in 1927 from José Yarnoz Larrosa, who presented his project in 1928.[10] Construction work commenced in 1930 and was completed in 1934. While it was in progress, and was sufficiently advanced to allow work on the stained glass programme to begin, the architect wrote to the Governor of the Banco de España on 1 December 1932 to inform him that

> the current state of work on the extension of the central building now makes it necessary to assign the complementary tasks separate from the main structure that are required for the completion of our building. Among these tasks is the supply of the artistic stained glass.[11]

According to Yarnoz's memorandum, the windows to be made were as follows:

a) A SMALL CUPOLA in the connecting vestibule, with an area of some 40.00 m², with a central decorative motif on a background of tracery.
b) A STAINED GLASS WINDOW in the rear vestibule, analogous to that in the Paseo del Prado staircase. Area: 21.85 m².
c) TWO STAINED GLASS WINDOWS in liftshafts, decorated with an ornamental border, central decorative motif and general background of tracery, with a total surface area of 23.40 m².
d) A STAINED GLASS WINDOW for the opening in the vestibule that forms the principal gallery for access to the Trading Floor, with decoration analogous to the previous two. Area: 13.75 m².
e) TWO STAINED GLASS WINDOWS in liftshafts, decorated like the windows described in (c) and (d), with a total area of 25.45 m².
f) TWO STAINED GLASS FRONTS in the main entrance on Calle de Alcalá, each comprising three great windows with a large decorative frieze and background of tracery. Total surface area: 71.00 m².
g) and finally, A GREAT SKYLIGHT for the Trading Floor, very richly decorated, and in harmony with the general ornamentation of the Floor. This is a major task owing to its surface area of 380.00 m², and because of the considerable work it entails.[12]

For the execution of this work, José Yarnoz proposed Casa Maumejean, the most important specialised workshop in Spain, which had been responsible for the principal sets of stained glass windows produced since 1900. Yarnoz attached an estimate from Casa Maumejean for a sum of 160,236 pesetas, dated 19 December 1932. On the capabilities of Casa Maumejean, the architect remarked:

> There is nothing I need say about the artistic competence of this firm, which is renowned throughout the world, owing to the accolades it has received and the major work it has carried out, as one of the most important of its kind. It is moreover well known to the Banco, for which it has been executing all the works of this type for the new branch buildings under construction.[13]

Yarnoz's proposal was approved by the General Council of the Banco de España on 19 December 1932.

The Maumejean studio had a prior relationship with Yarnoz. Besides collaborating on some of his projects, the statutes of Maumejean Hermanos de Vidriera Artística [fig. 2], a limited

company based in San Sebastián that was formed as a replacement for the earlier Maumejean Hermanos, had been approved on 3 October 1923 in the presence of the notary Luis Burruela. José Yarnoz was appointed as the chairman of its Board of Directors, whose other members were Mariano Benlliure, José Maumejean, Enrique Maumejean and Gabriel Benito de Larrea.[14]

A programme of this magnitude evidently required minute preparation. It was necessary to design the structure of the skylight, determine the subjects and their distribution, make small-scale cartoons, and finally produce the 1/1 cartoons for the final execution. Moreover, arduous labour was involved in cutting the glass (many of the pieces were both complex and complicated in shape), painting and firing, leading and fixing the reinforcement rods, and constructing and positioning the different panels. This process was to begin in late 1932 or early 1933. The set was already in place by the end of 1934 or, at the latest, the beginning of 1935.[15]

The General Council of the Banco required that sketches be submitted. On 19 December 1932, when the Council approved the designation of Casa Maumejean for the execution of the work, it was agreed that: "after the Council has examined the relevant drawings and models, the corresponding committee will establish the definitive artistic design from among the elements proposed for the great skylight." The sketches were duly presented by the studio.[16] For the great skylight in particular, the firm made a commitment in its estimate presented on 19 December 1932 to submit, among various models, "a watercolour sketch to a scale of 5 cm to one metre, and a further watercolour sketch to a scale of 3 cm to one metre...".[17] The sketch which was used for the final execution of the skylight is extant [figs. 3 and 4]. It shows precisely the overall composition, the subject matter of the allegories and the design of the abundant decorative motifs.[18]


Fig. 2 The name of the manufacturers, "MAUMEJEAN H.OS S.A. MADRID", appears on the stained glass over the Trading Floor at the Banco de España. Rendered in black grisaille, like the many other examples appearing on stained glass windows made by these artists, it is located at the foot of one of the figures representing Abundance (fig. 26)

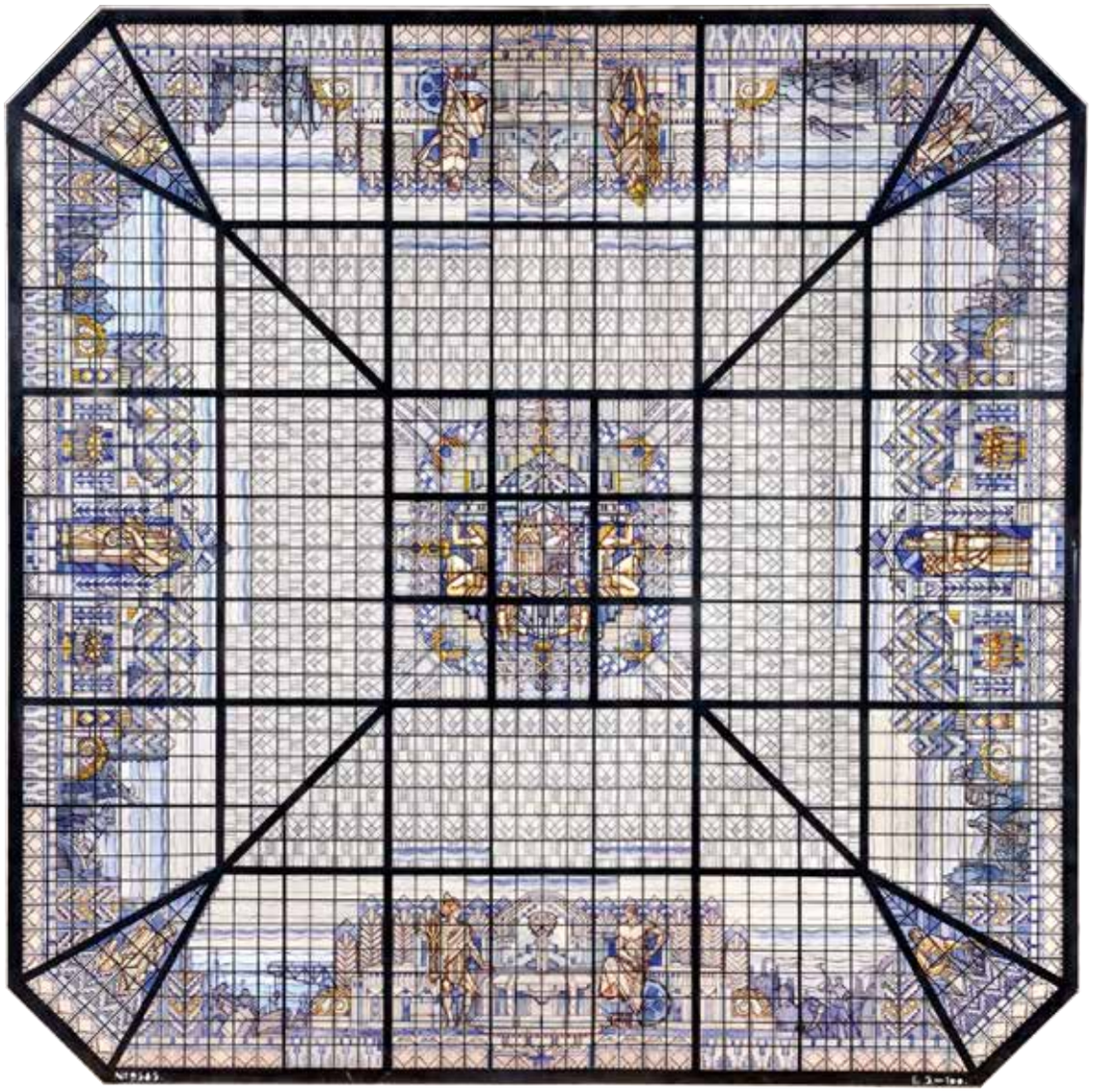
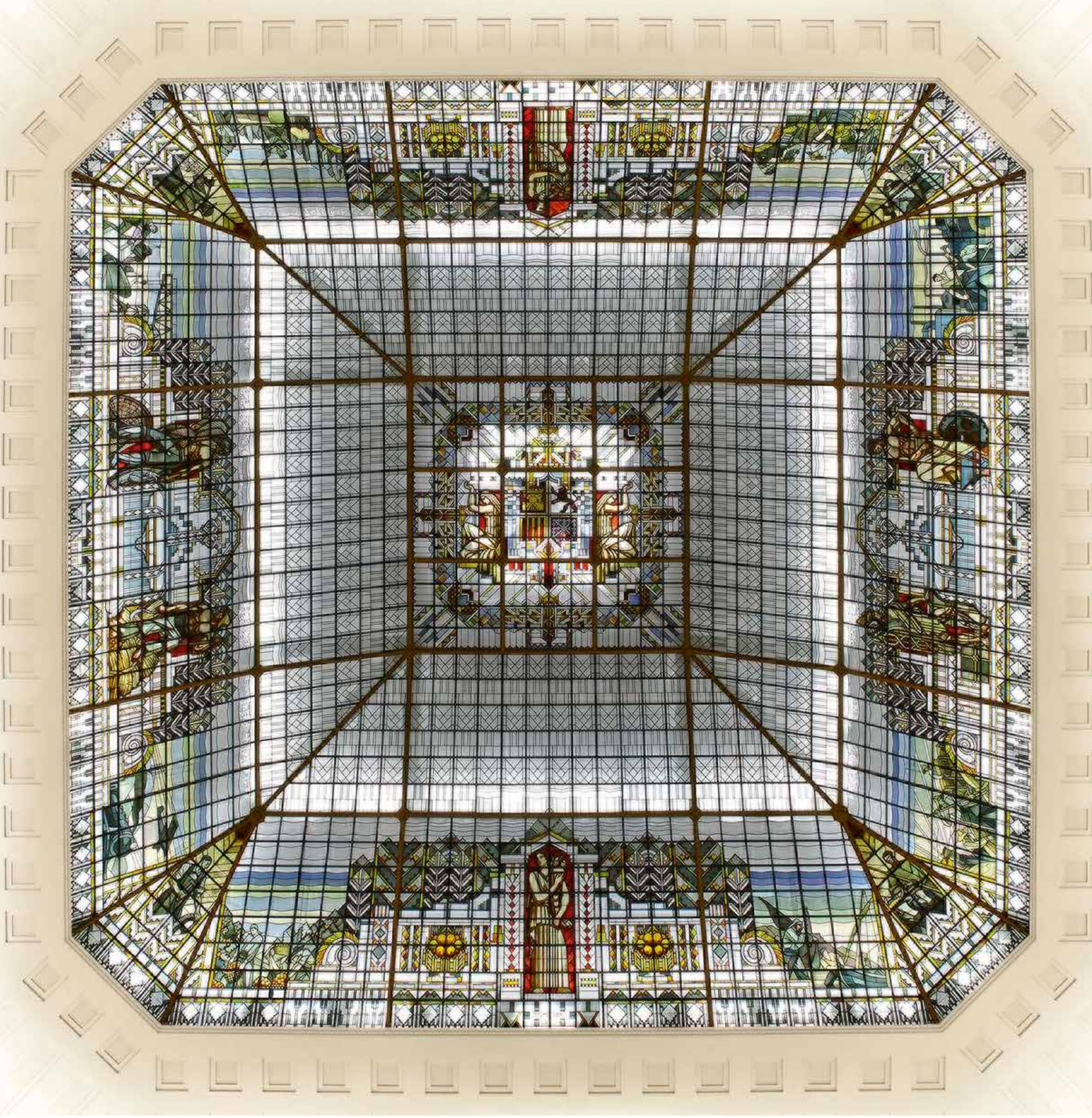


Fig. 3 The collection of drawings, cartoons and photographs from the Maumejean workshop, now the property of the Museo Nacional de Artes Decorativas, is kept in storage at the Centro Nacional del Vidrio (National Glass Centre, La Granja, Segovia). From it comes this sketch, or "reduced scale cartoon", with a precise depiction of the great stained glass window of the Trading Floor skylight

Fig. 4 From the end of the 19th century, roofing with cupolas or glass skylights became habitual in bank architecture for privileged areas open to the public, such as the Trading Floor. In Yarnoz's extension, the great skylight acquires special prominence as the support for an iconographic programme dedicated to progress, and as the element which defines the lighting of the architectural space



## STAINED GLASS AND DIAPHANOUS SPACE

The programme of stained glass windows for the new building was conceived as an emblematic art work bound to establish a paragon with the cycle produced by Mayer for the first building. In the extension, Yarnoz respectfully continued the classical composition of Eduardo Adaro's façade, concentrating a sumptuous and monumental modernity in the interior. In this respect, Yarnoz followed an architectural practice that was common in Madrid in the late 19th and early 20th centuries. This was to maintain classicism on the exterior, in keeping in this case with the pre-existing façade, while using the interior for an outpouring of modern expression.

In Yarnoz's extension, considerable importance was granted to the Trading Floor, reached through a vestibule opening onto Calle de Alcalá. Set into the transoms on the doors were windows in highly textured patterned glass with monochrome scenes representing labour, producing a photographic effect in black and white [figs. 10 and 13].

Owing to its purpose and to the fact it was open to the public, the Trading Floor had a key role in the new building [fig. 5]. It was a space destined to transmit an image of security, solvency and power for the country's most important banking institution, and it made a strong and direct impression on the viewer. The modernised evocation of a monumental classicism in the manner of certain Roman models, such as bath-houses, aroused an undeniable sensation of solidity and security.

The effect produced by this room was also meant to render ideas of modernity and contemporaneity compatible with those of security and tradition. To express this notion, the architecture of the banks built at that time used a free classicism with strict formal restrictions. The monumental orders and the use of Roman capitals for signs predominate in an architecture otherwise dotted with constructive and decorative licence. The idea of modernity was accentuated with sculpture reliefs or sets of stained glass windows alluding to the modern world. By contrast with the symbolism of the stained glass produced by Mayer for the Banco's original building, the notion prevalent in the new set was the presentation of a solvent and dynamic institution adjusted to the demands of modern life.

The Trading Floor is a single space covered by a great rectangular skylight with angled corners. Since it is a centralised area with no supports to divide it up, the most suitable form of roofing was a large skylight of this type which would reinforce the image of modernity through its framework of iron and glass, materials identified with new architecture

Fig. 5 The Trading Floor is a single centralised space, strongly monumental in character. The skylight assumes the role of a great glass cupola

since the 19th century [fig. 6]. In the meantime, by designing a great skylight as a vault that would close off the whole ceiling of the Trading Floor, the planners were also activating all the traditional significance of the dome as an image and emblem of prestige. It moreover connected with the 19th century practice which had permitted iron and glass to be combined with the use of stained glass as an element of closure, spatial configuration and support for iconographic and decorative programmes. What had been a technical experiment soon became a fundamental architectural component for the creation of sumptuous spaces, which were thereby provided with "a zenithal illumination that reaches

Fig. 6 One salient feature of the stained glass window is the use of two materials characteristic of the new architecture: iron for the supporting structure, and leaded glass for the different panels

the heart of monumental constructions".[19] The iron and glass dome had emerged at the 1889 International Exposition in Paris. In Madrid, various glass domes and ceilings with iron frameworks had been constructed before the skylight of the Trading Floor of the Banco de España, showing that this solution was already a widespread practice.[20] The novelty of the great skylight at the Banco de España lay in its monumentality, the dedication of its subject matter to progress, and the innovative employment of a fully art deco language.

Besides iconographic and aesthetic reasons, there were also functional motives to justify roofing the Trading Floor with a great skylight. Compared with the ceiling of Fortune and the five continents in Adaro's building, there is a clearly observable reduction in the amount of glass in base colours, and an increased proportion of glass in bright or pale colours or altogether colourless. The coat-of-arms of Spain is in the centre of the skylight while the allegories are around the edges, an arrangement that ensures the natural lighting is much more intense than it would have been if the skylight had consisted exclusively of coloured glass. The light is bright and diaphanous, filtered by the textures of the patterned glass and the tenuous effect of the colours, and therefore suited to a space devoted to financial operations.

The illumination of the Trading Floor is articulated on the skylight by alternating a series of concentric areas of light of greater or lesser intensity. The lowest of these corresponds to the thermal windows at the top of the supporting walls. The lower slopes of the skylight, where the allegories are depicted, create a coloured ring that nuances the diaphanous light entering through the thermal windows. Panes of colourless glass allowing intense illumination are then used to form a bright area alongside another that is slightly darker. In the centre, around the coat-of-arms, the same arrangement is followed, with a surrounding coloured ring of a decorative nature, and another brighter ring between it and the shield located in the centre. These "bright" areas are mediated only by the decorative geometry and compositional harmony of the various assembled pieces of glass, and by the varied textures of the patterned glass panels, forming a monumental translucent collage.

## LABOUR AND THE MYTH OF PROGRESS

The iconographic programme of the skylight is dedicated to extolling economic activity, with labour and abundance as the essential pillars of progress. In some ways, this cycle was a completion of that of the stained glass windows in the original building. Nevertheless, its contents are very different. The idea of knowledge and science is here omitted, and labour becomes the focal support of economic activity and the source of progress. This concept is reinforced by the stained glass windows of the hall or vestibule [figs. 7–16] and the two on the staircase dedicated to agriculture and industry. These two compositions occupying the windows of the staircase are perhaps among those whose formal dimension accords best with art deco schematisation [figs. 17 and 18]. Agriculture, a preparatory drawing of which is preserved[21] [fig. 18], appears in an abstract geometrical setting as a representation of its benefits and of the wealth generated by the harvest. Industry, on the other hand, is conceived as a classical figure of a man surrounded by geometrical elements and a giant cogwheel. The whole "environment" underscores the notion of a mechanical setting. The figure and the rest of the components relate to the propaganda poster glorifying labour as the road to individual perfection, as it was used for political purposes in various countries at that time.

The programme established an identity between labour, technology, modernity and progress at a historical moment when the effects of the crash of 1929 were still very much alive. Although the crisis affected Spain less than other countries owing to its limited industrialisation, it did have an effect on certain sectors, such as exports, with the consequent detriment to internal activity. Nevertheless, in the years preceding the advent of the Second Republic, while the country was under the dictatorship of General Primo de Rivera, Spanish industry had experienced considerable development, and communications had entered a phase of expansion with the enlargement and modernisation of the road network. In the thirties, the preponderance of the rural population declined and there was an appreciable increase in the urban population, industry, electricity, mechanisation and transportation.

The main premise of these stained glass windows was that an identity established between labour, progress, wealth and modernity could act as an exorcism against the economic crisis, and the instruments which would help to overcome it were therefore clearly signalled. In this respect, it is worth transcribing the following statement by Bury:

> The idea of human Progress then is a theory which involves a synthesis of the past and a prophecy of the future. It is based on an interpretation of history which regards men as slowly advancing – *pedetentim progredientes* – in a definite and desirable direction...[22]

Figs. 7–14 In the vestibule at the entrance to the extension, a series of stained glass windows dedicated to agriculture and industry acts as a preamble to the programme in the Trading Floor. Displaying clear parallels with paintings of the period extolling the virtues of labour, these windows are made with colourless glass panels, including an abundance of patterned glass whose textures produce the effect of a collage

