110Th

felix Candela

1910-2020

2020 EXHIBITION

The Structural Art of Thin Concrete Shells

Manuel Blanco Lage

Director de la Escuela Técnica Superior de Arquitectura de Madrid, ETSAM
Universidad Politécnica de Madrid

Quiero agradecerle a la Directora de la Fundación Eduardo Torroja y Profesora del Departamento de Construcciones Arquitectónicas de la Escuela Técnica Superior de Arquitectura de la Universidad Politécnica de Madrid, Pepa Cassinello, el esfuerzo continuado por mantener viva entre nosotros la presencia de una de las mayores figuras de nuestra Escuela, y ahora de nuestra Universidad, Félix Candela, que aúna en su obra todo lo mejor de la Arquitectura tal y como se concibe desde nuestra formación.

Candela es un gran diseñador que maneja el espacio y las formas de una manera muy personal y espectacular, y al mismo tiempo es el gran creador técnico que consigue soluciones insólitas en sus obras produciendo una sinergia perfecta entre la investigación estructural y el resultado espacial con un manejo de la luz realmente muy especial que modula todos los ámbitos de sus edificaciones.

La importancia de sus edificios en la ciudad está muy bien estructurada, son monumentos contemporáneos que articulan el espacio urbano, pero no abusan de su posición, sino que mide muy cuidadosamente su impacto en el tejido existente.

Creo que uno de los mejores recuerdos que tengo de una experiencia arquitectónica es la primera vez que entré en la Fábrica Barcardí o ese largo verano mexicano visitando bajo la lluvia sus iglesias.

Desde la UNAM el Profesor Del Cueto, hijo del exilio republicano español en México, ha investigado su figura con grandes exposiciones y desde nuestra Escuela la Profesora Cassinello se ha ocupado de esta labor con la exposición del Centenario del nacimiento de Candela que realizó en el Centro Cultural Conde Duque, y ahora diez años después con esta exposición digital, que recoge también los trabajos de los estudiantes de Arquitectura e Ingeniería de muchos países que con sus dibujos y carteles homenajean a nuestro maestro. La vinculación del Profesor Del Cueto con Candela es evidente. Dos miembros de nuestro exilio que desarrollan su labor en México, pero es mucho menos conocida la vinculación de la Profesora Cassinello con Candela puesto que fue su padre, Catedrático también de la ETSAM, en su papel de Director del Instituto Torroja el que recibió a Candela cuando volvió del exilio y lo llevó de su mano de vuelta a nuestra Escuela.

Candela es uno de los más reconocidos frutos de la enseñanza de nuestra ETSAM. Hizo la carrera en nuestra antigua sede de la calle Estudios antes de que la Escuela se mudara a nuestro actual edificio construido por Pascual Bravo en la Ciudad Universitaria que había diseñado nuestro Director Modesto López Otero y en cuyas aulas se encontraba, también, Matilde Ucelay, la primera mujer arquitecta de nuestro país. Su hijo Enrique, con el editor Ruiz Castillo, arquitecto también por nuestra Escuela, terminó siendo su colaborador y discípulo que creó la empresa Construcciones Laminares S.L que siguió la estela marcada por el maestro.

Muy pocas figuras contemporáneas españolas han conseguido el impacto de Félix Candela, que sin proponérselo se convirtió en uno de los primeros grandes arquitectos estrella con una síntesis del diseño de formas icónicas muy pregnantes y tecnología y su modo de hacer fue desarrollando después por alguna de las figuras más conocidas de nuestra contemporaneidad. Su obra, absolutamente original, lo convierte en el gran maestro internacional de las construcciones laminares.