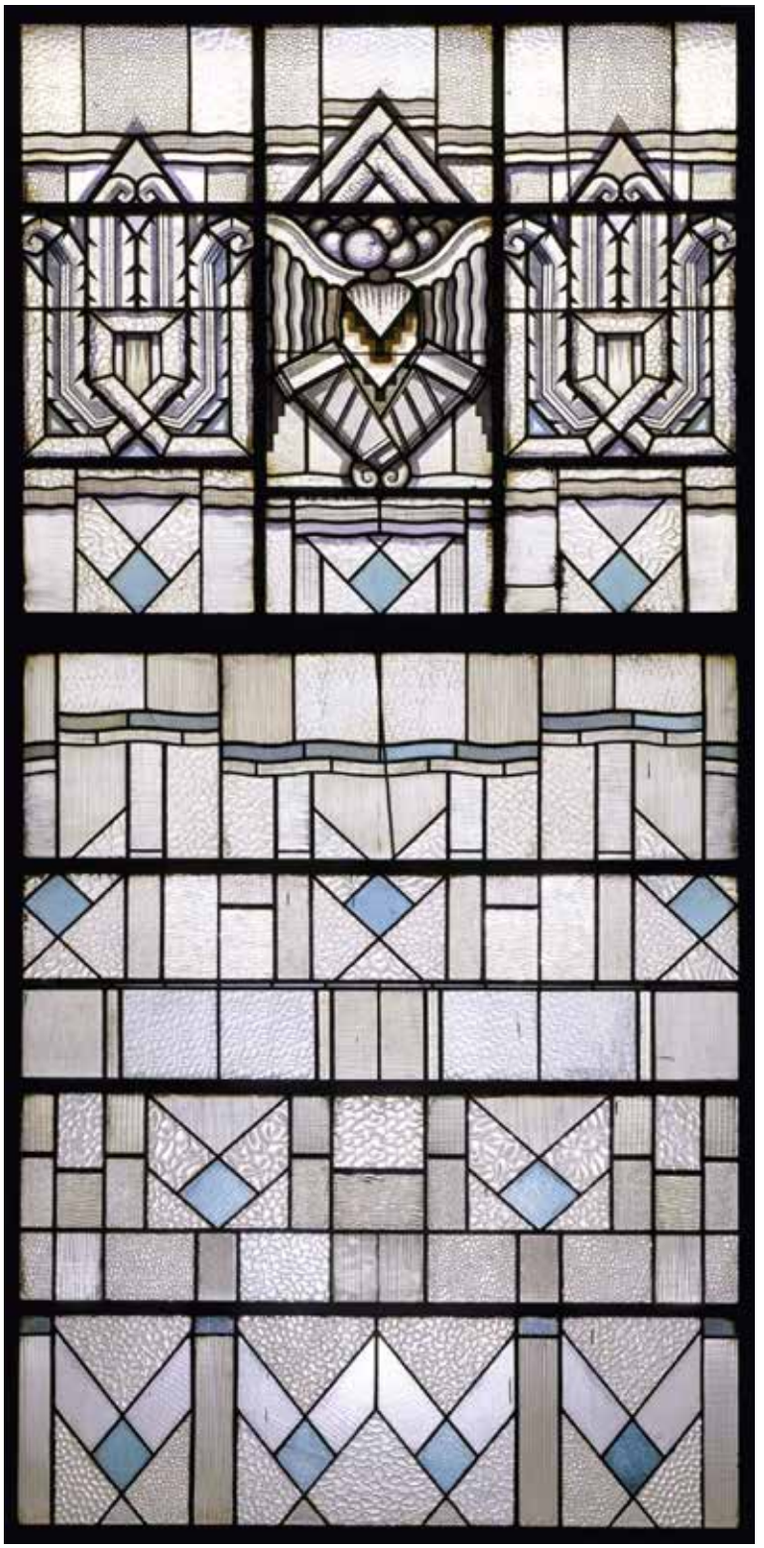


Fig. 7

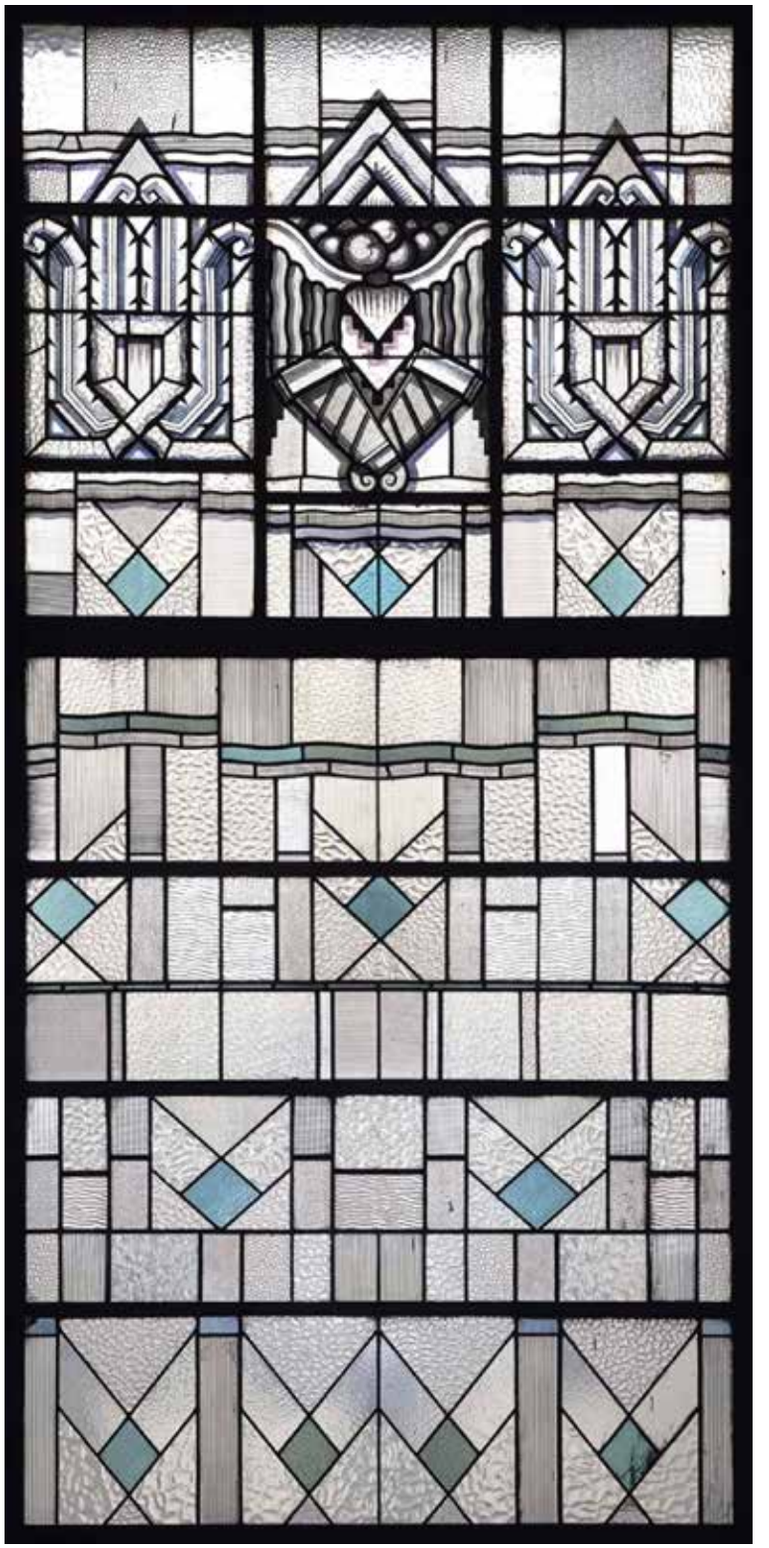


Fig. 8

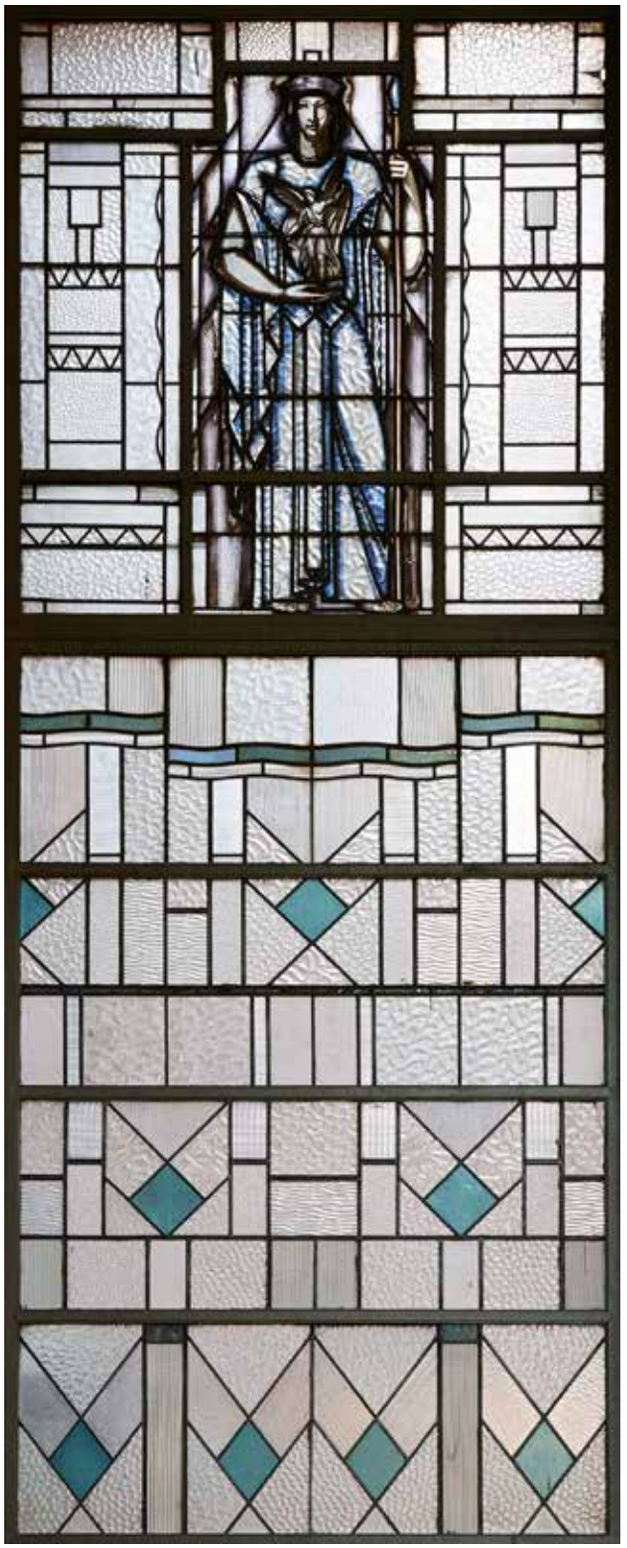


Fig. 9

Fig. 10

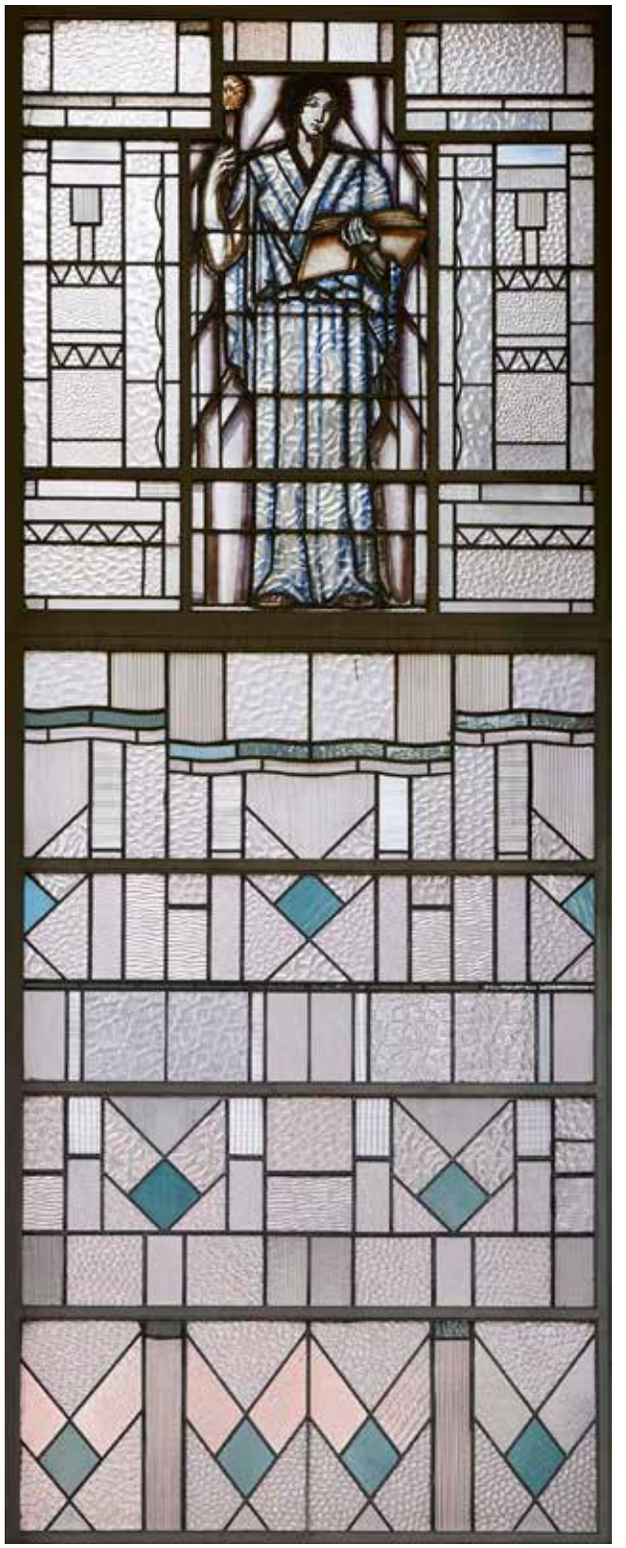


Fig. 11

Fig. 12

Fig. 13

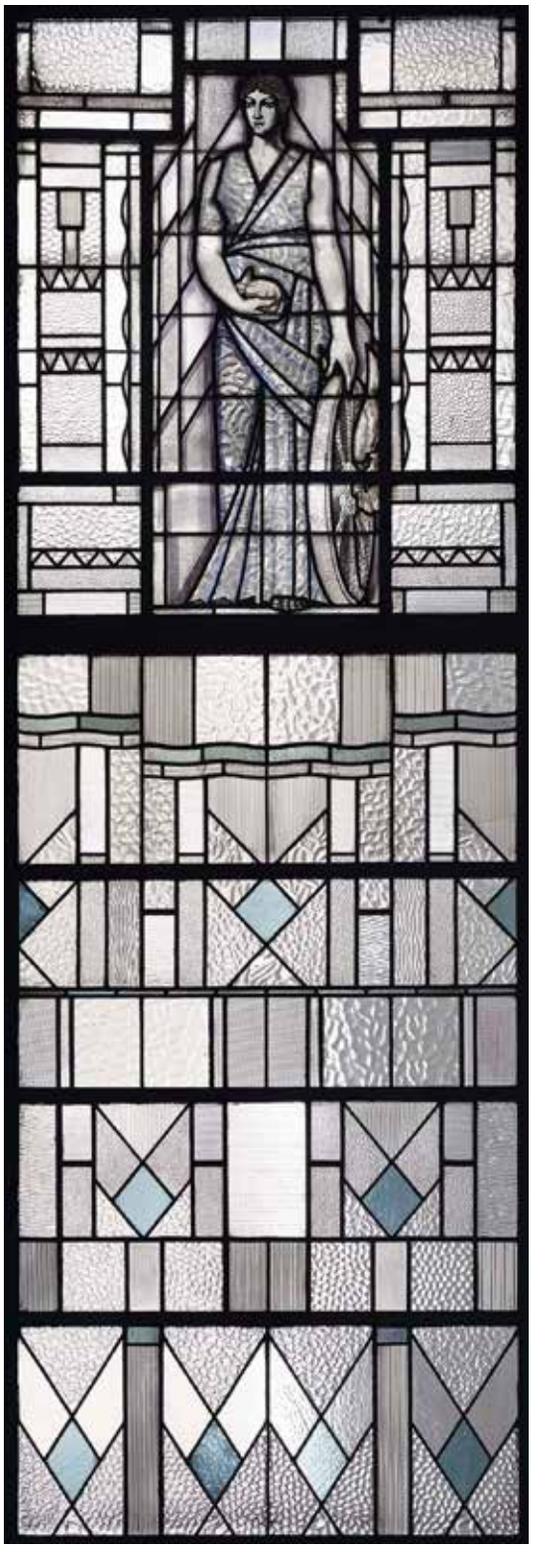
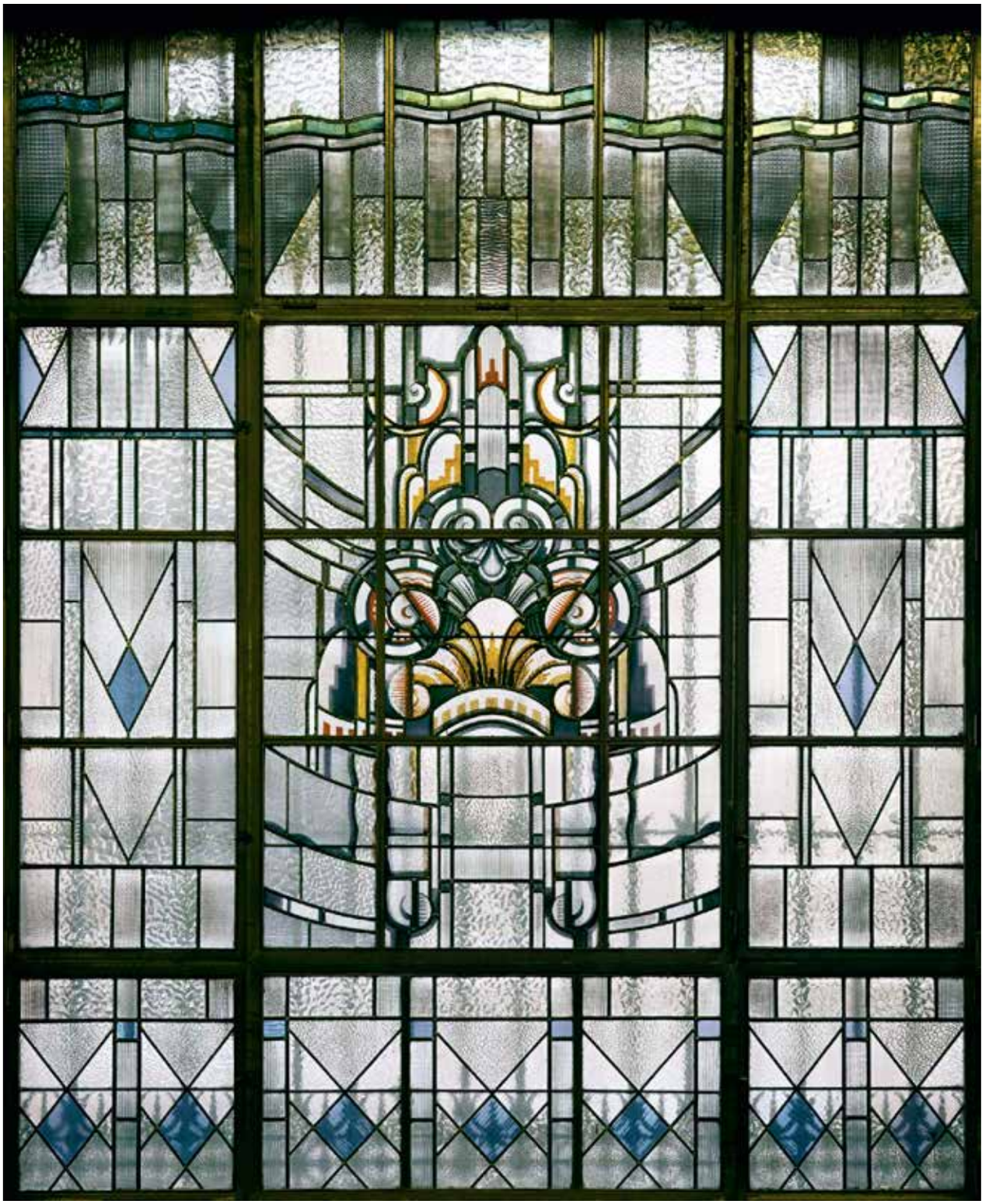


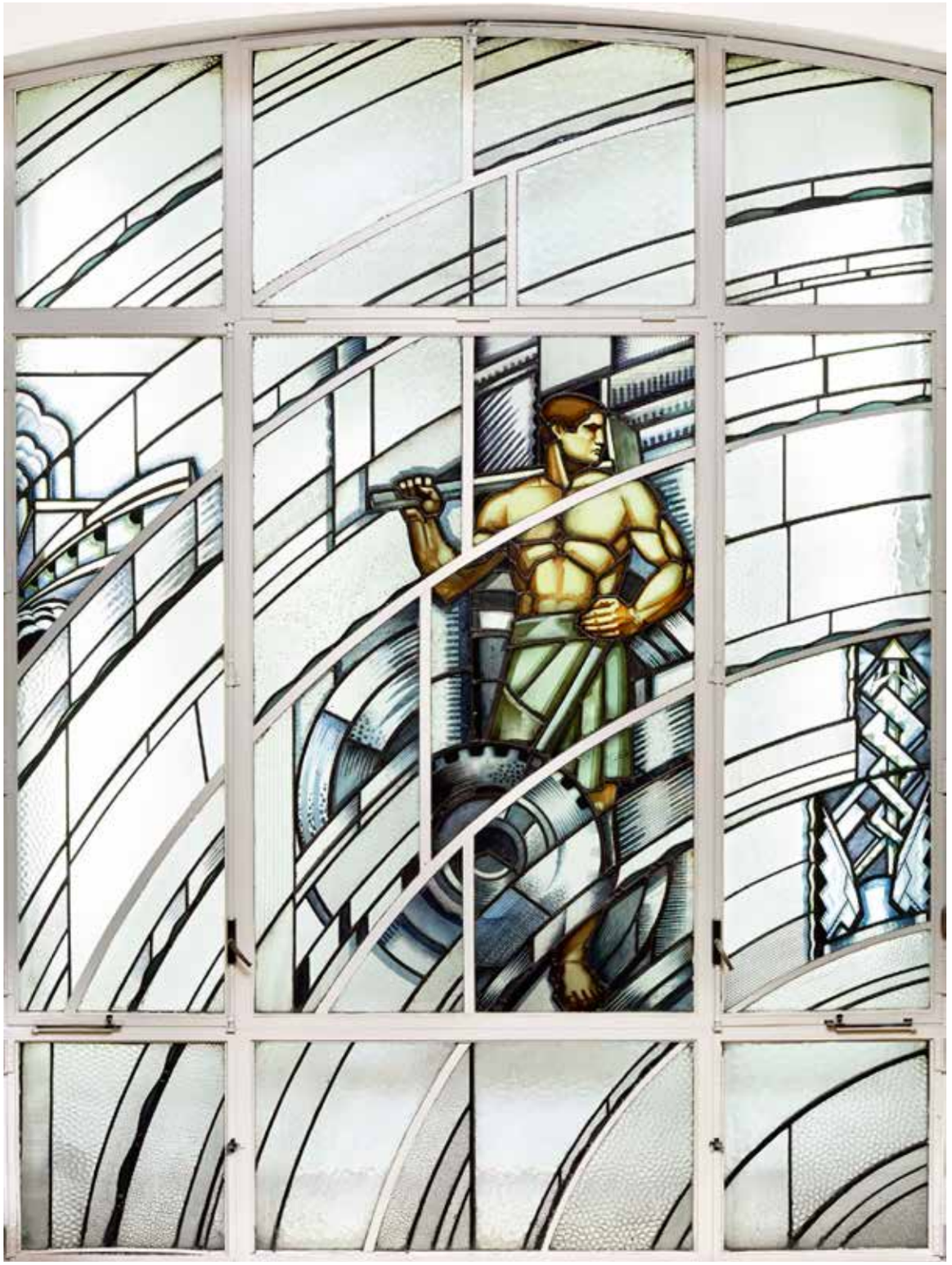
Fig. 14



Figs. 15 and 16
The stained glass windows in the vestibule feature a variety of geometric or vegetable decorative motifs and a large amount of patterned glass in different textures, in consonance with the geometric decoration on the skylight of the Trading Floor. Together they form a comprehensive catalogue of art deco geometrical forms for serial and modular application

Figs. 17 and 18 Among the stained glass made for the extension, two allegories of Industry and Agriculture were destined for the large windows in the staircase. A preparatory drawing of the second is preserved at the Centro Nacional del Vidrio (National Glass Centre, La Granja, Segovia). In the composition, the colour of the figures is contrasted with the colourless panes of the rest of the window, which are articulated by means of leading in a typical art deco ornamental pattern

Fig. 19 The figure of Industry is a clear example of the glorification of labour in the field of socially committed art. Although their aims were different, trends like social realism, National Socialist art and Italian Fascist art developed a large corpus of images during the period that were intended as a heroic and mythical exaltation of labour



Unlike the Mayer stained glass programme, where historical and symbolic references were the principal support of the narrative, the scant references of this type in the cycle of the new Trading Floor are limited to the figures representing Trade, Industry and Abundance. Instead, inspiration is drawn directly from the reality of modern means of production, economic development and labour. Technology, in a word, is here seen as the transformer of nature and the creator of progress, and the subject matter of the stained glass windows of the skylight in the Trading Floor, in dealing with economic activity, implicitly develops this programme. In 1933, Ortega y Gasset gave a course on "technics" at the Universidad de Santander which was published as a book in 1939.[23] In it, the thinker defined technics as:

> the reform which man imposes on nature in view of the satisfaction of his needs ... [which] were impositions of nature upon man. Man responds by imposing a change upon nature in his turn. Technics, then, is the energetic reaction against nature or circumstance, which leads to the creation between it and man of a new nature.[24]

The overall composition follows the habitual scheme for works of an official and institutional character, with the coat-of-arms of Spain represented in the centre [fig. 20]. Shown in the centre of two of the lower slopes of the skylight is Abundance, conventionally represented by a female figure of classical inspiration with a tunic reaching down to her feet and the horn of abundance in her hands. Both figures stand out against a red background, and are framed by a niche situated in the centre of a "retable" formed by a dynamic interplay of geometric art deco motifs [figs. 21 and 23].

In the centre of one of the other two slopes are the figures of Mercury and Vulcan as allegories of Trade and Industry [fig. 22]. Mercury appears with his habitual attributes: the caduceus with two entwined serpents, and the winged helmet and sandals. Vulcan, the god of fire and metals, appears with the hammer and anvil. The two figures stand face to face on either side of a central space containing a fantastic fountain that evokes life, wealth and abundance. The composition in the centre of the opposite slope, with the same background architecture, shows Fishing on the left and Agriculture on the right. Each of these activities has its attributes. The first has a fish in his hand, a net and a basket, while the second carries a sickle and leans on a pitchfork thrust through a wheatsheaf [fig. 24]. All these allegories are represented by Herculean figures, classical in inspiration, in the manner of the figure of Industry on the staircase window, and they are rendered with a schematisation and simplification of forms that enhances an intensely expressive monumentality.

Fig. 20 In the centre of the skylight, highlighting the official and national character of the building, is the coat-of-arms of Spain flanked by kneeling caryatids and a set of geometric art deco decorative features. The coat-of-arms stands out against a background of colourless glass panels, making it the main focal point of the skylight

Fig. 21 Shown in the centre of one of the lower slopes is the figure of Abundance, framed by a geometrical "retable". Both this decoration and the figure's bearing evoke classical forms, though here schematically transformed into art deco motifs. At the feet of the figure is the name of the studio where the window was made. The figure forms a pendant to another opposite it that represents the same subject. On either side of it are scenes of *Fruit Picking* and *Beaching the Fishing Boats*, designed in accordance with what were then the habitual models for the painting of local customs, though with a markedly reduced use of colour

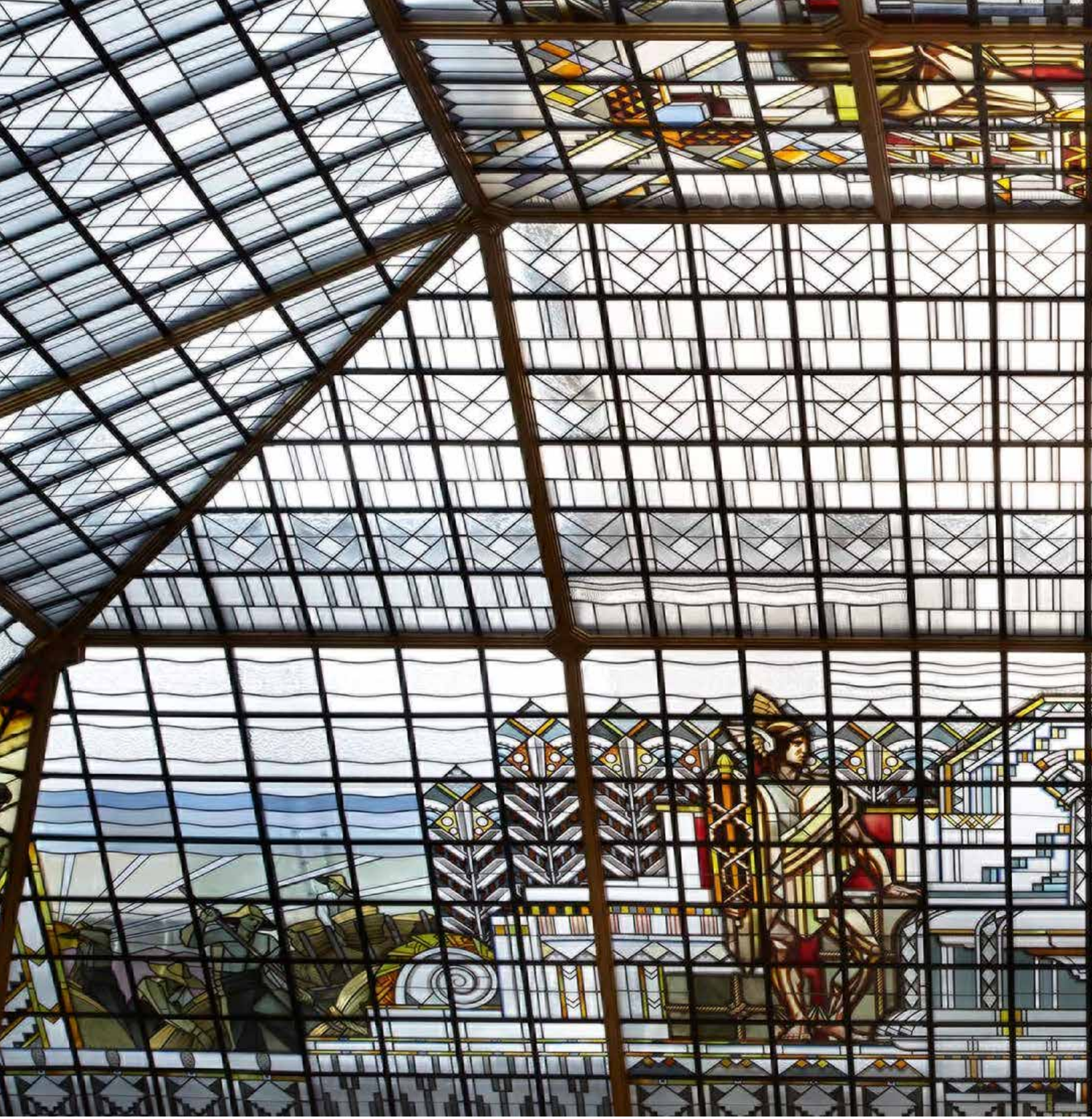


Fig. 22 On another of the lower slopes, also framed by a "retable" made of geometric motifs rather in the manner of a child's building set, are the figures of Mercury, a symbol of Commerce, and Vulcan, an allegory of Industry. Mercury is shown with his classical attributes, while Vulcan, besides his hammer, has behind him a cogwheel representative of modern industry

Fig. 23 The figure of Abundance situated opposite the other is flanked by scenes of *The Grape Harvest* and *The Woodcutters*

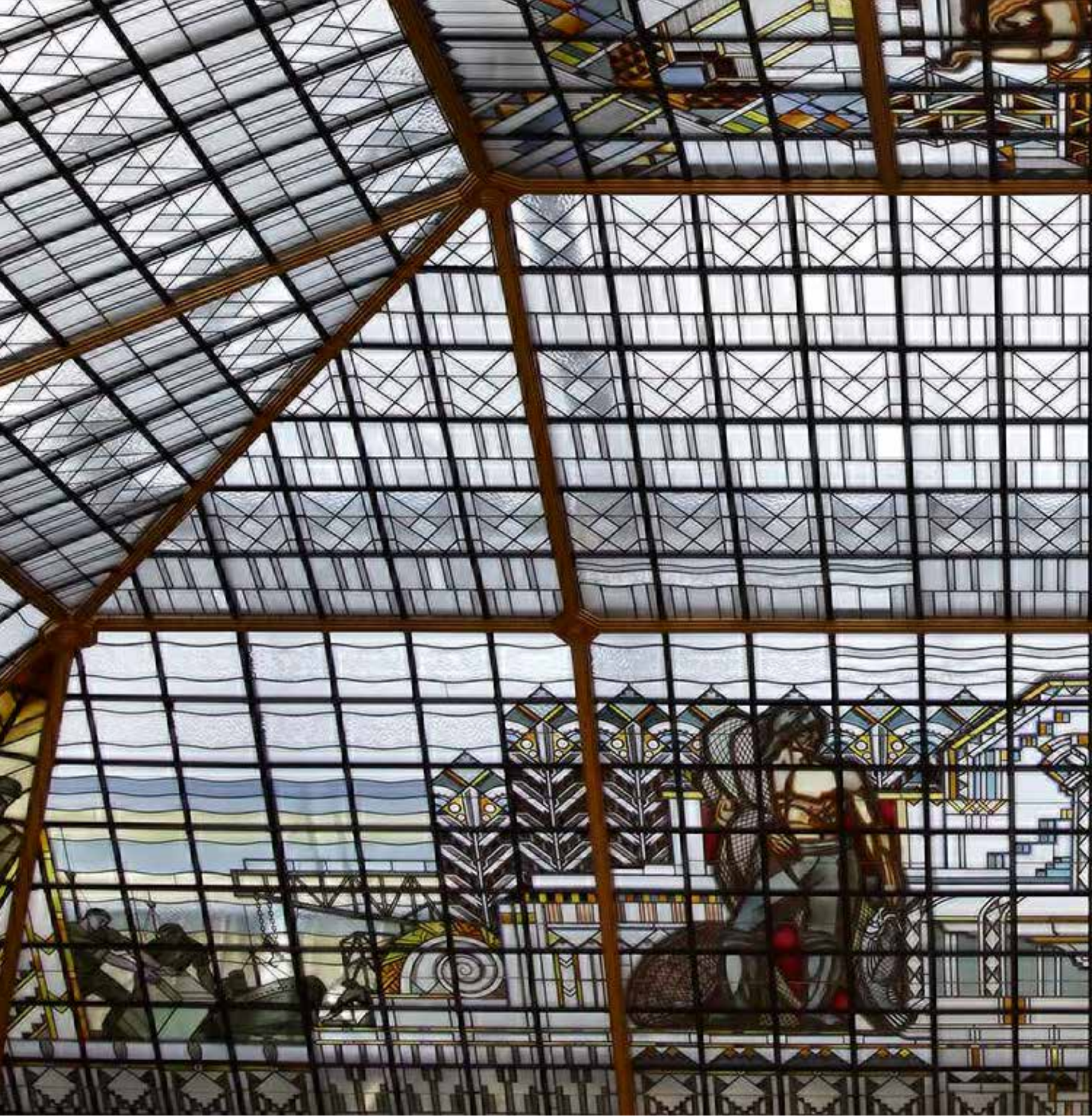


Fig. 24 On the last of the lower slopes are allegories of Fishing and Agriculture, shown as Herculean male figures with the attributes of their activities. The composition matches that of the figures of Mercury and Vulcan, but this time with no components from classical mythology

Figs. 25 and 26 In a programme dedicated to the exaltation of progress as a path to the generation of wealth, it was important to accentuate the protagonism of the allegories of Abundance and Wealth. Unlike the scenes of the various economic activities, which are indebted to traditions of the depiction of local customs, these figures display classical forms with vigorous modelling achieved with a subtle use of grisaille. They stand out against a red background made with panes of flashed glass. Their monumentality corresponds to the idea of the institution's security, permanence and solvency, the result of progress. They are privileged images within the overall design, and beneath one of them appears the name of the studio responsible for the stained glass

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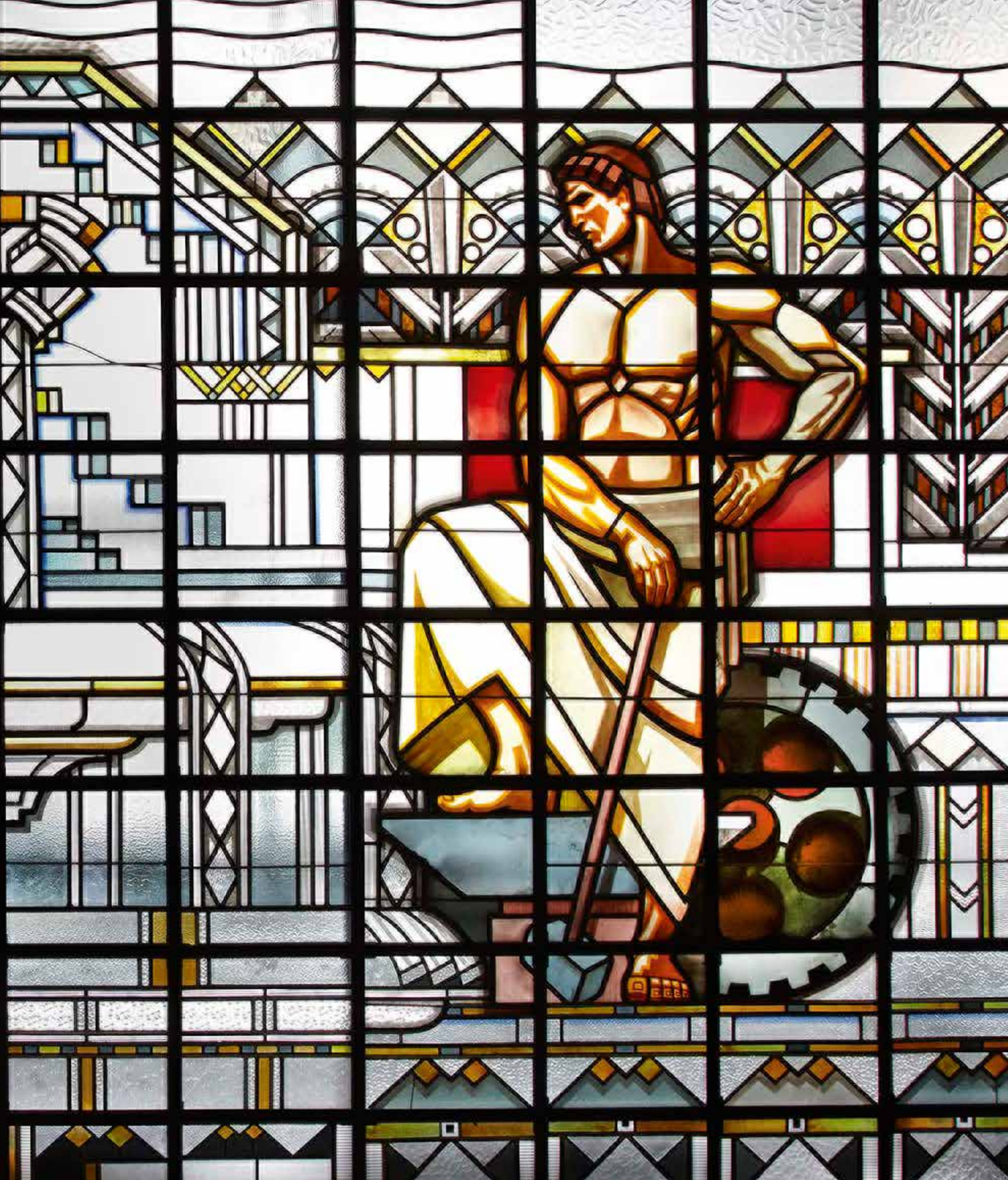
Fig. 27 Mercury appears with his classical attributes, such as the caduceus with two entwined serpents and the winged hat and sandals. He is a monumental figure whose schematic classicism is subordinated to the schematisation proper to art deco. Opposite Mercury, Vulcan appears with a nude torso, resting his left leg on an anvil while bearing a hammer in his right hand. Behind him is a cogwheel, a symbol of industrial machinery that adapts the character from classical mythology to his function as allegory of a modern activity

Fig. 28 Related to the figures of Mercury and Vulcan, the allegory of Fishing is represented by a sailor with a net and a fish in his hand. His typology evokes the inspiration of models found in socially-oriented Basque painting, where representations of popular types abound. Opposite this figure is that of Agriculture, shown as a reaper holding a sickle while his left leg rests on some wheatsheaves. Both figures are framed by a "retable" with a background of red flashed glass in the lower part, and geometric decorative motifs in colourless, yellow and coloured glass, the latter with grisailles of various intensities. They display a sculptural monumentality appropriate to an official visual concept



Besides symbolising trade, industry, agriculture and fishing, the four figures also refer to the four elements of air (Mercury), fire (Vulcan), earth (Agriculture) and water (Fishing) [figs. 27 and 28]. These are the elements which provide a spatial context for industry, fishing and maritime commerce, livestock farming and agriculture, alluded to by the male figures represented in the inverted triangles on the corners [figs. 29, 30 and 39-42].

The spaces between these inverted triangles and the "art deco retables" are used to support the aforementioned allegories and those of Abundance [figs. 25 and 26] with representations of scenes illustrating labour in various productive trades and professions.

Shown next to Mercury and Vulcan are *Harvesting*, with reapers collecting sheaves to be loaded on a cart [fig. 31], and *The Iron and Steel Industry*, with workers labouring in the

Fig. 29 At the corners of the skylight, where the lower slopes meet, there are four inverted triangles containing various allegories, such as this one of Industry, represented on an intermediate scale between that of the allegories in the centres of the sloping sides and that of the scenes of economic activities adjacent to them. As on other windows in this series, the allegories are shown with a bare minimum of iconographic elements, such as the hammer and the cogwheel seen here held by a worker

Fig. 30 Agricultural Transport is represented by a cart drawn by two oxen and led by their driver. As in the previous case, the hieratic and monumental attitude of the figure clearly distances him from naturalist representations of local customs

foreground and factories behind [fig. 32]. Opposite, next to the Fishing and Agriculture retable, is an allusion to maritime transport in the form of port with a crane, a merchant ship and a group of dock workers [fig. 33]. On the other side is an allegory of modern transport represented by the aeroplane and the railway [fig. 34] in a mythical image of speed, futurist in content, which Casa Maumejean had already used in a series of stained glass windows for a residential building in Calle Marqués de Cubas in Madrid[25] [figs. 46 and 47]. In the spaces next to the allegories of Abundance are scenes of *Fruit Picking* [fig. 35] and *Beaching the Fishing Boats* [fig. 36], and of *The Grape Harvest* [fig. 37] and *The Woodcutters* [fig. 38]. These scenes, like the ones flanking the other retables, have a background of sky made with pieces of colourless, grey and blue patterned glass forming parallel wavy lines.

Fig. 31 The representations of agricultural activities, such as *Harvesting*, are narrated with striking simplicity by contrast with the exaltation of industrial labour. This is a scene closer to a depiction of local custom than to a glorification of labour as a support for progress, although it is designed with a modern simplification of both form and composition

Fig. 32 On the other hand, in the scene representing *The Iron and Steel Industry*, whose setting is made up of factories with their chimneys, the figures of the labourers are notably "heroic" by contrast with the agricultural scenes representing the persistence of a traditional economy

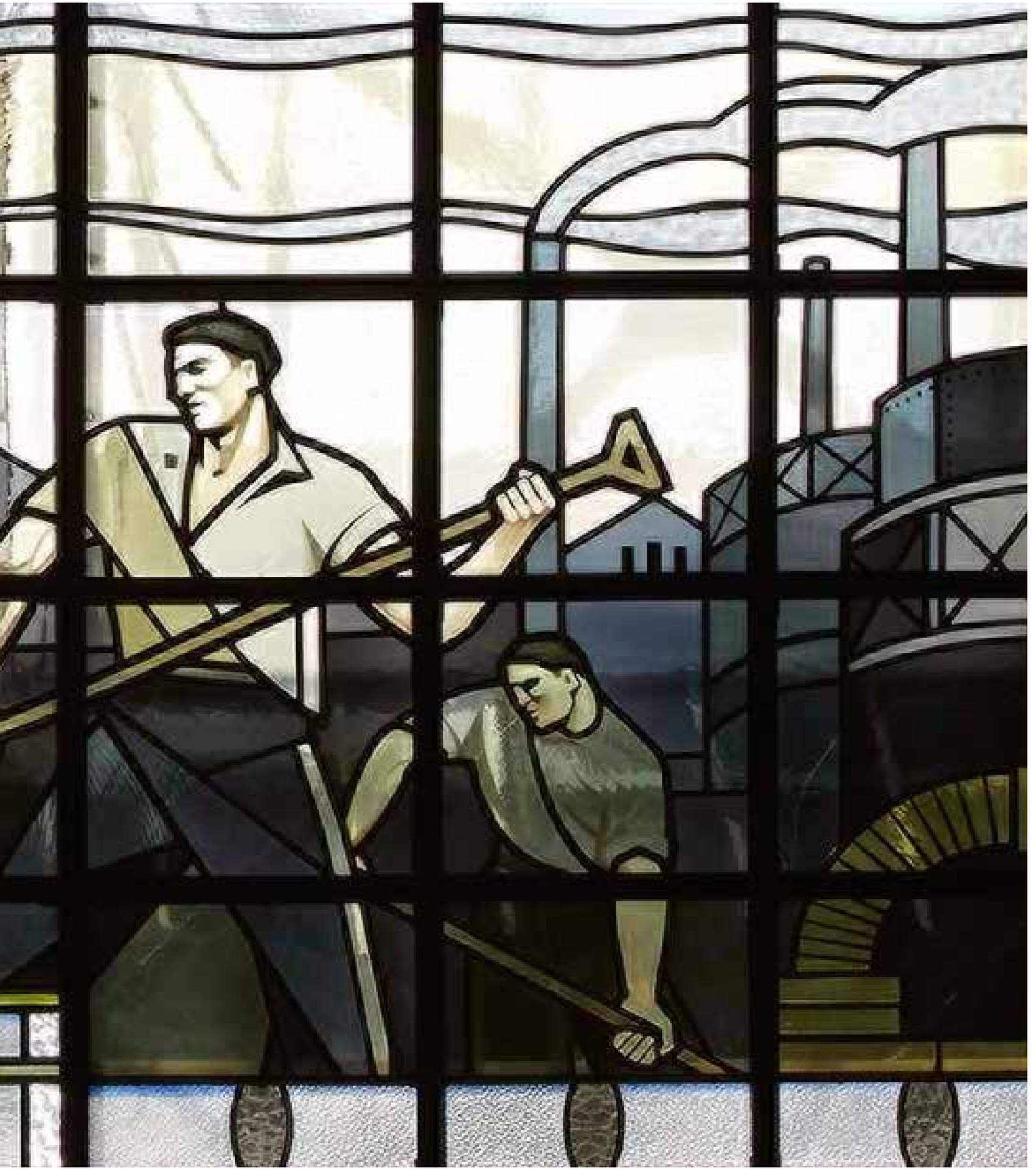


Fig. 33 *The Docks*, with its contemporary references such as the cranes and the modern ship, develops the same idea of sublimating a modern activity essential to the progress of industry and agriculture

Fig. 34 In an exaltation of progress, it was essential to make reference to the new means of communication and transport. Railways, aviation and the telegraph make up a modern representation of these means of communication, creating an image of mechanisation that Maumejean had already employed in other stained glass windows of the twenties

Fig. 35 Another representation of economic activity is dedicated to *Fruit Picking*. The agricultural workers are schematised figures who move at a rhythm far removed from any mythical exaltation