Quiero agradecerle a la Profesora Cassinello, y a la Fundación Eduardo Torroja, en la figura de su Presidente José Antonio Torroja, que hace con Candela la iglesia de Nuestra Señora de Guadalupe en Madrid, este nuevo esfuerzo que difunde y defiende unas de las arquitecturas más originales del siglo XX, y por ayudarnos a reafirmar una vez más la presencia de nuestra Escuela, la ETSAM, en las corrientes principales de la Arquitectura contemporánea. Arquitectura, ETSAM y la Fundación Eduardo Torroja, vuelven a ir de la mano con esta exposición, este concurso sobre uno de los grandes referentes mundiales que ha salido de nuestra Universidad.

Manuel Blanco Lage
Director de la Escuela Técnica Superior de Arquitectura de Madrid, ETSAM
Universidad Politécnica de Madrid

I would like to thank the Director of the Eduardo Torroja Foundation and Professor of the Architectural Construction Department of the Escuela Técnica Superior de Arquitectura de Madrid, ETSAM, from the Universidad Politécnica de Madrid, Pepa Cassinello, for her continuous effort to keep alive among us the presence of one of the greatest figures of our School, and now of our University, Félix Candela, who brings together in his work all the best of Architecture as it has been conceived since our training.

Candela is a great designer who handles space and shapes in a very personal and spectacular way, and at the same time he is a great technical creator who achieves unusual solutions in his work, producing a perfect synergy between structural research and spatial results, with a special light management that modulates all the areas of his buildings.

The importance of his buildings in the city is very well structured. They are monuments that articulate the urban space but do not abuse their position, and rather measure their impact on the existing fabric very rigorously.

I consider one of the best memories I have of an architectural experience is the first time I entered the Bacardi Factory during that long Mexican summer visiting his churches in the rain.

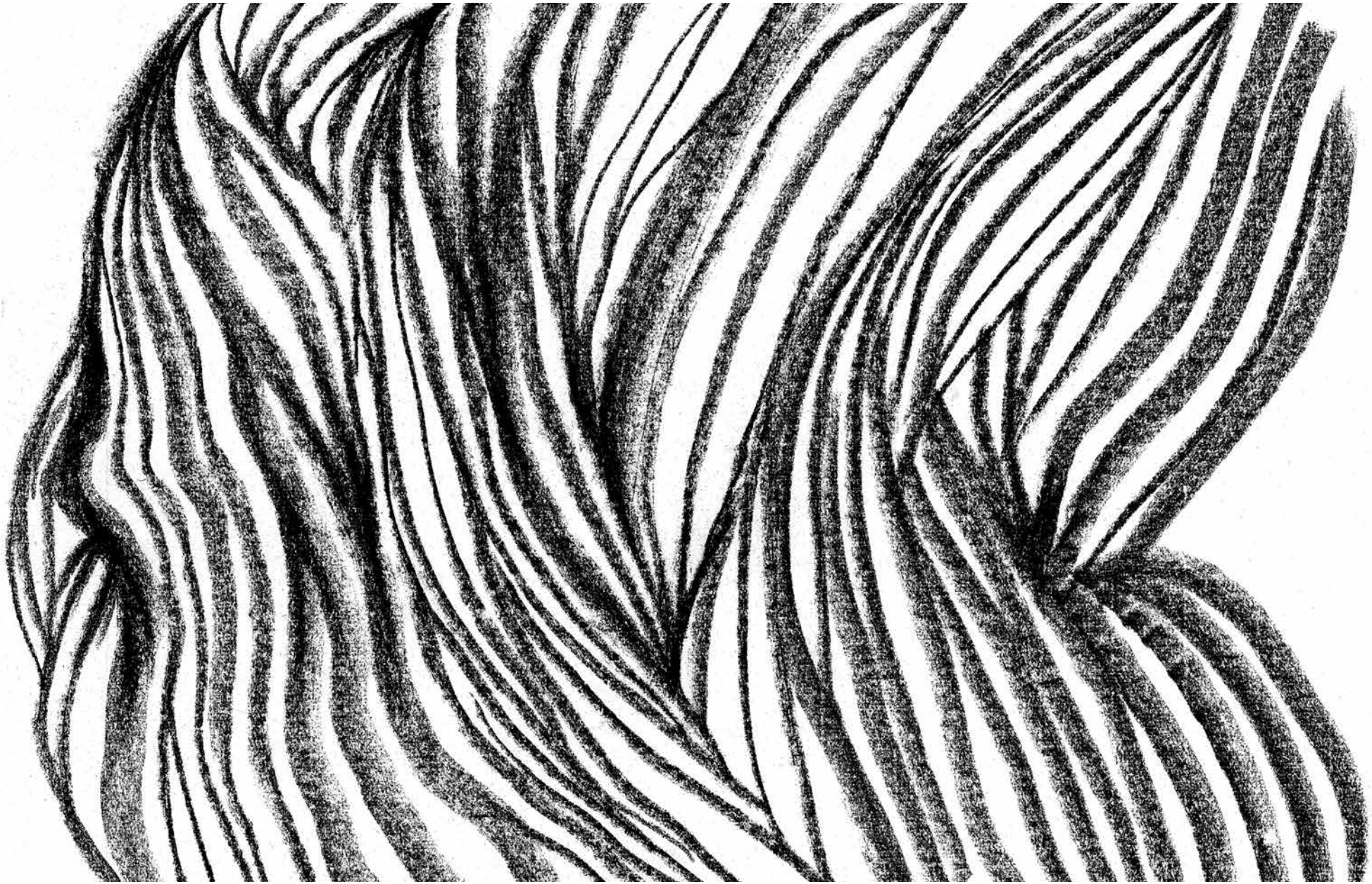
Professor Del Cueto from the UNAM, who is also son of the Spanish Republican exile in Mexico, has investigated his figure with great exhibitions and Professor Cassinello, from our School, has taken care of this work by organizing the exhibition of the Centenary of the birth of Candela that she made in the Cultural Center Conde Duque, and now ten years later with this digital exhibition, which also includes the work of students of Architecture and Engineering from many countries who pay homage to our teacher with their drawings and posters. Professor Del Cueto's connection with Candela is evident. Both were members of our exile who developed their work in Mexico, but the link between Professor Cassinello and Candela is less known. Her father, also a Professor of the ETSAM, as Director of the Torroja Institute, received Candela when he returned from exile and brought him back to our School.

Candela is one of the most recognized exponents of teaching in the ETSAM. He studied in all our buildings at *calle Estudios* before the school moved to our current building constructed by Pascual Bravo in the *Ciudad Universitaria* which had been designed by our Director Modesto López Otero and in whose classrooms was also Matilde Ucelay, the first woman architect in our country. Her son Enrique, with the editor Ruiz Castillo, also an architect from our School, ended up being his collaborator and disciple and created the company *Construcciones Laminares* S.L. which followed the learnings of his master.

Very few contemporary Spanish figures have achieved the impact of Félix Candela, who without intending to, became one of the first great star architects with a synthesis of the design of very pregnant iconic forms and technology. His way of doing was later developed by some of the most well-known contemporary figures by some of ours. His absolutely original work makes him the great international master of shell constructions.

I would like to thank Professor Cassinello, and the Eduardo Torroja Foundation, in the figure of its President José Antonio Torroja, who made the church of Our Lady of Guadalupe in Madrid with Candela, for this new effort to disseminate and advocate for some of the most original architecture of the 20th century, and for helping us to reaffirm once again the presence of our School, the ETSAM, in the main currents of contemporary architecture. Architecture, ETSAM, and the Eduardo Torroja Foundation once again go hand in hand with this exhibition, this competition about one of the great world references that has come out of our University.