Fig. 36 *Beaching the Fishing Boats* is shown as a scene of local customs, without the exaltation that characterises the industrial depictions. Emphasis is laid on the effort of labour as a natural activity, here performed by two sailors rendered with post-cubist schematisation

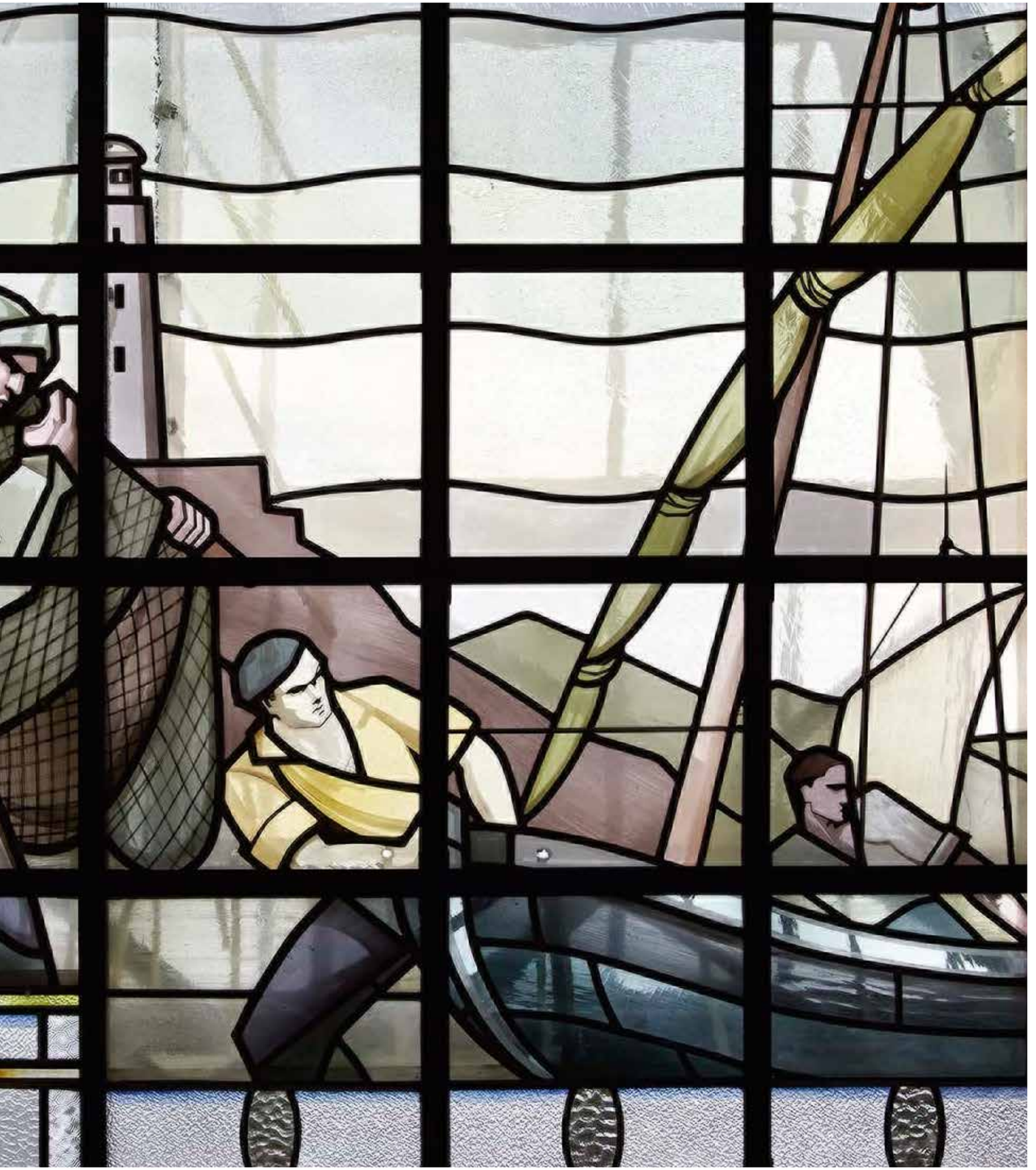


Fig. 37 Agricultural scenes, such as *The Grape Harvest*, had traditionally been used as reference points for the seasons, representing the principal activity taking place during each one. Here they lose that allegorical connotation, appearing instead as different varieties of farm labour

Fig. 38 In *The Woodcutters*, the models used are similar to those found in Basque painting of local customs. The woodcutters, like the tree trunks and the woods in the background, are subjected to a formal simplification that tallies with the geometric art deco ornamentation dominating the overall design

Fig. 39 Detail of the allegory of Industry in one of the inverted triangles at the corners. Especially striking is the reduction of colour to a monochromatic gamut of whites, blacks and greys, which lends sculptural volume to the figure

Fig. 40 Detail of the allegory of Agricultural Transport

Fig. 41 Shepherding is another of the activities represented in the corner triangles, here depicted with the usual cursory iconographic attributes of the pouch and staff

Fig. 42 The allegory of Mining is represented by a miner with helmet and pick against a white background. Economy of colour is here added to schematisation of forms

In the corners of the skylight are spaces in the form of inverted triangles. These contain allegories of Industry [fig. 39], Agricultural Transport [fig. 40], Shepherding [fig. 41] and Mining [fig. 42]. Each allegory consists of a single three-quarter length figure with a decoration of geometric zigzag motifs in white, black and yellow at the bottom.

All these images present affinities with examples of the representation of labour in painting. Detached from the traditional academic language, the compositions and models respond instead to a concept that characterises contemporary social painting. In particular, it is not by chance that there are representational coincidences with the Basque painting of the first third of the 20th century, and specifically with its monumental treatment of local custom.

The cycle mythifies labour as a triumphant and heroic action, but this does not prevent the compositions from being dominated by a subtle interplay of light and colours, and the tempered schematisation of the figures, objects and landscape features is the key to the beauty of a new modern classicism that makes these stained glass windows one of the most striking socially-oriented cycles of images of the period.

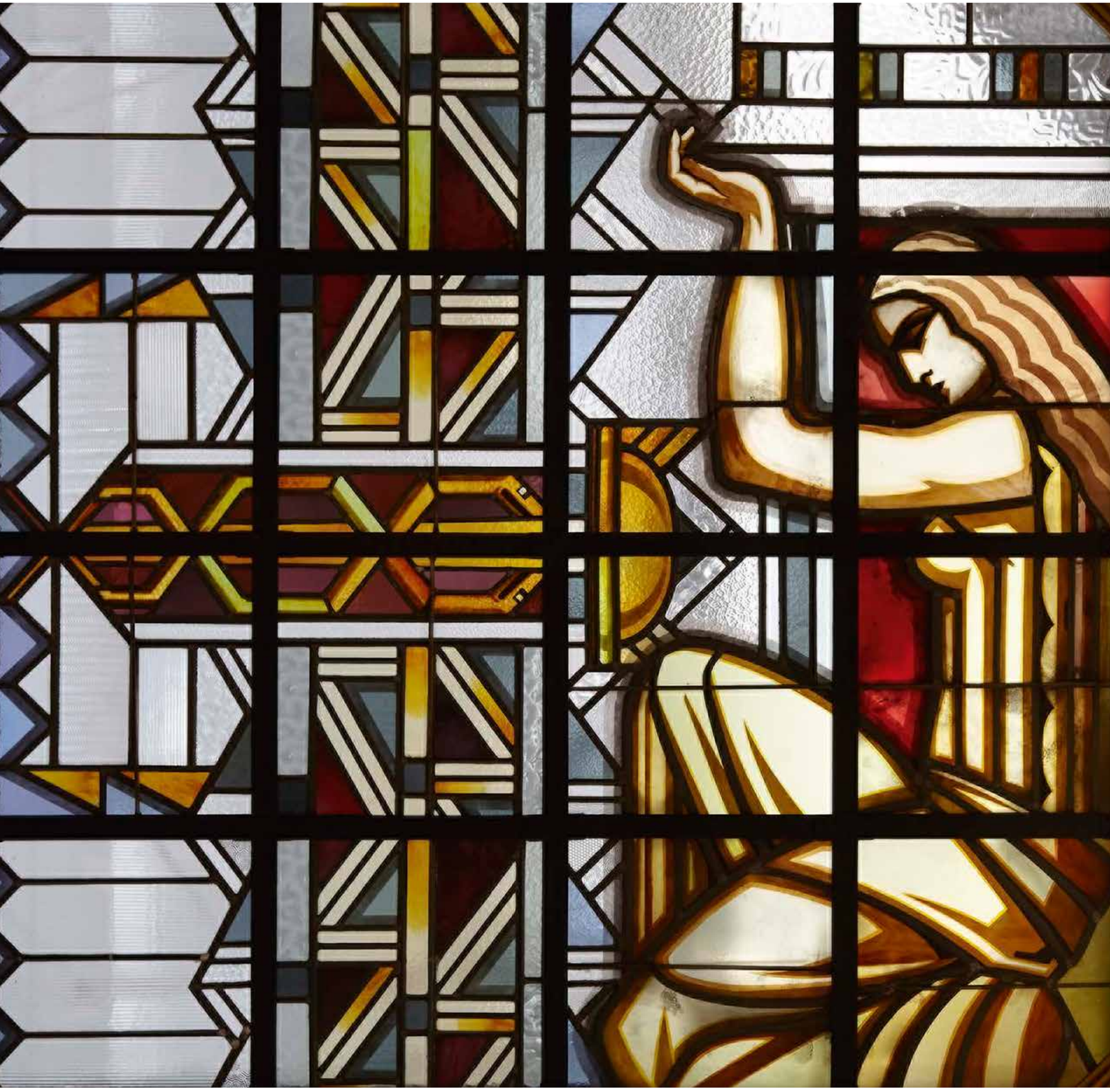
The novelty of the group, as we said earlier, resides in the union of the idea of progress as a modern myth and the modern forms of art deco. There is integral identity between the subject and the system of representation. Progress is depicted with modern forms. As we have pointed out elsewhere:

> At a moment when a profound economic crisis has arisen and shaken the value of the idea of Progress, what is implicitly proposed is the development of a utopia: modernity as the salvation of Progress, with the renewal of Progress by a modernity which does not relinquish the support of a series of permanent values.[26]

This is a modernity projected from the schematic classicism proper to art deco figuration, which is used as a form representative of the official character of the building and the concept of the institution's prestige.

Hence the resort to simplified classical models, like the facing figures appearing in the "retables" on either side of a central space, or the caryatids on both sides of the central coat-of-arms [fig. 43], which are derived from the atlantes painted by Michelangelo on the vault of the Sistine Chapel. The use of such elements is also related to their application to a roofing structure

Fig. 43 The coat-of-arms of Spain, located in the centre of the skylight, is flanked by two kneeling caryatids supporting a cornice. These figures follow classical types and are clearly related to the sculptural decoration that was applied to art deco architecture. Around is a profusion of decorative motifs belonging to the same artistic language, as well as an abundance of panes of patterned glass in various textures



regarded as paradigmatic. These recognisable and well-established models act as authoritative quotations, reinforcing a monumentality inspired by models whose status is beyond question, and connecting with the traditional symbolism of the dome, as mentioned above.

## THE IMAGE OF MODERNITY

The skylight of the Trading Floor appears to us as a vast surface of suspended glass. Its art deco ornamentation introduces the idea that the sensation of solidity and security produced by the Banco does not rest on a static and traditional concept of economic and financial power, but on an active and dynamic course of development. In short, it is modern. However, this is a modernity channelled within the paths of order, tempered, unprovocative, comprehensible and acceptable as a natural element. Such an idea coincided with the language and principles of art deco in helping to spread avant-garde forms and modernise tradition and classicism.

The Maumejean studio made stained glass windows in a wide range of artistic languages, from neo-Gothic to neo-Renaissance, neo-Baroque and modern. Its ability to design works in the most disparate styles was inexhaustible [fig. 44]. The Maumejean brothers understood glazing as an activity independent of the hegemony of one artistic tendency or another, and determined instead by the exigencies of each commission. Such formal diversity was enabled by resorting to artists with a profound knowledge of the technique. Production was organised as an industrial process, but always maintaining a rigorous observance and application of the craftsman's techniques and procedures [fig. 45]. In a publicity brochure for the studio entitled *Vitraux et mosaïques d'Art*, explicit reference is made to this aspect:

> It is important to specify the artistic speciality of the firm, which has voluntarily banished from its production the working method that appears to be imposed by modern industrialism. Following the traditions so wisely established by the art of the ancient glaziers and mosaicists, it is the firm's object to arrive by these means at the production of works of art worthy to be compared with theirs. Its directors were trained in the workshops, and their work is based, as in ancient times, on their long practical experience of the craft, their knowledge of draughtsmanship and their exhaustive study of styles. No detail of execution, then, is a matter of chance. Absolutely everything is produced by them and their assistants in the workshops, from the initial concept to the final touch, and this allows them to achieve the harmony between the whole and the detail that is demanded by these two beautiful branches of the decorative arts, the Stained Glass Window and the Mosaic.[27]

Fig. 44 The decorative motifs of a geometric nature are arranged in accordance with a composition that rigorously distributes them in a symmetrical and regular pattern. The form of each pane, its size, its colour, its texture and its position in the composition form the basis of these abstract designs in tune with the avant-garde art of the period

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Fig. 45 The stained glass window requires a structure to attach it to the building. The great skylight is borne up by a large supporting structure and another secondary one which holds the different panels. Together with the forms traced by the leading, the shapes of these metal structures reinforce the effect of the language of the stained glass compositions

At the same time, they made stained glass windows in the "modern style", which was the option chosen for the programme of the extension to the Banco de España. Its execution reveals a profound knowledge of traditional methods and an impeccable technique. In relation to the modern classicism of the architecture, it was a type of stained glass integrated artistically into the building. Furthermore, the great skylight functions as an outstanding architectural component in its own right.

Figs. 46 and 47 The image of the machine associated with progress was authoritatively employed by Maumejean in the stained glass windows made by the firm in 1925 for a residential building at Calle Marqués de Cubas, no. 25, in Madrid. Besides images of machines, there is also a depiction of an aerial view, a type of representation which was starting to become widespread at that time

Many of the compositional and decorative elements in these stained glass windows relate to classical models, and they also represent a simplification of cubist forms. Indeed, this was a requirement for the programme. Placed as they were alongside mythological allegories of a symbolic character, the subjects related to progress – industry, trade, agriculture or mining – would have completely altered the image of progress and modernity that was intended to predominate had they been represented in a naturalist language.[28]

Art deco was applied extensively during that period of crisis, when it became a priority to integrate art and industry in an attempt to increase the production and the aesthetic value of objects. The stained glass of the skylight in the Trading Floor is an example of a mythical sublimation of progress established by means of an art that was integrated in industrialisation without renouncing its intrinsic craftsmanship.

The integration of art deco in technology took place without subjecting the mechanical product and traditional values to full-scale mechanisation. What occurred was a recomposition of the contributions of the avant-garde without going so far as to produce formally radical objects with an alarming appearance. Art deco stained glass exemplifies this modernisation through the forms and materials of an industrialised world, where artistic values

create a modern language without resorting to the academic lessons of history. For what actually developed was an integration and confluence of the efforts of art and industry to bestow an artistic nature on machine-made products, and to allow art to continue developing as part of the world of machines and technology.

The organisers of the 1925 Exposition in Paris defended such integration when they asked: "Could it possibly be affirmed in the 20th century, when some of the purest aesthetic realisations of our time are the bodies of automobiles and the silhouettes of aeroplanes, that there exists some antinomy between art and industry?"[29] The wealth and diversity of the types of industrial glass used in art deco windows, together with the mechanical appearance of their geometric forms, testify clearly to this technical and formal relationship, which became increasingly frequent from the twenties onwards.[30]

The stained glass windows with elements alluding to progress which are most closely related to those at the Banco de España are the ones made by the Maumejean workshop for the windows on the staircase of a residential building at Calle Marqués de Cubas, no. 25, in Madrid [figs. 46 and 47]. Futurist in inspiration, these windows establish a conjunction between the white, black and grey colouring, the modern texture of the various types of glass, and the subject matter of modern transport: a train, an airship, an aeroplane and a ship, and the view of a port from the air. These images are a definition of the myth of modernity and the triumphant idea of progress which the futurists sought in "the tangible miracles of contemporary life – the iron network of speedy communications which envelops the earth, the transatlantic lines, the dreadnoughts, those marvellous flights which furrow our skies, the profound courage of our submarine navigators ...".[31]

Fig. 48 In the corners, the sloping sides made it necessary to insert panels in the form of inverted triangles integrated in the geometric structure of the skylight

The monochrome character of these stained glass windows foregrounds the essential use of their own media. The series in the hall of the Banco de España, made at the same time as that of the Trading Floor, follows the same principles. The insistent use of glasses with high-relief textures and patterns, the geometrical

interplay of the panels, the fragmentation produced by the leading and the use of grisaille to reinforce the line all express the modernity of this stained glass through its specific materiality [fig. 48]. This reduction of colour may have arisen through a desire to achieve an effect of modernity through concordance with photography and above all with the cinematograph, one of the paradigms of modernity at that time, and itself an art of light.

## CONSTRUCTION AS LABYRINTH

Unlike *art nouveau*, a style for which various different names were proposed while it was in vogue, art deco lacked a specific denomination until much later. This has prompted one of the historians of the trend to affirm that "the art deco style, as such, never existed".[32] The principal trends of contemporary art had a name in their own day, such as fauvism, expressionism, cubism or futurism. Art deco did not, probably because it was a syncretism of disparate forms and tendencies that shunned the radical character of those styles. Since it was not a programmatic tendency, art deco was regarded as a second-rate substitute. The term "*art déco*" did not appear until "Les Années 25", an exhibition held from 3 March to 16 May 1966 at the Musée des Arts décoratifs in Paris to commemorate the "Exposition internationale des arts décoratifs modernes" in 1925. What name, then, used to be given to this language, which despite its diversity of sources constituted a coherent and well-defined style with characteristics of its own? Reproduced in an advertising brochure published in Madrid by Maumejean are several pieces from the firm's workshop that offer paradigmatic examples of art deco stained glass. They appear under the denomination of "stained glass windows in the modern style". In other words, what we now call art deco was known as the "modern style" to its creators and users, who saw it as the artistic language of modern life by contrast with stifling historicisms.

The part of the skylight which lacks figurative elements is resolved with procedures and forms that are essentially those of the glazier. Yarnoz, the architect who designed the extension, indicated that the great skylight of the Trading Floor should be "very richly decorated, and in harmony with the general ornamentation of the Floor".[33] On the skylight, the Maumejean brothers devised a corpus of geometrical forms which are also to be seen, with very intense colours, on the ornamental elements supporting the figurative subjects [fig. 49]. Together with the rich interplay of the differently calibrated panes of glass, they make up a full catalogue of an abstract morphology combined with the grid formed by the iron bars holding the numerous panels in place. A simplification of the forms of cubism

Fig. 49 Although the ornamental modules form part of the overall decoration, each one also displays its own constructive and neoplastic composition, with harmonious colouring and the textured effects of the patterned glass

and of geometric abstraction is observable in these combinations, but there are also connotations of machinism, which assumes certain forms in the painting of Ferdinand Léger and the development of *l'esprit moderne*. The combinations appear as an agglutinant of mechanical forms, which are projected onto the architectures that frame and support the central allegories on the lower slopes. The niches and architectural motifs that accompany the allegories of Abundance, like those of Fishing and Agriculture and the figures of Mercury (Trade) and Vulcan (Industry), resemble toy constructions made out of pieces of wood. The forms and combinations of these elements are in fact strongly reminiscent of such ludic rearrangements of classical features, and many of the decorative motifs that are not representative of architectural structures also produce a result similar to that of toy construction sets, whose influence on the development of avant-garde art has been shown to have been considerable.[34]

Fig. 50 Bruno Taut, *Dandanah: The Fairy Palace*, 1919 (replica of 2003), molten coloured glass. Montreal, Centre Canadien d'Architecture. Phyllis Lambert Collection

A stained glass window, made up of panes of glass in different colours bonded by leading, is also a construction articulated on the basis of different pieces. The arrangement of stained glass is flat, presenting an appearance similar to the pieces of construction sets when they are laid out in their boxes. As fantasy architectures, they display clear affinities with toy buildings, whose history parallels that of modern architecture. To this we might add the illusory constructions of an ornamental character found in much art deco stained glass, whose geometrism makes them convertible, in an inverse process of retransformation, into boxed construction sets.

The toy building sets of the architect Bruno Taut (1880–1938), made of glass and designed in 1919 under the title *Dandanah: The Fairy Palace. Building Blocks of Solid Glass. Invented by Blanche Mahlberg. Models and Designs by Bruno Taut*,[35] coincide in their pretence with these imaginary architectures [fig. 50]. Indeed, the fantastic architectures of the skylight could have been built on a considerably smaller scale with the pieces of such sets, or the architectures on the stained glass could have served as a basis for manufacturing pieces for toy buildings. The coincidence is even greater in this case because the pieces of the construction set are made of glass, and so display the translucence characteristic of stained glass.

Fig. 51 Owing to the regular pattern followed in the geometrical decoration, some of the figurative elements, like the basket of fruit seen here to one side of Abundance, acquire the forms of the decorative motifs

The controversy between abstraction and figuration never arose in art deco stained glass. The two modalities live side by side, as is appreciable on the great skylight [figs. 51 and 52]. The figuration here tends towards an abstract geometry, and is integrated within a rhythm of abstract forms. The new plastic value of the different glass panes asserts itself independently of the figurative or abstract character of the window. The textures of the glass seem to be used as in a post-cubist collage, foregrounding the plasticity of the material. Years before the stained glass windows were made for the extension to the Banco de España, José Yarnoz said of those presented by the Maumejean brothers at the 1925 Paris Exposition:

> effects of great artistic value have been achieved with the use of double and triple panes in various colours, and of reticulated, undulating or faceted glass, etc. ... The use of paint is limited to the strictly indispensable, so as not to detract from the purity and transparency of the glass, the principal qualities of a well executed stained glass window.[36]

In this sense, one of the innovative contributions of this work was the use of a wide variety of patterned glass, which allowed the window to be so thoroughly textured as to make many parts of it into translucent collages.