Manuel Blanco Lage
Director de la Escuela Técnica Superior de Arquitectura de Madrid, ETSAM
Universidad Politécnica de Madrid



Author: CARMEN EN PINART Drawing: wraparounds

2010 From Cover catalogue book- Félix Candela Centenario/Centenary. Exhibition 2010 Curator: Pepa Cassinello

INTRODUCTION
Pepa Cassinello

2020 110th Anniversary of the Birth of FÉLIX CANDELA
The Structural Art of the Thin Concrete Shells

Madrid, the city where he was born on January 27, 1910, and the "Escuela Técnica Superior de Arquitectura" of the "Universidad Politécnica de Madrid" Spain, where he studied, have wanted to pay tribute to him. For this purpose, the "Fundación Eduardo Torroja" organized in January 2020 an **International Ideas Competitio**n for students with the collaboration of "Consejo Superior de Colegios de Arquitectos de España", Ministerio de Fomento, Dirección General de Arquitectura, Universidad Politécnica de Madrid, Escuela Técnica Superior de Arquitectura, Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos, Sika España, IABSE Spanish Group, and the IASS/ International Association for Shell and Spatial Structures founded by Eduardo Torroja in 1959.

This digital E**XHIBITION "The Structural Art of Thin Concrete Shells"** contains Félix Candela´s brief biography together with the drawings and posters submitted to the International Ideas Competition from **37 universities** in **10 different countries** who wanted to join this well-deserved tribute and some professors contribution.

We all have made this Exhibition to continue spreading not only his work but also that invisible part of his legacy that has made him an international **timeless reference of the new generations of architects and engineers** - *his model of thought and action* -, in which it is clear that the "magic" of success is nothing more than the illusion and effort to innovate.

Pepa Cassinello
Director Fundación Eduardo Torroja

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FÉLIX CANDELA
The Structural Art of Thin Concrete Shells

¡Cuántas veces no he dado gracias a la enseñanza profundamente teórica que se me impartió en la vieja Escuela de Madrid!

Félix Candela 1994

Felix Candela Outeriño (1910-1997) has been one of the architects, of Spanish origin, who has achieved greater international fame. His contribution to Modern Architecture represents the most extensive legacy of thin concrete shell structures ever built.

He was born in Madrid on January 27, 1910, and his life was linked to the historical surroundings of the city. His parents had a shoe store -Calzados Candela- on the "Calle Mayor". He graduated as an architect in 1935, at the "Escuela Técnica Superior de Arquitectura de Madrid". He got the scholarship "Conde de Cartagena" and he was also champion of Spain in Ski.

His interest in the concrete shell structures, which Eduardo Torroja was building in those years (Hipódromo de la Zarzuela, Frontón Recoletos and Mercado de Algeciras) increased his enthusiasm for participating in the **"Shell Adventure of Modern Architecture"**, which were revolutionizing the world of Architecture and Engineering at international level. **Build concrete shell structures was his dream**.

An "adventure" that over the years has become one of the most revered landmarks of the History of Construction in the 20th century, not only because of the extensive and relevant international heritage legacy which together form the so-called "Thin Concrete Shells", but because their appearance was due to the will, effort and courage of a few architects, engineers and builders, who came together as links in the same chain, forged in the search for the *most effective, bare and slender structural form*. The aim was to conquer the new freedom of form and size, that reinforced concrete offered them, together with the new feeling of Modernity, which in all Arts produced a new and innovative model of thought, which will always be recognized, through the famous phrase attributed to Mies Van Der Rohe; *Less is More*

@Pepa Cassinello

A NEW PHILOSOPHY OF STRUCTURES

Aunque tuve que aprender por mi cuenta, sin ayuda directa de universidades o despachos de proyectos, estoy en deuda con muchas personas que me ayudaron indirectamente con sus escritos. Uno de los más importantes acreedores es Maillart.

Félix Candela 1972

In 1936, as a prize for his doctoral thesis "The influence of new trends in reinforced concrete techniques on Architectural Forms", he was awarded a scholarship, which he had requested from the Royal Academy of San Fernando, to extend his studies on laminar structures in Germany, the country in which, in 1922, the company Dyckerhoff y Widmann had built what is considered to be the first "Thin Concrete Shell" dome in the world.