In the extension to the Banco de España, the stained glass windows in the Trading Floor, the staircase and the vestibule constitute one of the foremost examples of the monumental art deco stained glass window. As we have noted elsewhere,

> through the technical media of the stained glass, experimentation with the possibilities of the support, the interplay of textures, and the possibilities available for cutting the panes and joining them with leading, deco stained glass windows transmit some of the images that best define the language known as art deco.[37]

Art deco led to the diffusion of a moderate and temperate modernity derived from the radical tendencies of the avant-garde. It found reflection in arts of all kinds, such as textiles, fashion and costume design, bookbinding and its related arts, posters, glassware, furniture, objects of industrial design, jewellery, cinema and photography. It was the aesthetic of a modernisation of life that also found major expression in architecture and décor. In this respect, as I have pointed out,

> While the avant-gardes appeared with a messianic purpose, breaking with tradition and creating an art supposedly *ex nihilo*, art deco was the trend whereby such developments,

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Fig. 52 The figurative motifs of the skylight are found on the lower slopes and in the centre, where the coat-of-arms of Spain is to be seen. Around this is a surface of colourless glass that permits the entrance of more light. The purpose was to ensure sufficient interior lighting for a space where operations were to be carried out. This luminous area is made up of panels of colourless patterned glass whose pieces form an undulation that dynamises the surface. With regard to the compositions commented on above, the leading is here used as the expression of the essence of the window's design, with panes of various forms joined by lead that is adjusted to them

acceptable only to a minority, were transformed into artifacts for a wider public. Through cinema, fashion, illustration and the graphic arts, the stained glass windows on the staircase of a house or the architecture of cinemas, a broad sector of the public lived in contact with something that would later be defined as an artistic style, but was then no more than the expression of the modern. It was a far-reaching modernity, much less radical than the avant-gardes, through which a majority between the two world wars felt that they lived in a new ambience, different from those bequeathed to them by History. It was a modernity without epithets or nuances, but one which fulfilled, without exclusions, an important function of renovating the bastions of academe.[38]

The wide dissemination of art deco products in society is explained by the fact they achieved application in every sphere of life rather than remaining enclosed in the cryptic atmosphere of the avant-garde laboratories, swapping the traditional environment for a modern one without producing radical ruptures. Such is the case of Yarnoz's extension to the Banco de España and the luminous ambience created by the Maumejean studio.

1 Carmen Giménez Serrano, "Dinero y arquitectura. Edificios bancarios en España", in *Arquitectura Bancaria en España* [exh. cat.], Madrid, Ministerio de Fomento, 1998, p. 23.

2 Víctor Nieto Alcaide, Sagrario Aznar Almazán and Victoria Soto Caba, *Vidrieras de Madrid, del modernismo al art déco*, Madrid, Comunidad de Madrid, Dirección General de Patrimonio Cultural, 1996, p. 26.

3 *Ibid.*, p. 25.

4 Juan Bautista Lázaro, *Las artes decorativas españolas. Discursos leídos ante la Real Academia de Bellas Artes de San Fernando en la recepción del Excmo. Sr. D. Juan Bautista Lázaro el 16 de diciembre de 1906*, Madrid, 1906, pp. 25–26.

5 José María Viñuela, "Las vidrieras del taller Mayer en el edificio de Madrid. Un programa iconográfico para un establecimiento bancario", in *Banco de España. Boletín de información de difusión interna para el personal*, 14 (1984), p. 25.

6 *Ibid.*, pp. 24–25.

7 Nieto Alcaide, Aznar Almazán and Soto Caba, *op. cit.*, p. 29.

8 On this problem, see Eric Storm, *La perspectiva del progreso. Pensamiento político en la España del cambio de siglo (1890–1914)*, prologue by José Álvarez Junco, Madrid, Biblioteca Nueva, Sociedad Menéndez Pelayo, 2001.

9 The term is used in an advertising leaflet: *S. A. MAUMEJEAN. Hos.*, Madrid, Heliotipia de Kalmeyer.

10 Pedro Navascués Palacio, "El Banco de España en Madrid. Génesis de un edificio", in *El Banco de España. Dos siglos de historia, 1782–1982* [exh. cat.], Madrid, Banco de España, 1982, pp. 121–22.

11 Archivo Histórico del Banco de España, Administración y Obras, Caja 70. Nieto Alcaide, Aznar Almazán and Soto Caba, *op. cit.*, p. 88.

12 Archivo Histórico del Banco de España, Administración y Obras, Caja 70. Nieto Alcaide, Aznar Almazán and Soto Caba, *op. cit.*, p. 99, note 38.

13 Archivo Histórico del Banco de España, Administración y Obras, Caja 70. Nieto Alcaide, Aznar Almazán and Soto Caba, *op. cit.*, p. 88.

14 *Estatutos por los que ha de regirse la Sociedad Anónima Maumejean Hermanos de Vidriería Artística S.A. ...*, Madrid, Imprenta Policarpo Sáenz, 1923.

15 The window can be seen already installed in A. Hernández, "El Banco de España orgullo de edificios", *Blanco y Negro* (30 June 1935); and in *El Banco de España. Información Gráfica*, Madrid, Asociación General de Empleados del Banco de España, [February] 1936, n. pag.

16 The collection of drawings, cartoons and photographs from Casa Maumejean was acquired in 1993 by the Spanish State and allotted to the Museo Nacional de Artes Decorativas, whereupon it was placed in storage in the Museo del Vidrio at La Granja (Segovia).

17 Archivo Histórico del Banco de España, Administración y Obras, Caja 70.

18 Paloma Pastor Rey de Viñas, *Vidrieras del Taller Maumejean en las colecciones de la Real Fábrica de Cristales de La Granja*, Segovia, 2005.

19 Pierre-Frank Michel, *Le Vitrail 1900 en Suisse* [exh. cat.], Liestal, Amt für Museen und Archäologie des Kantons Basel-Landschaft, 1985, p. 22.

20 Víctor Nieto Alcaide, "Cúpulas de hierro y vidrio", in *Arquitectura y ciudad en España de 1845 a 1898. Actas de las I Jornadas de Arquitectura Histórica y Urbanismo* (Cádiz, 3, 4 and 5 June 1998), Cádiz, Universidad de Cádiz, UNED, 2000, pp. 257–60.

21 Pastor Rey de Viñas, *op. cit.*, p. 15.

22 John B. Bury, *The Idea of Progress*, London, Macmillan and Co., 1921, p. 5.

23 José Ortega y Gasset, *Meditación de la técnica y otros ensayos sobre ciencia y filosofía*, Buenos Aires. Espasa Calpe, 1939. The papers had previously been published in Buenos Aires as a series of articles in *La Nación*.

24 José Ortega y Gasset, *Meditación de la técnica y otros ensayos de ciencia y filosofía*, Madrid, Alianza Editorial, 2001, p. 28.

25 Nieto Alcaide, Aznar Almazán and Soto Caba, *op. cit.*, p. 78.

26 *Ibid.*, p. 91.

27 Société Anonyme Mauméjean Frères, *Vitraux et mosaïques d'Art*, Paris, Imprimerie d'Art Le Croquis, n.d.

28 Such is the case of the stained glass windows produced by the Maumejean studio on the basis of forms drawn from traditional realism for the auditorium of the Caja de Ahorros de Sabadell, which exalted Trade, Industry and Agriculture. Joan VilaGrau and Francesc Rodon, *Las vidrieras modernistas catalanas*, Barcelona, Polígrafa, 1983, pp. 55, 58 and 59.

29 Yvanhoe Rambosson, "Les grandes directives de l'Exposition", in *Les Arts décoratifs modernes*, special issue of *Vient de Paraître*, Paris, Les Editions G. Grès et Cie., 1925, p. 38.

30 Jacques Gruber, *Le Vitrail à l'Exposition internationale des arts décoratifs. Paris 1925*, Paris, Librairie d'Art Industriel Ch. Moureau, 1925, pp. 25 and 38. At the 1925 Exposition, mentioned above, artists like Gaëtan Jeannin presented stained glass windows on the subjects of *The Automobile* and *The Ocean Liner*, while J.J.K. Ray exhibited another on *The Navy*.

31 Umberto Boccioni, Carlo Carrà, Luigi Russolo, Giacomo Balla and Gino Severini, "Manifesto of the Futurist Painters 1910", in Umbro Apollonio (ed.), *Futurist Manifestos*, London, Thames and Hudson, 1973, p. 25.

32 Paul Maenz, *Art Déco, 1920–1940: formas entre dos guerras*, Barcelona, Gustavo Gili, 1974, p. 10.

33 Archivo Histórico del Banco de España, Administración y Obras, Caja 79.

34 Juan Bordes, *Historia de los juguetes de construcción. Escuela de la arquitectura moderna*, Madrid, Cátedra, 2012.

35 *Ibid.*, p. 25, plates 8, 9, 44.

36 José Yarnoz Larrosa, "La vidriera artística y sus últimas manifestaciones en la Exposición Internacional de Artes Decorativas", *Arquitectura*, 80 (1925), p. 303.

37 Nieto Alcaide, Aznar Almazán and Soto Caba, *op. cit.*, p. 73.

38 Víctor Nieto Alcaide, *La vidriera española. Ocho siglos de luz*, San Sebastián, Nerea, 2011 (2nd ed.), p. 331.

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# The Trading Floor in the Traditional Building of the Banco de España

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The set of buildings forming the Banco de España in Madrid occupies a whole block surrounded by the streets of Alcalá, Marqués de Cubas, Los Madrazo and Paseo del Prado [fig. 54]. Within this block, there are various buildings of different ages and configurations, as described below:

- The Edificio Tradicional (Traditional Building) has fronts giving onto Calle de Alcalá, Paseo del Prado and Calle de los Madrazo. It was constructed in two phases:

  The first, corresponding to the work of the architects Eduardo Adaro and Severiano Sainz de la Lastra, was inaugurated in 1891.

  The second, corresponding to the work of the architect José Yarnoz Larrosa, was inaugurated in 1934.

The Traditional Building of the Banco de España was declared a Property of Cultural Interest in Royal Decree 1933/1999 of 17 December 1999, published in the Official State Bulletin of 31 December 1999, and is included in the Register of Real Properties of Cultural Interest under code 0010508, category 51 ("Monuments"). The General Urban Development Plan of Madrid, whose approval was published in the Official Regional Bulletin of Madrid on 17 April 1997, includes the Traditional Building of the Banco de España in the General Catalogue of Protected Buildings under Level 1 of Singular Protection.

- The Edificio Ampliación (Extension Building) has fronts giving onto Calle Marqués de Cubas and Calle de los Madrazo. It was built between 1969 and 1975 to designs by the architect Javier Yarnoz Orcoyen.

Fig. 53 Interior of the Trading Floor

- Edificio Torre (Tower Building) is located inside the central courtyard of the city block, accessed from the perimeter entrances on Calle Alcalá and Calle de los Madrazo. It was built between 1969 and 1975 according to Javier Yarnoz Orcoyen's designs.

- The Edificio Cierre (Closure Building) lies on the corner of Calle de Alcalá and Calle Marqués de Cubas. It was constructed between 2005 and 2007 to designs by the architect José Rafael Moneo.

The first building to house the Banco de España when it was founded in 1856 was the so-called "Building of the Five Guilds", also known as the "Old Customs House". Designed by the architect José de la Ballina, it was located on Calle de Atocha in Madrid. Just twenty-six years later, that first building was found insufficient for the Banco's needs, leading to a search for solutions that concluded with the purchase of the palace of the Marqués de Alcañices and its grounds, situated on the corner of Calle de Alcalá and Paseo del Prado. This marked the beginning of a series of projects which eventually materialised years later in part of the complex we see today.

A competition was announced in the *Gaceta de Madrid* of 1 August 1882 for the design of the new building, with an initial programme that drew four projects. The winner announced by the jury was a project presented under the title of *Doblón* (Doubloon) by the architects Luis Aladrén and Adolfo Morales. The prize was duly awarded, but the Banco deemed it necessary to revise its programme of requirements, and therefore commissioned its architects, Eduardo Adaro and Severiano Sainz de la Lastra, to come up with a series of proposals, one of which was finally accepted by the Works Commission in April 1883.

The ceremony of laying the first stone, with King Alfonso XII in attendance, took place on 4 July 1884, as recorded on the commemorative plaque next to the main entrance on Paseo del Prado. Nevertheless, the project underwent modifications and enlargements that necessitated the purchase of more land. These purchases affected the church of San Fermín de los Navarros and the estate of the Marqués de Larios, which occupied the corner of Paseo del Prado and today's Calle de los Madrazo, and the Marqués de Retortillo's house and grounds on Calle de los Madrazo. The new land was thus incorporated to the initial property.

With the purchase of these plots of land, the Banco de España was able to adopt a definitive project in 1887, with a front extending along Paseo del Prado, from Plaza de Cibeles to Calle de los Madrazo, and a flank running along Calle de Alcalá, from the corner to a private service

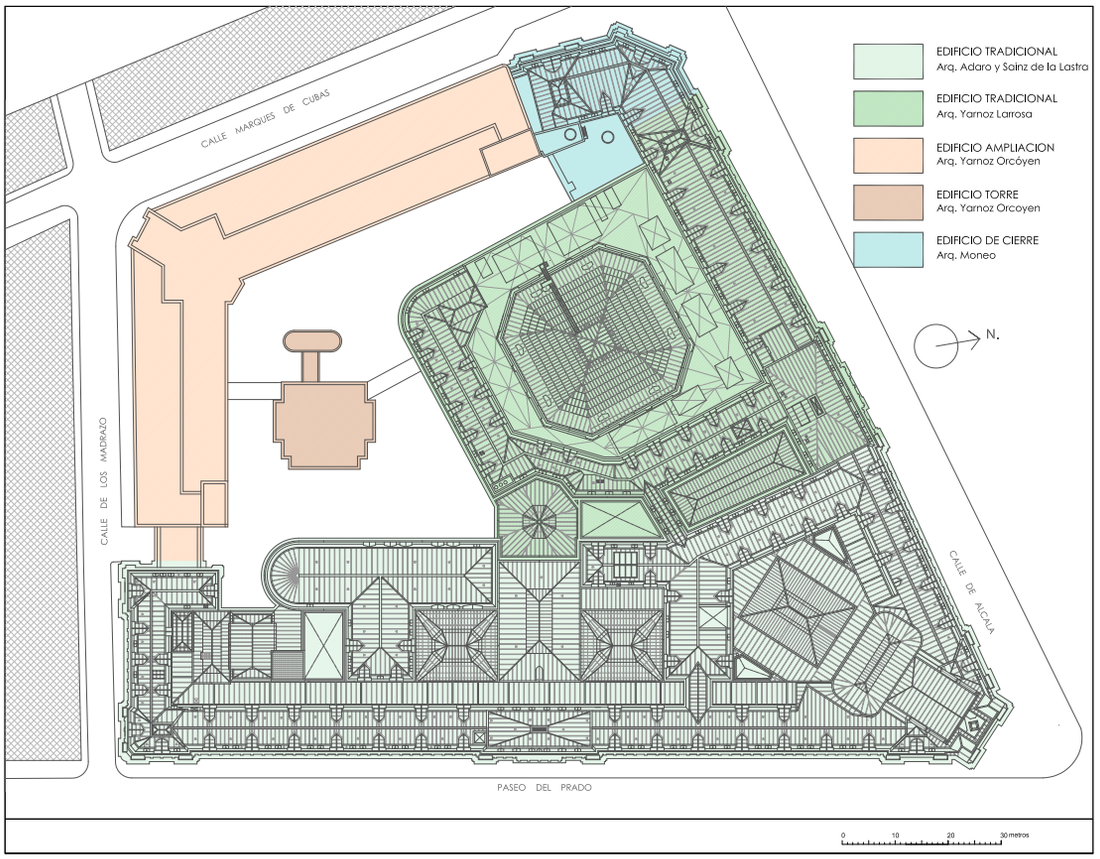



Fig. 54 Plan of the block occupied by the Banco de España with its successive phases of construction

street on the west side. Work on this initial phase began on 3 March 1891, with Alfonso XIII now on the throne under the regency of Queen María Cristina.

The façade on Paseo del Prado, with its striking termination in the bevel corner on Plaza de Cibeles, possesses an expressive force that makes it one of the most significant examples of Spanish architecture of the late 19th century [fig. 55]. It is organised in horizontal bands, with imposing lintel arch openings on the base, round arched openings on the main floor, and an upper frieze with smaller lintel arch windows, all constructed with a thick facing of Guadarrama granite, limestone from La Alconera (Badajoz), ornamental features in Carrara marble, singular wrought iron grilles, and metal castings for the final details. Appearing behind the balustrade that runs along the top of the walls is the mansard storey, with an architecturally prominent frontline built in zinc and slate.

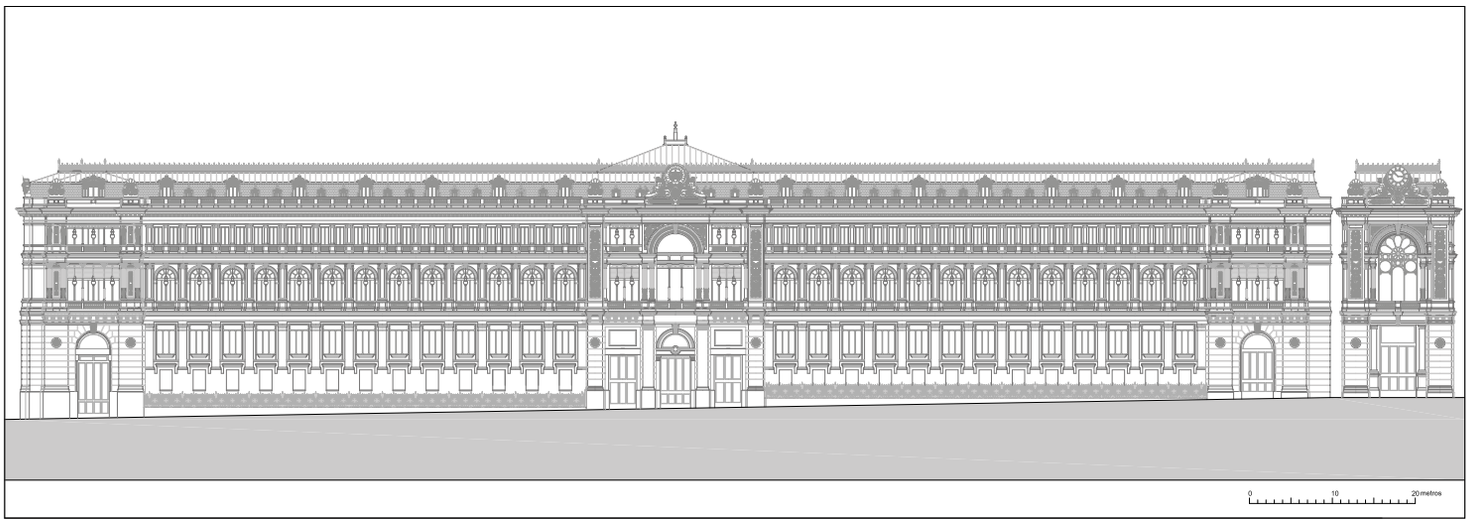



Fig. 55 Elevation of the façade on Paseo del Prado

On the rear side of the building facing Paseo del Prado, the inner façade was designed with a very different appearance. A more industrial character is predominant here, with the use of exposed brickwork for the walls and prominent masonry surrounds for the openings [fig. 57].

Just thirty years after the inauguration of the building, the Banco initiated proceedings for its enlargement. In 1923, it acquired the palace and gardens of Bartolomé Santamarca, which occupied what had previously been the Casas del Chantre (Chantry Houses) on the side facing Calle de Alcalá. The architect José Yarnoz Larrosa drew up a project for an extension which was approved by the Banco Council in March 1928, and work began with the demolition of the old Santamarca Palace.

Yarnoz Larrosa's project completes the outer façade on Calle de Alcalá, rigorously maintaining the design of the first phase by the architects Adaro and Sainz de la Lastra, but also adds a prominent portico at the side of the private street that was built during the initial phase. The section where the new portico meets the original façade hosts the main entrance to the whole complex and provides access to the new Patio de Operaciones (Trading Floor) [fig. 56].

On the rear façades of the new buildings as well as in the interior spaces, the architecture displays a substantial change in its features and its compositional criteria. The union with the initial phase is resolved on the outside with the addition of the entrance mentioned

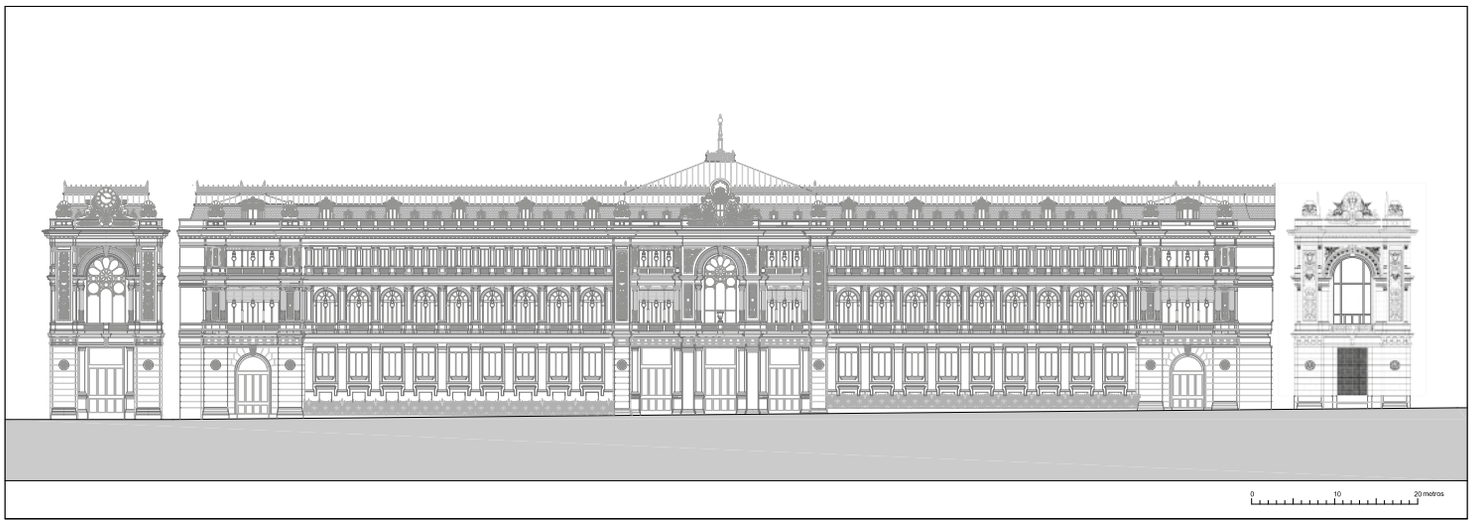



Fig. 56 Elevation of the façade
on Calle de Alcalá

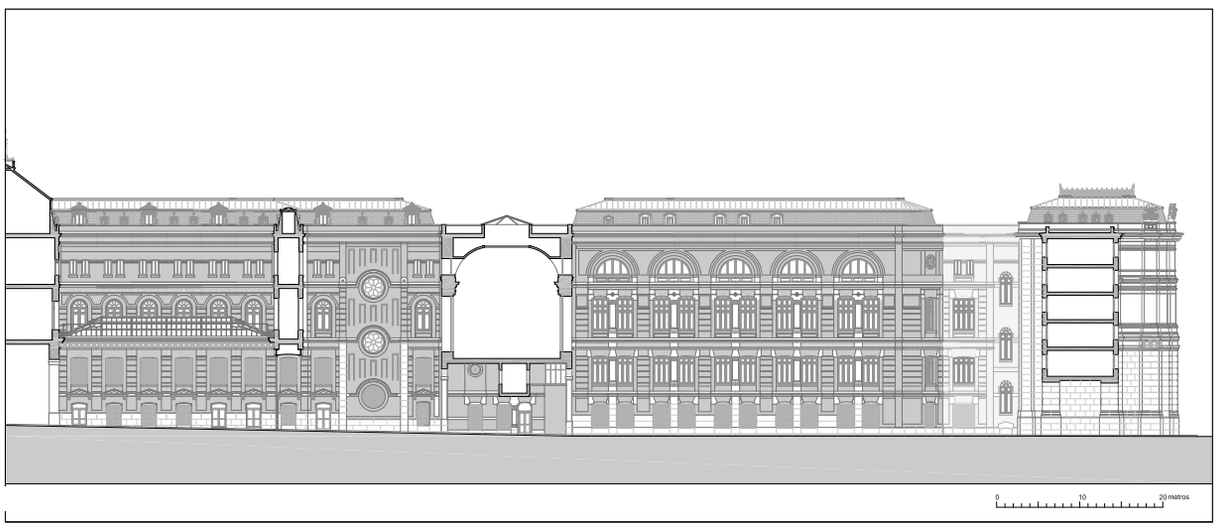



Fig. 57 Elevation of the interior
façade overlooking the private street

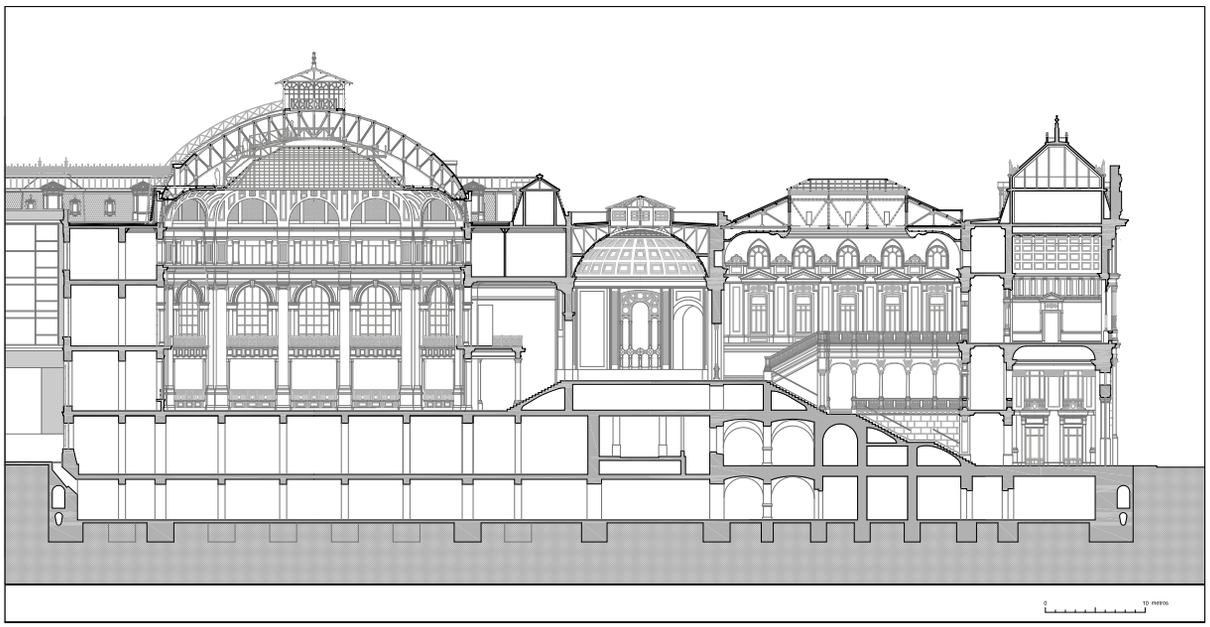


Fig. 58 Section of the Trading Floor, the Echegaray Rotunda and the Royal Staircase

above, and on the inside by the Echegaray Rotunda (so named for the bust that overlooks the room), which links the Royal Staircase with the Trading Floor [fig. 58]. In both the Rotunda and the Trading Floor, the architecture is expressed in a new language that makes these areas two of the prime architectural achievements in Madrid during the first third of the 20th century.

The new Trading Floor replaced the space which had fulfilled the same function in Adaro's first phase, whose location was associated to the public entrance in the bevel corner on Plaza de Cibeles. The entrance in the centre of the façade on Paseo del Prado, more restricted in character, provides access to the Royal Staircase, exquisitely fashioned in an eclectic design. The Cibeles entrance leads into a vestibule, currently used for temporary exhibitions, which connects with the Governor's Staircase, providing access to the original Trading Floor, now a research library [fig. 59]. Above the Cibeles entrance is the Executive Committee Hall, a very striking room with a colossal window that opens onto the bevel façade and is one of the Banco's characteristic features.

Fig. 59 Section of the Trading Floor, Library, Governor's Staircase and Cibeles Bevel

The Trading Floor displays the expressive force of the architecture of the 1930s. It is a quadrangular enclosure of 30 x 30 metres, with angled corners and a height of 18 metres to the edge of the skylight. The interior walls of the Trading Floor are organised with a lower plinth punctured by lintel arch openings containing the counters for public service, behind which are the surrounding administrative areas. On the main floor level, the openings are large round-arched windows with overhung balconies. The lower and main levels are linked by pilasters on tall pedestals crowned by an architrave, frieze and cornice in a simplified Ionic order. Above this cornice, on the upper floor, are a number of lintel arch openings with fluted pilasters topped by a second cornice. These open onto a corridor which organises circulation around the Floor. The interior façades are faced in a warm coloured marble from Escobedo (Santander) with a glossy texture, detailed by carved mouldings and ornamental features. The counter grilles, balcony railings and window frames are excellently fashioned in bronze and steel. In the centre of the Trading Floor is a unique four-armed writing desk with a central protruding element that contributes to the visual organisation of the space. Now surmounted by a clock, it was originally a flue for the room's heating system.

Crowning the Trading Floor as a whole is a spectacular skylight, which is articulated in the interior by a lower tier of lunettes with segmental arches, a transitional section of timbrel vaulting finished in plaster, and a central tier of trapezoidal curbs that supports the colossal ornamental stained glass window which filters the light. The window, made by the firm of Casa Maumejean Hermanos in 1932, is an exceptional work of Spanish art deco in a bold geometric style with various allegories related to work, progress and prosperity.

Hidden behind the scene visible on the skylight is a singular structure that covers a 30-metre span. On the exterior, it shapes into a gored dome rising from an octagonal base and crowned by a lantern with a squared base [fig. 60]. The internal structure of the skylight is not visible so the public is virtually unaware of it, although it was described with admiration in numerous press articles shortly after the building's inauguration. The structure is mounted on a brickwork tambour with windows, and its frame consists of triangulated pairs of wide laminated steel beams and structural knots with brackets composed of plates, rivets and screws. Yarnoz was assisted in the calculations for the structure by the civil engineer Alfonso Peña Boeuf, who years later became Minister of Public Works. The gores in the lower third of the dome are plated in zinc, while the upper two thirds are glazed over a steel angled structure known as the Eclipse system.

Because of its monumental and representative purpose and its structural complexity, the Banco de España in Madrid is undoubtedly one of the most significant works of nineteenth-century Spanish architecture. It is a singular example of the eclectic architecture of its era, partly connecting with what remained of the cultured reinterpretation of classical features, partly an outstanding representative of cast-iron architecture, and partly also a harbinger of art deco, and it signified a momentous act of creation at the time.

The Traditional Building of the Banco de España has a roof level organised mainly by a system of mansards covered in zinc and slate laminate. This has now been fully restored on the basis of a master plan drawn up after compiling all the information preserved in the Banco's Historical Archive regarding the initial construction and the building systems employed. The mansard roofs encompass a series of skylights which cover key areas and allow light into their interiors. Their location is shown on the accompanying plan [fig. 61].

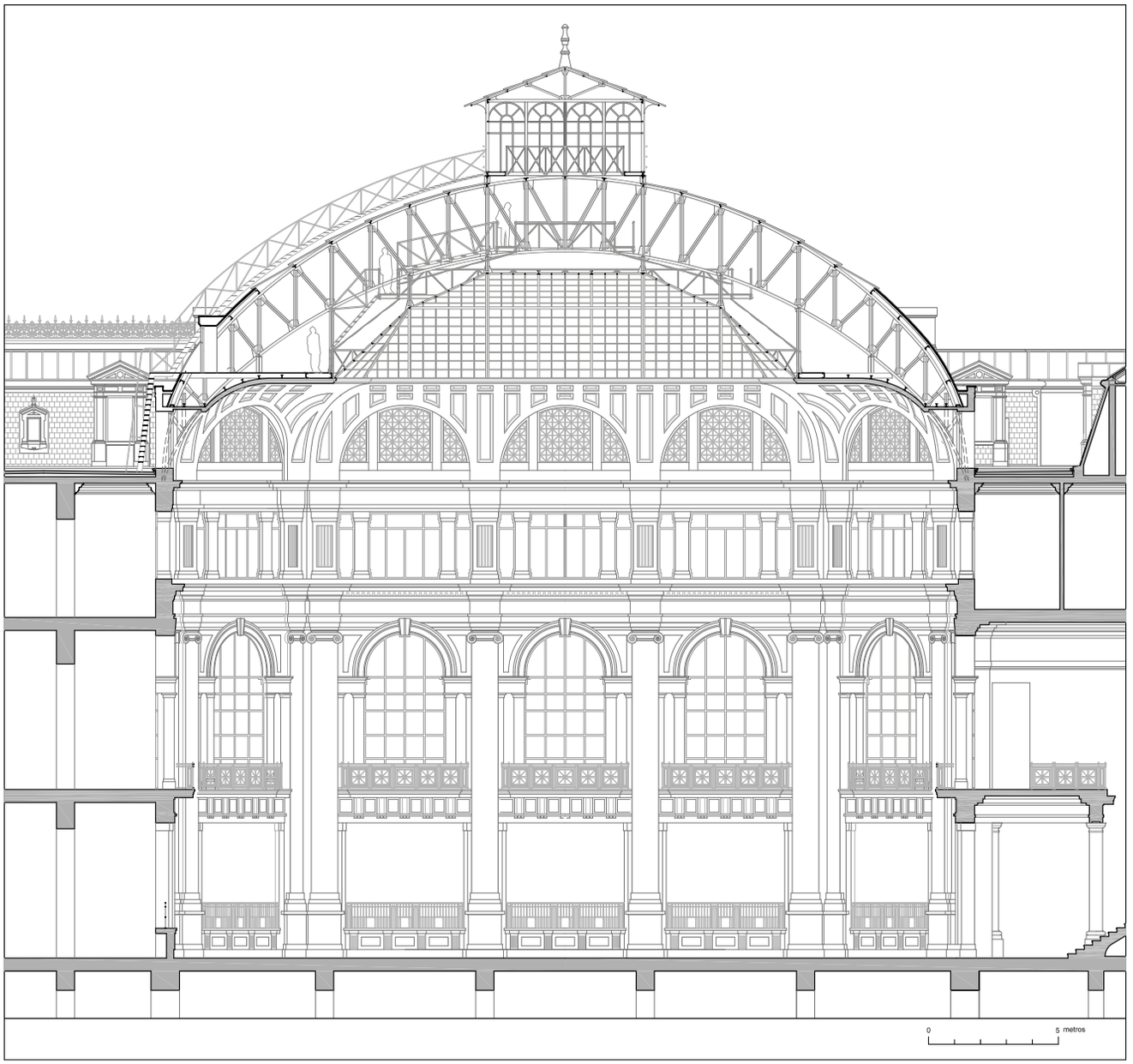



Fig. 60 Cross-section of the Trading Floor

The skylights, numbered chronologically according to the date of their original construction, are as follows:

- Skylight 1. South Staircase. The skylight covers the stairwell located in the inner passageway of the south side of the building.
- Skylight 2. South Twin Courtyard. The skylight covers the courtyard located on the south side of the Royal Staircase [fig. 62].
- Skylight 3. North Twin Courtyard. The skylight covers the courtyard located on the north side of the Royal Staircase.
- Skylight 4. Royal Staircase. The skylight covers the well of the staircase, situated on the axis of the façade giving onto Paseo del Prado.
- Skylight 5. Library. The skylight covers the current Library, formerly the Trading Floor during the first phase of construction of the building [fig. 63].
- Skylight 6. Governor's Staircase. The skylight covers the so-called Governor's Staircase behind the bevel overlooking Cibeles.
- Skylight 7. Interior street. The skylight covers the interior street with its carriageway.
- Skylight 8. Echegaray Rotunda. The skylight covers the so-called "Echegaray Rotunda" where the initial phase and the first extension converge.
- Skylight 9. Trading Floor. The skylight covers the current Trading Floor.

Skylights 1 to 7 belong to the phase designed by the architects Eduardo Adaro and Severiano Sainz de la Lastra, inaugurated in 1891. Skylights 8 and 9 correspond to the phase designed by the architect José Yarnoz Larrosa, inaugurated in 1934.

The skylights in the roofs of the Traditional Building of the Banco de España have certain common characteristics regarding the construction of the metal profiles on which the panes are set. The system employed in the glazing process corresponds to a patent of the period called "Eclipse Glass Roofs". This system for constructing the skylights was adopted in the construction of the first phase of the Banco de España building by the architect Eduardo Adaro, and its use was continued in the second phase extension by the architect José Yarnoz. The Eclipse System for skylights was also systematically used in most of the buildings of the Banco de España's provincial branches, making a common identifying feature for them all. The system is based on a T-shaped steel profile that allows the pane to be lodged by intercalating elements of lead in the supports. The panes were originally wired and patterned with a thickness of 4 millimetres. There is a brake at the end of each Eclipse profile to prevent the panes from sliding out, and on top of them is lead caulking to ensure the whole window is watertight. The glass panes are tiered to form staggered alleys, with the overlaps and ridges filled with lead flashing.

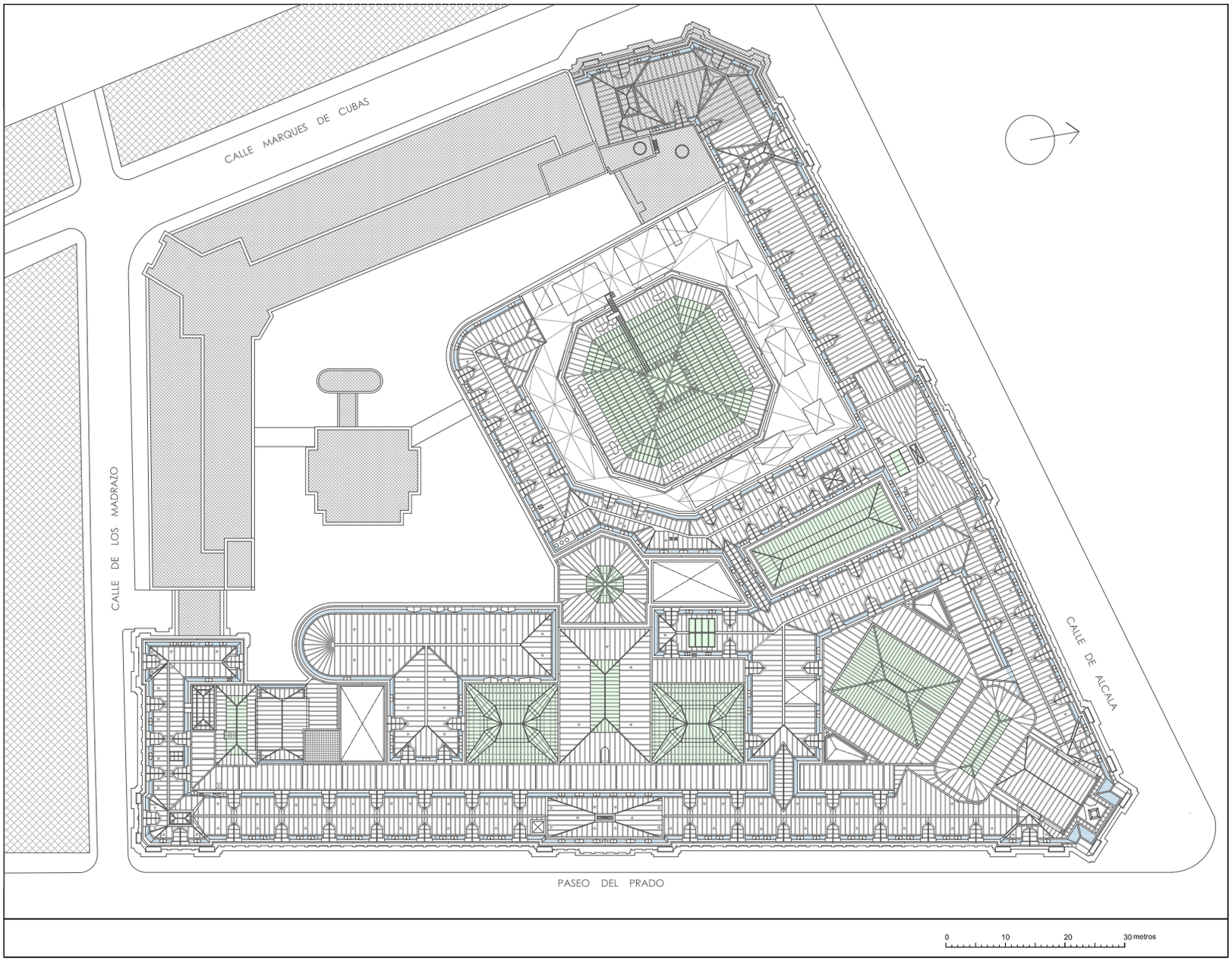



Fig. 61 General plan of the roofs with the location of the skylights

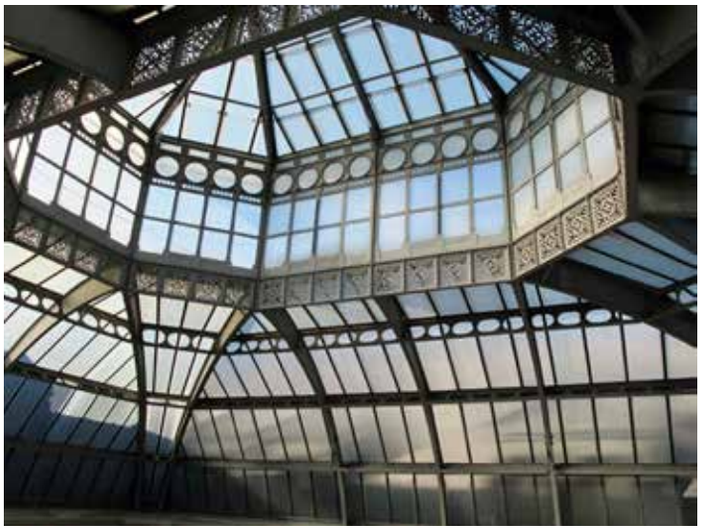


Fig. 62 Interior of the South Twin Court skylight

Fig. 63 Interior of the Library skylight

The structure forming the slopes of the skylights is constructed entirely with laminated steel angles. In the sector corresponding to the first phase of construction (the architects Adaro and Sainz de la Lastra), the steel angles used mixed different sections, comprising plates and steel angles assembled with rivets. Crafted ornamental features are frequent in the plate designs, which are cut into extremely expressive filigree patterns [figs. 62 and 63].

In the section corresponding to the second phase of construction (the architect Yarnoz), laminated steel angles bearing the mark of Altos Hornos de Vizcaya were assembled with rivets and screws. There were no welded joints, since the system was not yet in use at that time, and the ornamental features so frequent in the earlier phase now disappear [fig. 64].

Fig. 64 Interior of the Trading Floor skylight

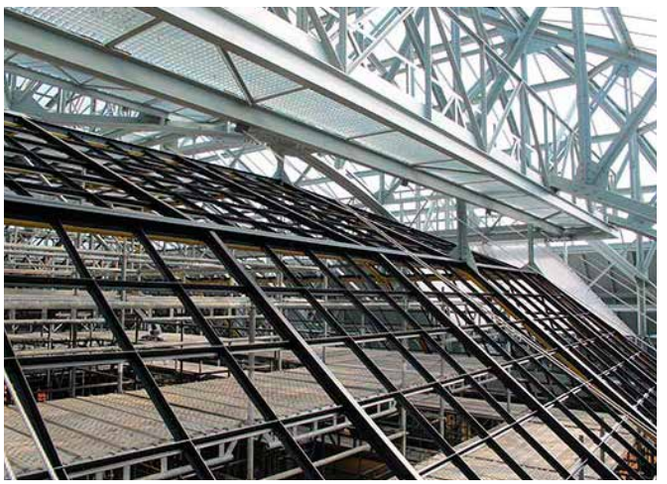
Fig. 65 View of the platform of the scaffolding mounted on the base of the skylight

During the recent restoration of the Trading Floor, work was carried out on the interior façades, the stained glass and the skylight structure, both inside and out. To enable work at that height, it was necessary to mount scaffolding onto turrets resting on the floor of the room. It rose as far as the upper tambour, where a horizontal board was set up to isolate the working area from the Trading Floor below, which remained open to the public while the restoration was in progress [figs. 65 and 66].

Above the board at the level of the tambour, the workers proceeded to dismantle the stained glass window, numbering its panels and transferring them to the restoration workshop located on the Banco's premises [fig. 67]. In the workshop, the panels of the window were examined, cleaned and minutely restored by the Vetraria team.

After the dismantling of the window, the scaffolding continued to rise until it completely enveloped both the exterior and the interior of the gored dome that encloses the skylight [fig. 68]. The steel profile structure was cleaned, examined and partially repaired, and additional elements were added to allow gangways to be set up for regular maintenance work.

On the lower third of the dome, the gores are formed by false vaults of wood covered on the exterior by zinc plates clamped onto wooden battens. This forms a system referred to in the technical manuals of the period as a "Belgian-style roof", similar to the ones found on the mansards of the attic storey of the building. Around the lower perimeter, behind the parapet of the tambour, is a large lead gutter. The zinc plates and the lead guttering were renovated in their entirety [fig. 69].