The beginning of the Spanish Civil War made him give up his trip, and he enlisted in the Republican Army. In 1939, once the war was over, Felix Candela went into exile in Mexico. Since his arrival, Félix Candela opened way developing different works like; draughtsman, builder, architect, ...In **1941 he acquired the Mexican nationality.**

Calm recovered, and with it his youthful illusion to be directly involved in the **"Shell Adventure of Modern Architecture"**.

Seeking new analytical approaches, Candela also reviewed papers by Van der Broek, Johansen, Freudenthal, Kist, Saliger and others who described different ways of tackling structural analysis. He studied methods based on failure theory, which drew heavily from two areas of his own expertise, acquired at the Madrid School of Architecture: statics and the real properties of materials. Following this new course, Candela acquired the knowledge he needed to be able to analyze thin reinforced concrete shells and develop simplified methods for their design. He concluded that if the shell support system could be regarded to be isostatic, static equilibrium equations for membranes would suffice to solve the problem. Further to this reasoning, Candela devised a way to simplify thin concrete shell engineering, teaching himself to create new structural forms and contributing to revolutionize and disseminate an understanding of such structures. He later authored a book titled ***Hacia una nueva Filosofía de las Estructuras*** (A new philosophy of structures).

@Pepa Cassinello

HE WAS IN A HURRY TO LEARN

Algunas veces me permito imaginar que el progreso de la técnica estructural se hubiera producido por la evolución natural de los métodos intuitivos y experimentales empleados con tan sorprendente éxito en la Edad Media y el Renacimiento.

Félix Candela 1954
Massachussets Institute of Techlogy, U.S.A

In 1949, Félix Candela, imitating the "innovative" masters of the History of Architecture, had already convinced himself, clearly and categorically, that the most suitable way to train in the design and construction of reinforced concrete shells was not to rely on the then cumbersome and complex mathematical analytical systems, but to know the immutable Laws of Nature (Statics, Mechanics and Resistance of Materials), the way was direct experimentation through the construction of models.

He also considered that the simplest and most immediate thing for him -he was in a hurry to learn- was to build life-size models, just as the medieval master builders did, who, following this same path of learning, were able to create the Gothic Cathedrals, providing them with the most innovative stone vaults. Felix Candela, from the audacity of his mature knowledge, traced in this way the path of his self-learning.

On the other hand, experimentation with life-size models prevented him from having to immerse himself in another complex field of knowledge; the use of reduced models, which Eduardo Torroja had been masterfully developing since the 1930s, and which logically entailed the need, not only to have the means and technology to do so, but also to know how to build and load the model, in order to be able to transfer the results obtained to the life-size work.

In short, with the experimentation of life-size models Felix Candela optimized his self-learning time, and avoided getting involved in one of the biggest problems in history, "the change of scale", which he forgot throughout this "Shell Adventure", had already generated the collapse of some Thin Concrete Shells, before Felix Candela appeared on the scene.

@Pepa Cassinello

FULL SCALE MODELS

@Pepa Cassinello

His most important creative period began in 1950, when he founded his own company in Mexico -"Cubiertas Ala"-, with his brothers Antonio (quantity surveyor) and Julia, and with the architects brothers, Fernando and Raúl Fernández Rangel, who left the company in 1953. "Cubiertas Ala" was born with the purpose of constructing reinforced concrete shells, as a roof for all types of buildings, factories, homes, churches, restaurants, nightclubs, gas stations.

Félix Candela directed "Cubiertas Ala" from its foundation in 1950 until 1969, when his brother Antonio took over and directed it until it closures in 1976. In total, more than 1400 projects were carried out, of which almost 900 were built. During this period, Felix Candela became the most prolific designer and builder of reinforced concrete shell roofs in the world.

He used full scale model to check his shell designs and learn the best way to build it. These experimental shells were built with different geometric shape because he knew the importance of geometric shape and size in the structural behavior of a shell.

In 1949 he built the Ctesiphon Vault, 1950 the Fernández factory conoid and in the 1953 the umbrella at Las Aduanas. While at first, he experimented with different geometries, most of his oeuvre was based on hyperbolic paraboloids, a form that enabled him to generate a wide variety of shells whose strength derived from their double curvature geometry. Another considerable advantage of these structural forms was that he optimized the construction costs because concrete could be casting to simple formwork built with board arranged a long the straight lines that generated the shell. Candela created umbrellas by joining four straight-edged hypar surfaces.

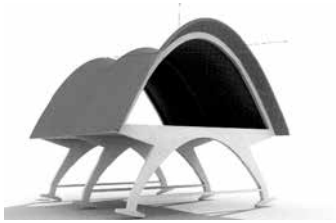
1951 MORE THAN A DREAM COME TRUE

COSMIC RAYS PAVILION

The year 1951 took a special importance for Felix Candela, since it was when he built the shell that launched him to international fame; the Cosmic Rays Pavilion of the National Autonomous University of Mexico, which was his seventh shell. He got more than a dream come true.

The shell of the Cosmic Ray Pavilion had to be only 15 mm thick, as it had to allow the measurement of neutrons. In view of the demand for its extreme thinness, Félix Candela chose a geometry of double curvature - the hyperbolic paraboloid - which, in addition to having greater rigidity than a surface of simple curvature, was susceptible to being easily redesigned on site, and above all, to being executed with a wooden formwork of straight planks, since it is a ruled surface. Félix Candela solved the final shape of the shell using two hyperbolic paraboloids - hypars - coupled to a main parabola. Félix Candela had created the thinnest shell ever built, providing it with an unquestionable and rational beauty. By the disposition and form of its supports and wavy facade, the shell cover of reinforced concrete, appears in front our eyes, as a fine fabric stretched, softly, on the frame that covers.

Ahora me doy cuenta de que por este tiempo empecé a sentirme seguro de mí mismo, y hasta a atreverme a tener opinión propia.
Félix Candela 1963



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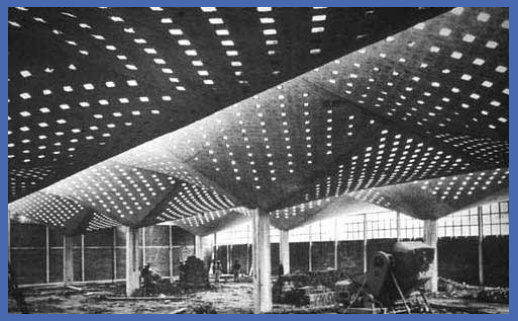
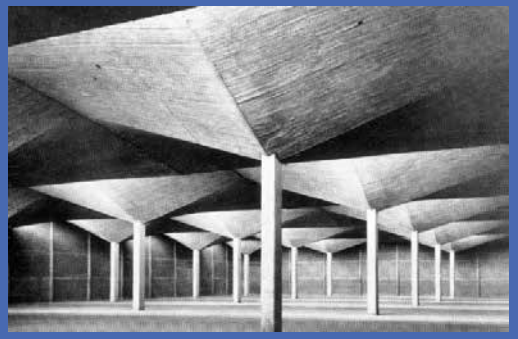
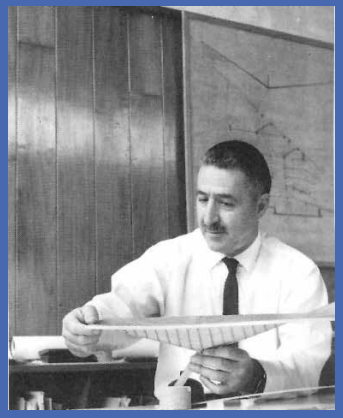
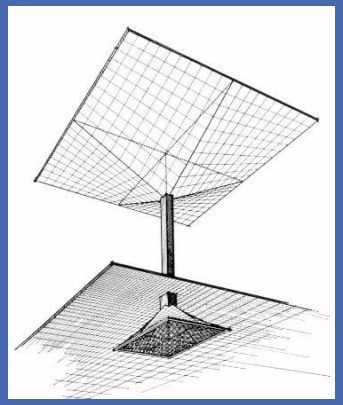
HE FELL IN LOVE WITH THE HYPAR