Figs. 66–68 Scaffolding mounted for the restoration of the skylight

Fig. 69 Exterior of the Trading Floor skylight

The secondary steel structure lies on the upper two thirds of the gored dome and over the gabled lantern roof lined by the purlins forming the gores, where it holds the glazing of the skylight. The existing glazing was taken apart completely, making it possible to number and dismantle all the Eclipse System steel angles for examination and restoration in the workshop. The restored profiles were then replaced, with complete renovation of the wooden battens and lead flashing. New glass with a laminated section, 3 + 3 millimetres in thickness with translucent opaline butyral, was next set in place.

On the vertical walls formed by the four sides of the lantern, a framework of steel steel angles forms the rounded lintel windows. The existing glass was removed, all the profiles were repaired, and the structural elements were examined and mended where necessary. The new

Fig. 70 Exterior of the upper lantern of the Trading Floor skylight

Fig. 71 Interior of the upper lantern of the Trading Floor skylight

glass is identical to that used in the skylight. The lintels of the windows in the lantern have semicircular panes that pivot on their horizontal axis. An automated system was installed with an electric motor to allow them to be opened and closed remotely [figs. 70 and 71].

Inside the skylight, there is a considerable increase in temperature during the summer months owing to the effect of the sun. To improve heat conditions in the skylight, a forced ventilation system has been installed to renew the air inside. The system comprises elements for the intake of outside air connected to dormer vents, filter boxes for eliminating environmental dust, and ducts which draw the air into the skylight, creating pressurisation for the renewal of the air. The fans which circulate the air have an automatic regulating system which allows their start times to be staggered. When running at full capacity, the full volume of air in the skylight can be renewed as necessary.

Once the work on the structure and roofing of the skylight was complete, the restored panels of the stained glass window were replaced on the auxiliary profiles that support them. Textile mesh has been placed over the glass panels to protect them from dust and to help reflect the illumination [fig. 72].

It was possible to dismantle the scaffolding progressively, attending to the examination, cleaning and restoration as necessary of the interior walls of the Trading Floor. The marble

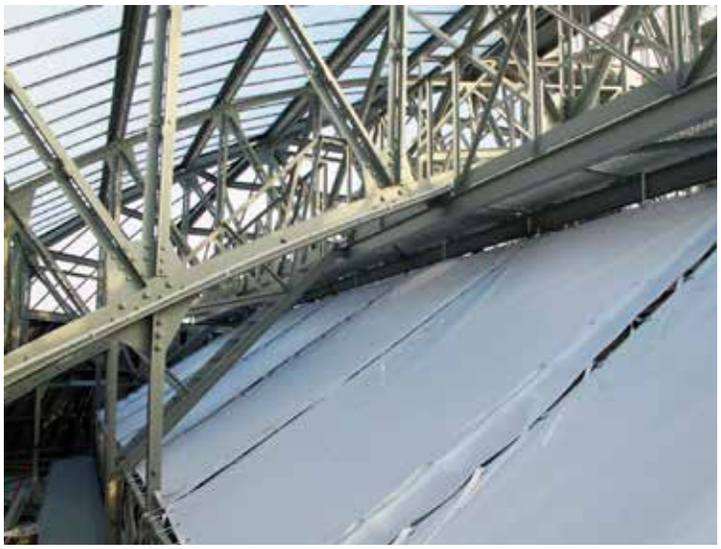


Fig. 72 Interior of the Trading Floor skylight. Protection of the stained glass

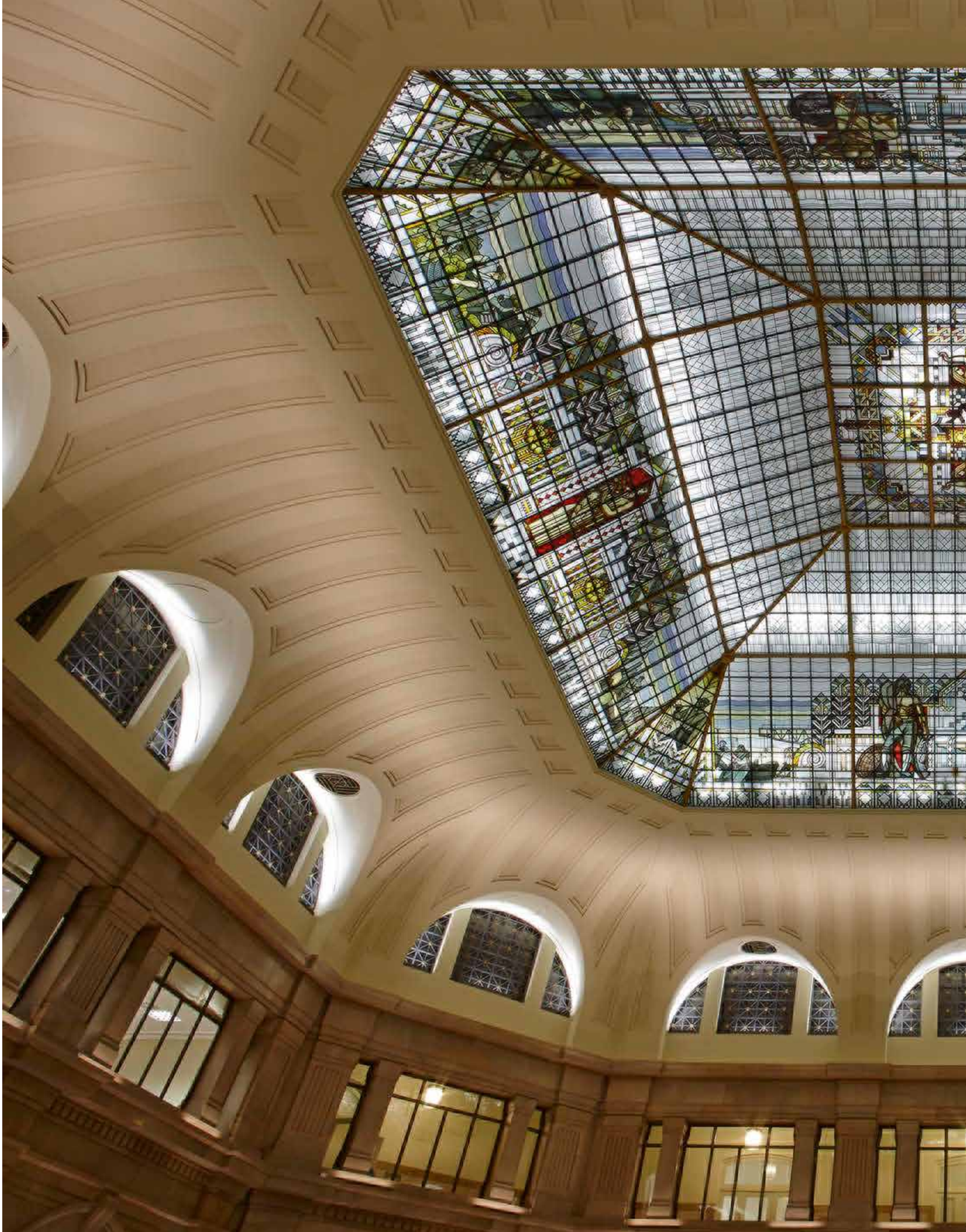
walls had been dulled by accumulated dust, and after cleaning have recovered their spectacular chromatic richness [fig. 73].

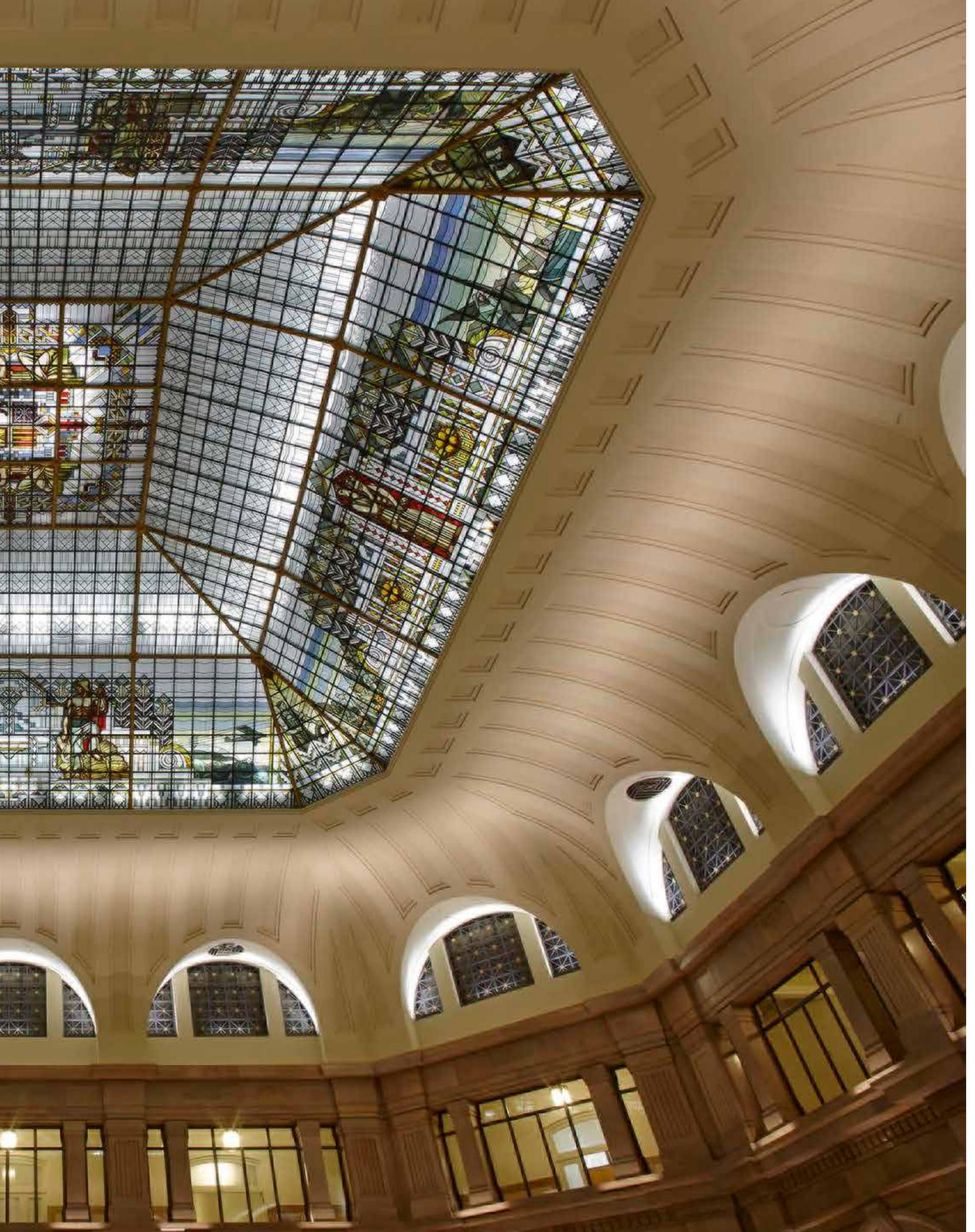
Both the stained glass window and the interior façades of the Trading Floor have been equipped with a monumental illumination system organised in differentiated bands of coordinated low-energy lighting with LED bulbs and special lenses. These can project pre-set patterns or be regulated manually from the building's general control panel [fig. 74].

Fig. 73 Interior façades of the Trading Floor

Next pages

Fig. 74 Interior illumination of the Trading Floor





# Report on the Intervention of the Stained Glass Window of the Trading Floor at the Banco de España

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## GENERAL DESCRIPTION

In the extension to the Banco de España in Madrid, designed by the architect José Yarnoz Larrosa and begun in 1928, it was planned to make a set of stained glass windows to close off various openings in the new construction. The new windows were destined for two different types of emplacement. The ones set into vertical cavities should therefore be distinguished from the skylight which covers the Trading Floor. The Trading Floor is a public space with an area of some 900 square metres and a height of 27 metres, making it the largest room in José Yarnoz's extension and in the building as a whole. It is covered by a large skylight of leaded glass in the form of an inverted trough with an area of 355 square metres.

The mechanical behaviour of the construction materials of this great stained glass window is entirely different from that of the vertical windows in other openings of the building. To understand this work of art fully in terms of its formal characteristics and contents, and to be able to intervene for the purposes of restoration and conservation, it must be viewed in its entirety, taking into account both what is evident and what is less so. The material reality of this work, a scientific and aesthetic alliance of iron and glass resulting in an example of translucent architecture, is not to be seen at a single glance or from just one viewpoint.

What is seen from the Trading Floor is a vast surface of luminous glass, but hidden above it is the roof which shelters and protects the whole leaded glass assembly. The gap between the two forms a large chamber which permits maintenance and conservation work to be carried out comfortably on the entire structure.

The structural relationship of the metal supports for the glass panes in the two frameworks is very interesting. On the perimeter of the common support of the roof and the leaded glass window, the difference in height between the two coverings is reminiscent of the old and highly rational discovery of one dome inside another.

The panes of glass used in this window are of the so-called "patterned glass" type, the result of a technology dating back to the introduction

Fig. 75 Coat-of-arms of Spain in the centre of the Trading Floor skylight

in the twenties of continuous-flow glass furnaces for the production of laminated and patterned sheet glass. The laminating and printing rollers can be renewed and exchanged, allowing for the most varied patterns and textures. This is a mechanically and serially produced industrial glass, manufactured in abundant quantities for general use and with multiple applications. Moreover, it has always been the cheapest type of glass available on the market.

The behaviour of light on a patterned glass surface enhances the reliefs of its textured forms, producing a luminosity and graphic richness that constitutes the great contribution of such glass to stained glass windows in the art deco and rationalist styles.

Here there is no mysterious and enveloping coloured light like that produced by the flat and densely coloured glass found in a Gothic cathedral. The glass in these windows is designed to generate pure luminosity. It is glass for light translated into textures, the light of constructed geometry, and it may serve as an example of the conceptual contributions of the rationalist movement, which enabled the old distinction between noble and vulgar materials to be overcome. No material is vulgar if treated with nobility and intelligence.

Patterned glass is translucent but not transparent, and normally colourless. When coloured, the process is applied to the molten mass in very short chromatic ranges and very bright colours.

For the stained glass window at the Banco de España, dense coloured panes were also required to act as a contrasting complement to the soft and luminous patterned ones, and so comply with the colour scheme proposed in the submitted sketch. Some of these "complementary" panes are made with blown glass of the so-called "antique" type doubled with ground glass to add colour and texture. The purpose of the technique of doubling glass, an extremely sophisticated application of chromatic knowledge, is to achieve very specific hues and shades.

In these stained glass windows, the Maumejean studio interpreted and developed the rationalist art deco movement with a number of different forms and contributions of its own, mainly the work of the great master craftsman Alberto Martorell. The magnificent results he obtained from the humble panes of patterned glass can almost be compared with a successful alchemical transmutation.

The extensive range of colours proposed in the sketches obliged the Maumejean workshop to look further than Spain's limited glass production. The pieces it lacked were manufactured in France, Germany and England. A valuable sample book has been preserved with more than thirty-five different graphics.

The technique employed in making these stained glass windows essentially maintains the technological knowledge accumulated through history. They consist of coloured or colourless panes that are painted, fired and leaded. The graphics and tints used to model the figures and ornamentation are coloured grisailles in cold blue and grey tones, with different intensities of chiaroscuro through velaturas in graded layers. The silver stain is strong or weak depending on the forms it needs to emphasise.

Attention should be drawn to an interesting variation between the solution proposed in the initial sketch and the final product. This is the switch from blue backgrounds for the figures and the central shield to red glass, leading to a substantial transformation in the colour concept of the work.

The elements of the metal framework are not solely mechanical and structural in function, but are aesthetically integrated in the graphics, with their opacity helping to enhance the darkest backlit areas. Iron is used to mark out the large grid which determines the form and size of the panels. Lead, with a greater calibre than normal, is the basis for mounting the glass, and also optically reinforces the contours and the grisaille they contain. The volumes of these figures, with their schematic and linear rotundity, are a prodigy of synthesis such as had never before been achieved in stained glass.

Fig. 76 Metal structure of the skylight before the intervention

The creator of this great work, responsible for the sketches and the workshop cartoons, was Alberto Martorell, an artist employed by the prestigious Casa Maumejean Hermanos of Madrid. The identities of the team of painters are unknown to us today.

## INITIAL STATE

To analyse the initial state of the skylight before intervention, we shall divide the work into the following structural elements:
1 · Metal structure.
2 · Leading.
3 · Glass.
4 · Paint layer.

### 1 · Metal structure

The metal structure of this stained glass skylight is made up of a number of steel profiles whose sections vary in accordance with the mechanical stress they are subjected to. The primary structure is made of hot-rolled steel angles, curved and riveted, producing four intersecting main arches with the same structure as a caliphal groined vault, eight other diagonal arches, and a large crosspiece at the geometrical centre [fig. 76]. Suspended from this primary structure by means of bracing is a secondary structure constructed with IPN 100 beams, creating the skylight's overall form of two superimposed truncated pyramids. The tertiary structure consists of an orthogonal 500 x 500 millimetre grid made from 40-millimetre hot-rolled T-section steel profiles.

The technology employed for the assembly employs rivets reinforced with angle brackets and braces. There is no welding.

The framework was in a perfect state of preservation, with only a few perforations and deformations in the steel profiles on the west-facing side caused by the impact of one or more projectiles during the Civil War [fig. 77]. We know from documents found in the archive of the Banco de España that the stained glass skylight was dismantled before a shell hit the structure and severed one of the trusses [figs. 78 and 79]. The event is related as follows:

> During our past war of Liberation, the building suffered the effects of the bombings. Out of adherence to the Glorious Movement, the necessary precautions were taken to prevent as far as possible the damage and destruction caused by aviation and artillery projectiles. Some 35 projectiles fell on the precinct of the building. Beforehand, all the artistic stained glass windows and many of the other glass panes were dismantled. They were extremely valuable, and most would have disappeared had such steps not been taken. The day after the dismantling of the great stained glass window in the public hall, there fell a 15-centimetre shell which severed an iron truss on the roof and completely shattered the protective upper window of reinforced glass, as well as the panes in the nearby windows. Today these magnificent stained glass windows decorate their respective places, and their value may be estimated at some three million pesetas. After the war, the reassembly and restoration of all the artistic stained glass windows came to a sum of only some 23,500 pesetas.

Fig. 77 Metal profile damaged by the impact of shrapnel

Figs. 78 and 79 Damage produced by an air raid during the Civil War on one of the windows and the vault

Fig. 80 Detail of the leading of a panel. The panel number can be seen engraved on the thickest lead came

Fig. 81 Reinforcement rod not supported by the structure. This was one of the causes of bent panels

In consultations with the works committee, it was decided not to repair the damage to the structure because it had no structural or aesthetic repercussions. There is no doubt that it constitutes a valuable historical testimony.

## 2 Leading

In this stained glass window, the leading is of supreme importance. On the one hand, it is the structure which holds the glass panels in place, with a fine balance between the rigidity necessary to support the mechanical forces they are subjected to owing to the horizontality of the assembly, and the flexibility required to allow the panels sufficient movement as a result of dilation and contraction and the not inconsiderable air pressure.

The supports are formed by lead cames with a five-millimetre heart width in the case of single panels and eight in those which are doubled (we shall explain this further when we come to talk of the glass). The leading meanwhile has a variety of breadths ranging from seven to fifteen millimetres, bearing a direct relation to artistic interests of line rather than purely mechanical concerns.

During the initial analyses, we observed that both the lead and the tin used for the soldering are of high quality, since they present no corrosion, carbonation or attacks by any kind of chemical agent [fig. 80]. The only significant deterioration is caused by mechanical stress owing to deformations resulting from impacts or missing reinforcement rods, and is limited to fissures in the joints between the lead and the tin (since this is an area with a flexibility differential and dilation coefficient between the lead and tin) or loose fragments of lead came.

One part of the skylight structure which we include in this section is the system for reinforcing the leading, consisting of iron rods with a diameter of six millimetres [fig. 81]. The ends of the rods are bevelled in order to reduce the gap between the panel and the tertiary structure and so prevent stress. On some occasions, when the pattern of the skylight so requires, the rods are curved in the direction of the leading. This is the part of the window with the greatest deterioration, since many of the rods were missing and many others were unable to fulfil their function because they were displaced from their position on the tertiary structure.

## 3 · Glass

One of the key features of the art deco stained glass windows made by Alberto Martorell for Maumejean is the use of patterned glass, either colourless or with subtle neutral colours, in combination with coloured blown glass and engraved plates. From the purely technical point of view, the use of these types of glass ensures good material conservation as they are manufactured with compositions very rich in silica (over 60%), and their network modifiers are highly stable because they employ calcium in combination with sodium and, to a lesser degree, some other alkalis. Moreover, the fact that the structure is protected from the open air, with extremely low relative humidity levels (this type of glass can be considered inert at levels of under 40%, a condition found in this space practically all the year round), makes for conditions that ensure long-term stability even with high pollution rates.

Mention must be made of the wide variety of patterns – fifty-four different models – used in this work. Replacements are no longer available for many of them, either because the factories which made them have disappeared or because tastes have changed in the industry [fig. 82]. To replace some of them, we have had to search among material stored from demolitions or turn to international suppliers. In cases where no substitute was to be found, we have had them manufactured by thermoforming.

## 4 · Paint Layer

During preparatory work for the intervention on the stained glass window, four panels with four different orientations were

Fig. 82 Panel on level 3. The combination of textures with different orientations contributes very vibrant details which change with the incidence of the light over the day

Fig. 83 Panel on level 3. The cut grisailles in flat tints soften the transition between the leading and the glass, creating subtle tonal gradations. The use of silver stain chromatically highlights the neutral grisailles

dismantled to determine the state and composition of the paint layers and surface dirt, and to ascertain the stability of the pigments on the support.

The elements constituting the painting on this work are of four different kinds. On the one hand, there are grisailles composed of metal oxides and dissolvents, with subtle tones ranging from the neutral grey employed in the backgrounds or the industrial features to the toasted sienna grisailles found in the figures [fig. 83].

Also used is silver stain, which produces a yellow colour. This type of colouring is very stable because it is not obtained by applying a layer of paint on the surface of the glass. Instead, a phenomenon of surface diffusion of silver ions is produced during firing through exchange with the alkaline network-modifying ions in the soda-lime glass. The yellow hue is thus the result of the formation of silver crystals in the glass mass, forming a colloid that modifies the transmission of light through the glass towards the yellow spectrum.

Fig. 84 Panel on level 1 before the intervention. The original stepped border had been replaced with another cold-painted on the glass, yielding very deficient results

The third type of colouring is a mixture of blue enamel with grey grisaille that produces a blue colour through transmission, though with a high degree of opacity. The process was frequently used by Martorell during this period.

Finally, the fourth type of colouring is a flesh tone known to glaziers as "Cousin rose", composed fundamentally of iron oxide ($Fe_2O_3$) in the form of hematite. This type of colouring has many peculiarities, foremost among which is its great chemical stability, owing to the fact it is an iron oxide, coupled with very low mechanical resistance, to the point where irreparable damage can be done by merely rubbing it with a pad.