UMBRELLAS

The concrete shell umbrella prototype is formed by the spatial set of four hyperbolic paraboloid eardrums -Hypar- supported, usually, by a single central pillar. Its edges are straight because they are cut according to the generational lines of the hyperbolic paraboloid. One of the precedents of this geometrical form were those published by de F. Aimond in 1936, as well as the umbrellas built by Giorgio Baroni in Italy in the 1930s. But it was Felix Candela who not only optimized the slenderness and size of this shell structural form, but he was also the only one who created a great variety and number of them of very different sizes and uses, including the use of hypar umbrellas as foundations.

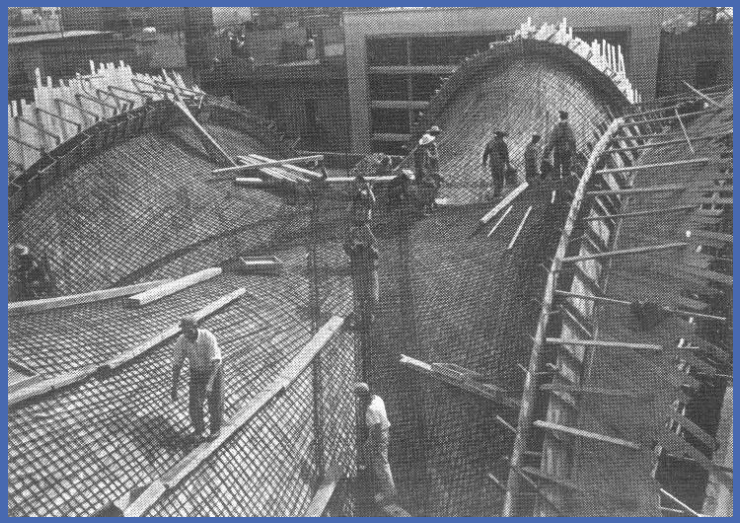
Umbrellas were the shells that Félix Candela built the most. He used them for the roofs of many building types, mainly factories, warehouses, and gas stations. The reason was that they were the more efficient structure due to its double curvature shape and easier and cheaper to build as the formwork could be made with straight boards. For this reason, Félix Candela fell in love whit the hyperbolic paraboloid. He had found the best geometric shape to build, in an easy way, many different sets of shells.

With boldness and ingenuity, Candela used variables with the same generic modular form, changing; the size of the hypar, its inclinations, creating gaps in the crown height between the hypar modules to allow the passage of natural light, creating differences in height and crown level between them, sizes, arrows, or including zenithal perforations on the surface of the hypar, as in High Life Factory. Coyoacan. Mexico D.F.

The umbrella and the different compositions created based on the hyperbolic paraboloid were part of the image of Cubiertas Ala, which even incorporated them into its Christmas greetings.

@Pepa Cassinello

SEARCH FOR FREE EDGES



"La simplificación real de las condiciones de borde, nunca explicada claramente en la mayoría de los textos, fue finalmente clara para mi. Entonces traté, sin éxito, de igualar las fuerzas normales a las aristas, pero la planta del cascarón no era simétrica". Félix Candela

STOCK EXCHANGE – MÉXICO CITY 1955

GROIN VAULT – RIBBED CURVED EDGES

Félix Candela revealed to us how he discovered the way to build "free edges" on his shells. It was precisely during the construction of the shell roof of the Mexico City Stock Exchange building (1954-1955), that he was not able to do so, because his floor plan was not symmetrical. It was a rectangular plant 14.10 x 25.50 m.