As indicated in the report, the paint is extremely stable and requires no special treatment. Special attention is merited by a series of panels at the base of level 1, which have rhombuses with a stepped frieze. The latter is fading or even missing on some panels [fig. 84]. This is not a consequence of the deterioration of the original grisaille, but of the replacement of the panel with another cold-painted with an oil-based pigment.

Finally, the analysis carried out gave us information about the surface dirt on the skylight and its components, allowing us to determine the most suitable and least aggressive processes of intervention.

In the deposits analysed, we found elements like inorganic dust, insects and cobwebs. With the exception of special circumstances like excess humidity, these cause no significant damage to the work and can easily be removed. Rather different is the problem of deposits

resulting from the gases and particles emitted by heating systems and combustion engines, especially diesels. This is the origin of the greasy black layer which impregnates both the stained glass window and the rest of the surfaces in the working area.

## PATHOLOGIES

Since this group of panels is not directly exposed to the exterior but protected by the glass roof which covers it, it has not suffered from the inclemencies of rain, hail, bird impacts, and so on. However, there has been considerable incidence from the temperature changes to which the panels have been subjected owing to heating of the chamber between the skylight and the roof. This has led to the deformations to be observed in some of the panels, which are caused by dilations and contractions as well as the softening of the putty by heat. The lack of ventilation meanwhile facilitates the accumulation of crusts on the surface of the glass, especially in an area of such intense traffic. This is therefore the most decisive factor where conservation is concerned, since crusting of this type can make it difficult to discern the image properly, and can cause chemical deterioration on both the glass surface and the paint layer.

Owing to the composition of the various types of patterned glass (soda-lime glass has high chemical resistance), together with the results of analyses performed by the Instituto de Ciencia de los Materiales of the Universidad de Valencia, we can assert that these panes of glass suffer no processes of degradation through dissolution of the vitreous structure, nor do they present problems in the paint layer.

The inner surface had a layer of accumulated dirt originating in the large movement of particles from the intense traffic on Calle de Alcalá, which are carried up to the skylight by air pressure from the vestibule. These extremely fine-grained particles were deposited both on the glass surfaces and in those areas where there were slight air currents, such as the space between the glass panel and the metal structure. The extremely fine dust accumulated on the surface of the glass had also infiltrated the nucleus of the double panes, since it had been dispersed by water from leaks in the glass roof. Moreover, there were splashes of plastic paint and remains of oil from the putty.

One problem presented by the technology of double panes used in this work, with two separate sheets of textured and painted glass "sandwiched" in the same lead came, is that the dust and particles which enter the space between the two panes, and so render the panels opaque, can be removed only by dismantling the support and separating the panes for cleaning. This is a complex operation requiring a very detailed assessment of the quality and state of preservation of the lead in order to avoid irreversible damage to the support.

This aspect was taken very much into consideration when the moment came for cleaning, since if liquid substances are poured onto the surface, part of the liquid will penetrate between the two panes, moistening the particles and worsening the loss of transparency as well as contributing to lixiviation of the glass. Cleaning must therefore be carried out with solutions of deionised water with organic dissolvents such as acetone or light alcohols, and no liquids must be squirted onto the glass surfaces.

The most significant damage we have observed in this stained glass window is of purely mechanical origin. Apart from a fairly large number of fractured panes, and even some cases of glass which had been lost and replaced with types of glass differing greatly from the originals, there was also a problem with the support of the panels. Some of the reinforcement rods failed to work on the main chassis because their ends were loose, preventing the forces of the rods from discharging onto the support and obliging the panel to take the full weight. On many occasions there was no rod at all, although there were visible remains of the soldering where the fixtures had once been. As a result, some panels had bent, fractures were to be observed in both the sheets of glass and the supports of the rods, and rods had come loose with a consequent danger of falling components. Another question affecting the resistance of the panels is the loss of hardness in the putty, a substance made on a basis of calcium carbonates and linseed oil with a cobalt drier that is applied between the lead and the glass with the purpose of waterproofing and hardening the panel. These putties are weakened by drips from leaks and by temperature changes, causing the panels to soften and potentially bend.

Fig. 85 Vacuuming the surface dust before dismantling

## CLEANING

Two complementary cleaning procedures have been employed in this restoration. In the first place, the entire surface of the stained glass window was vacuumed before dismantling in order to lift off the thick layer of dust deposited on the outer face of the skylight. For this, an industrial vacuum cleaner was used with a long-bristled brush (70 to 100 millimetres) so as not to scratch the surface [fig. 85]. A second vacuuming was performed in the workshop, this time on both sides, before finally proceeding to wet-cleaning.

As indicated above, chemical analyses have provided us with sufficient information on the work to be able to determine the best procedure for cleaning. In this part of the report, it is worth explaining in some detail which solutions are available and why we decided upon the one we adopted.

Historically, wet-cleaning methods have generally prevailed. This appeals to the common sense of anyone without specialised knowledge who confronts the challenge of cleaning thickly crusted glass. The product mainly used for wet-cleaning was water, since it was very easy to obtain and apparently innocuous. When water alone did not prove sufficient, the same mixtures were performed as those used for the cleaning of household goods, namely ammonia waters, acidic waters such as aqua regia, or basic waters resulting from

mixture with hydroxides. These products clean the glass surface perfectly, but also launch a variety of chemical attacks on both the surface and the paint layers. After the Second World War, it was agreed to prohibit wet-cleaning in future projects for the restoration and conservation of the mediaeval stained glass heritage, and to recommend methods of dry-cleaning only. Time has shown that the results of dry-cleaning are also problematical, since it does not eliminate potentially harmful substances and, more fundamentally, because mechanical aggressions on the surface are inevitable, occasionally resulting in damage as bad as that produced by wet-cleaning. Fortunately, technological progress has provided us with analytical procedures capable of determining the elements which make up the vitreous network and the state of conservation of both the substratum and the paint layer. Our team is the world's pioneer in the development of safe wet-cleaning procedures using water compositions designed specifically for each type of glass.

Water is a solvent with high polarity (dielectric constant of 82), a characteristic which makes it superreactive and perfect for cleaning operations where the solute contains oxygen or cations like Ca+, Na+, etc. The problem is that because the vitreous network incorporates alkaline network modifiers, it is not particularly stable in media with pH variations above 8.00 and below 7.00. Moreover, water seeks saturation with alkaline salts and especially sodium and calcium, which are the most habitual network modifiers. It is therefore important to know the specific composition of the glasses and grisailles we shall be working with, since this will enable us to create the most suitable type of water.

For the base water used to clean the skylight, we filtered tap water through an ion-exchange resin filter with an exiting purity of up to 20 µS/cm and a pH of between 5.50 and 6.00. Sodium nitrate was then added in a proportion of 0.5 g/l of water in order to saturate the water's need for sodium and prevent lixiviation of the glass, and the solution was then left to stand for three or four days until the pH had risen to 7.00, where it remains stabilised.

Since the analyses showed greasy organic residues from combustion, and the panels also contained remains of putty and paint, dimethylketone-water mixtures of 10%, 20%, 30% and 50% were made, and pure dimethylketone was also used. This solvent is very frequently employed for the cleaning of glass because it is inert to the vitreous substrata, and evaporates completely above 40°C without leaving any type of residue. It is furthermore possible to regulate the degree of evaporation by mixing it with water and adjusting the drying conditions, so preventing the surfaces from remaining clouded after cleaning.

The same procedure was used to clean this stained glass window as is employed for the cleaning of mural fresco paintings. This is to use two separate buckets of water. In the first, a suitable sponge is soaked with the necessary amount of water. After part of the surface is cleaned, the dirty water is squeezed into the second bucket from the sponge, which is then used to soak up more clean water from the first. In this way we are always working with clean water, without the risk of pH variations through saturation with sulphides or chlorides from the smoke patinas. Large amounts of solvent are also saved.

The use of sponges was determined by the need for a certain precision in the control of the amount of water deposited on the panel, since an infiltration of cleaning water between the two sheets of glass in the case of double panes would produce a very visible stain that would be extremely hard to remove. In our description of the stained glass window, we have already described what the double panes are and why this window has so many of them. This technology is problematical from the point of view of cleaning, since the deficient sealing of the leading and the enormous amount of dust had combined with water infiltrations to produce a degree of dirt in these chambers which we knew from the start was not going to be removed completely. To clean these pieces, we first carried out two different tests. In the first, we made two perforations in the lead through which we introduced a hypodermic needle with different solutions of water and dimethylketone, applying different pressures with the aid of a compressor. The result was unsatisfactory because it failed to remove the whole patina and the solution did not dry completely. The second test consisted of opening the leading by cutting the soldering beneath the principal came. This allowed us to loosen the cames without damaging them, and to solder them again afterwards to the same quality as the original work [figs. 86–91]. The danger of this procedure is that lead which has oxidation with processes of carbonation cannot be soldered well enough. Fortunately, the lead in this stained glass window is of excellent quality and has suffered no degradation whatsoever. We therefore decided to use this procedure to clean as many double panes as we could, starting with those which had fractures or ground glasses of excessive thickness, which were cleaned in their entirety, and ending with the

Figs. 86–91 Cleaning double glass panes. To remove the panes, the original supports have to undergo the delicate and laborious process of dismantling and releading

ones that were not so dirty as to prove an eyesore. It can thus be seen in panels like SO-3 and SO-4 that the patina has been left, since not only does it not prevent a correct reading of the glass but it actually benefits the visual quality of the textures and colours. On the other hand, panels SO-5 and SO-6 have been cleaned because the stains affected the painted heads, preventing the image from being properly discerned.

Figs. 92 and 93 Panel on level 1 before and after restoration

## REASSEMBLY

For a correct assessment of the state of conservation of the panels in this stained glass window, several different factors have to be taken into account. On the one hand, the aesthetic concerns behind its mechanical construction give rise to many large panels with shapes that occasionally place stress on the cut edges and put their mechanical stability at risk. Moreover, the working position of the panels, which tend towards the horizontal, creates mechanical overstress between the supports and the panes which can cause fractures as soon as one of the elements in the structure ceases to function properly. If we add to these peculiarities the fact that the window has successfully come through a dramatic war, with dismantling and reassembly included, and we consider too the vagaries of its maintenance at different moments of the country's history, it is frankly miraculous that the work has survived intact. The stability of the institution which houses it is almost certainly one of the keys to its success, particularly bearing in mind the fate of some of its "sister" windows like the one in the Facultad de Filosofía y Letras of the Universidad Complutense de Madrid, mounted in 1935 but never officially inaugurated. It disappeared without trace until 2008, when it was recreated by our workshop.

Where missing glass is concerned, the worst affected area is the bottom line of the first level. The panels in this row on the perimeter have no base on which to rest, and are supported instead at aleatory points of contact with the perimeter tie beam. In our opinion, they moreover needed a horizontal reinforcement rod on the first third of the panel in order to prevent it from bending, with the consequent fracture of the central rhomboid glass.

This type of panel is made of "Katedral" glass with a painted stepped frieze outlined in grisaille. When the broken glass in this part of the skylight was replaced, an attempt was made to imitate it with a cold paint based on oil enamel, which has gradually disappeared with time, temperature changes and humidity. All these panes have been replaced by painted Katedral glass with grisaille outlines fired in a muffle furnace at 650ºC [figs. 92 and 93].

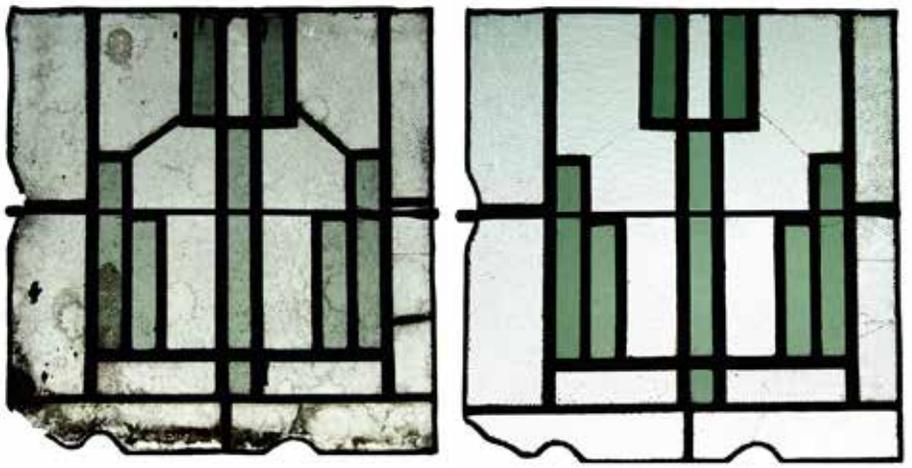


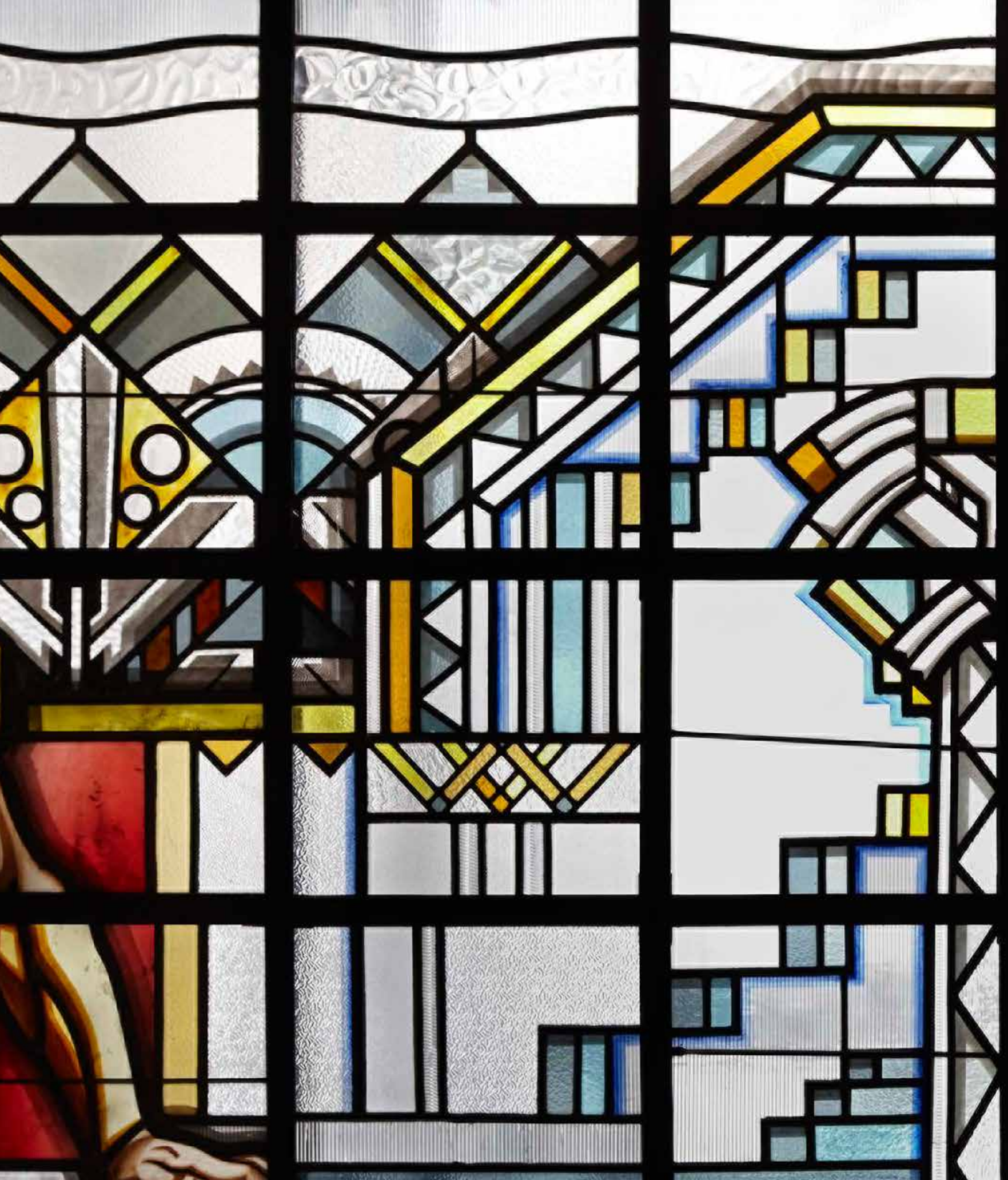
Fig. 94 and 95 Panel on level 1 before and after the intervention. The lead seals for earlier fractures, which distorted the original reading, have been removed, and the fractures are now reglued with hydroxyethyl methacrylate

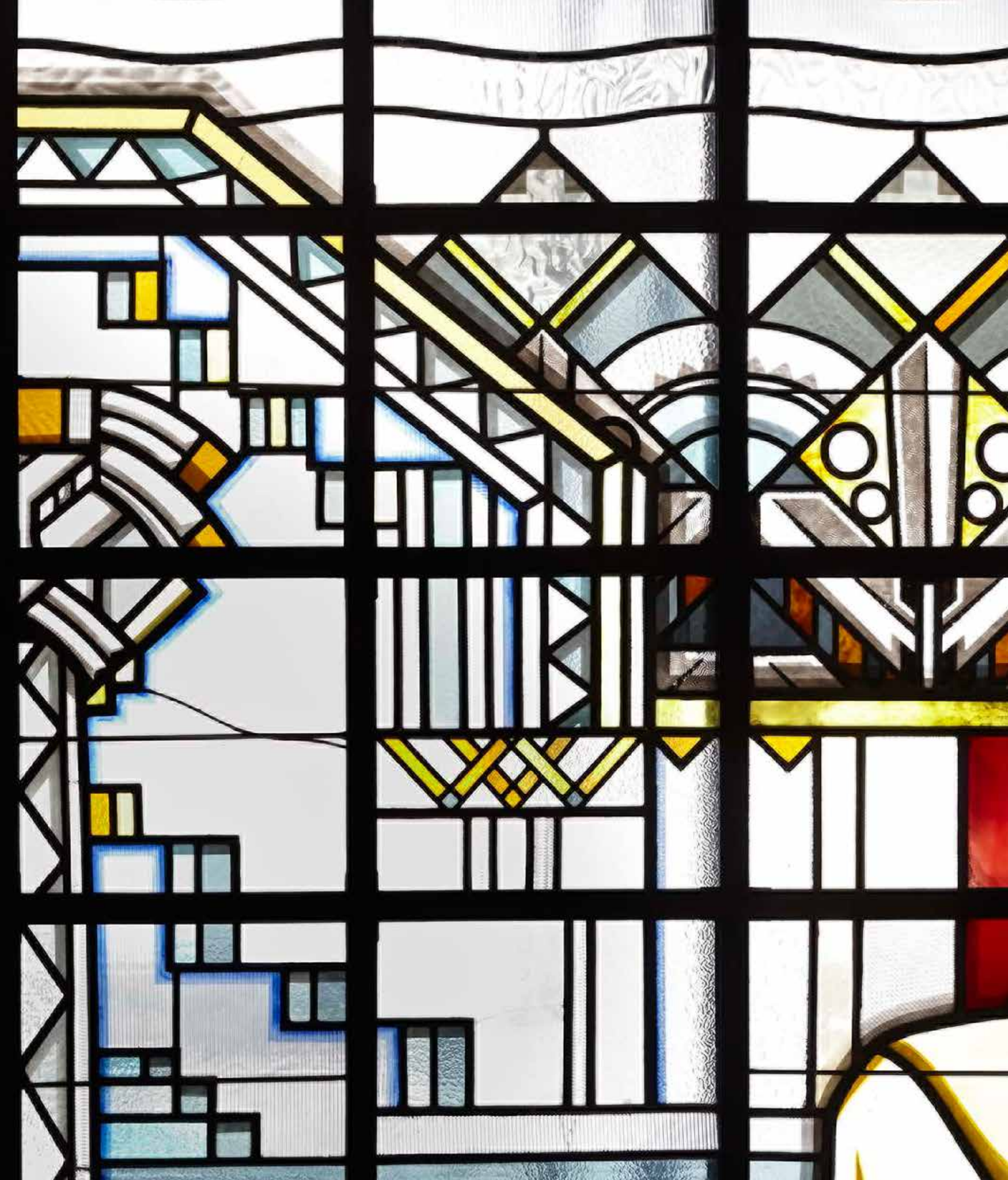
## FRACTURES

Over the years, fractures in the glass have been repaired in two ways: either a lead seal of between seven and ten millimetres has been soldered on, or the fracture has been filled with silicone. Since the lead draws the contours very clearly, and the lines in this window tend to be very synthetic and balanced, all these new pieces of lead cluttered up the support and confused its geometry. The criterion we have followed in dealing with this problem was to dismantle all the lead seals and glue the pieces with an ultraviolet-curing adhesive based on hydroxyethyl methacrylate, which is extraordinarily resistant. For this purpose, the fractured panes were dismantled and the contact surfaces cleaned with isopropyl. After the application, the joint was sealed with plastic adhesive tape to improve the curing (which is faster in an anaerobic environment). The sole requisite that a fracture has to fulfil in order to be glued is that the contact between the two fragments should be "edge to edge", meaning that the edges of the fracture are sufficiently intact and clean for precise contact to be made. In cases where the edges have been damaged by an earlier repair (the edges of some pieces were clipped with pliers to reduce their size and allow the lead seal to be inserted), the old lead seal has been replaced with a new one that is as thin as possible, nearly always with a width of three millimetres.

This operation has done away with the confusion caused by these lead seals. An example can be seen in the photo, where the stepped cutting of the glass demonstrates enormous skill, but its effect is lost owing to the earlier repair [figs. 94 and 95]. Such fractures were responsible for the most widespread deterioration and meant the hardest work for the restorers, who used this procedure to repair them in every case.

As regards the reassembly of the leading, new cames have been inserted where they had been torn out by the tension exerted by the rods, and the sections that had been twisted out of shape in previous interventions have been replaced. The perimeters of the panels have been completed, since many of them were lacking their lead enclosure, and all the missing rods and fixtures have been restored.





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Valentín Berriochoa Sánchez-Moreno: figs. 54–73
Joaquín Cortés Noriega and Román Lores Riesgo: cover, pp. 2, 8-11, 124–25; figs. 1, 2, 4–17, 19–45, 48, 49, 51–53, 74, 75
Foto García Najas: figs. 46, 47
Madrid, Museo Nacional de Artes Decorativas (long-term loan to Fundación Centro Nacional del Vidrio, photos: Cuauhtli Gutiérrez): figs. 3, 18
Montreal, Canadian Centre for Architecture, Phyllis Lambert Collection: fig. 50
Vetraria Muñoz de Pablos: figs. 76, 77, 80–95

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D.L.: M-36035-2014