It was his first shell groin vault. A fantastic work built on the top of the building. The edges of the vault are separated from the walls to allow come the light into the interior space. But it has large ribs in its edges which can be only appreciated from the exterior.

If we want to have free edges, we must have some inner edges or edges that reach the ground by inclined lines (in a symmetrical structure), or, all the edges rigidly fixed to structural elements capable of resisting forces in any direction

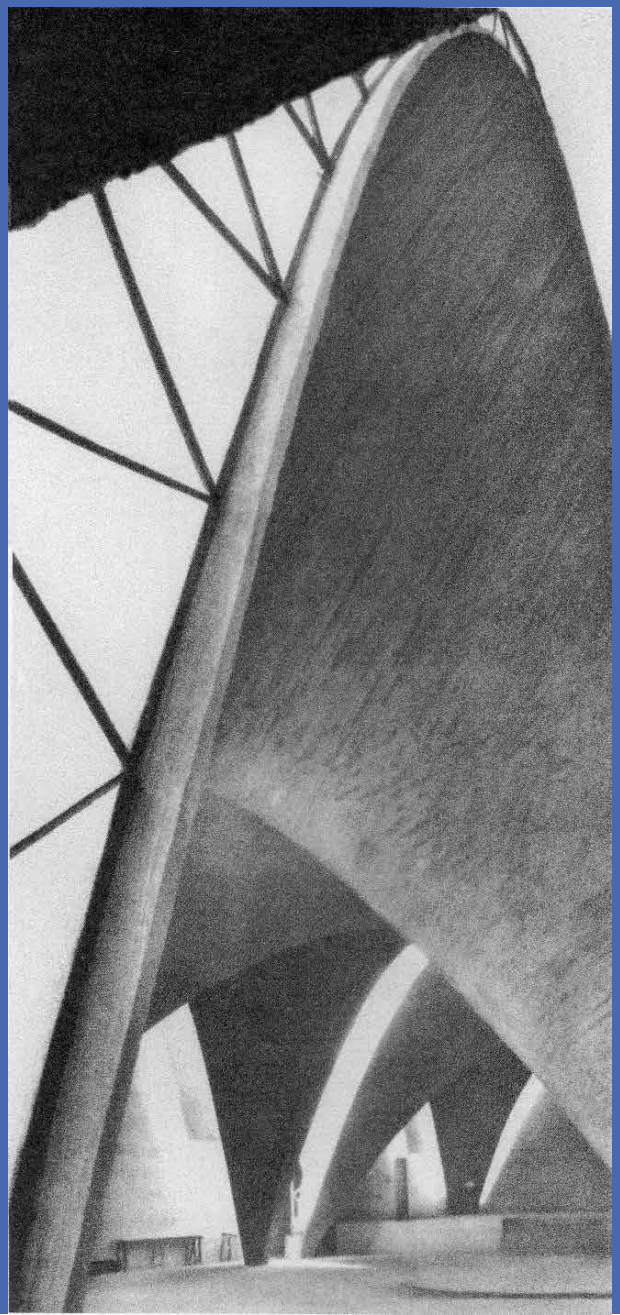
Félix Candela (Colin Faber)

He managed to build free edge shells using symmetrical hypar geometries in which he was able to balance the edge forces. The first was the grin vault of San Antonio de Huertas Church built in 1956 with the architects Enrique de la Mora and Fernando López Carmona. In 1957. He built other groin vaults free edges with four barrels as in 1960 Barcardí Bottling Plant and the Sales Office in Guadalajara. He also built groin vaults with different numbers of barrels. Between others, with eight barrels as the Restaurant Los Manantiales in Xochimilco 1957-1958, with five barrels Casino Hotel Selva Negra Cuernavaca 1958.

Not only did Candela learn to design ribless and free edge shells on his own, but as David P. Billington said, he also learned the discipline of thinness. He turned his work into Structural Art.

@Pepa Cassinello

1956 SAN ANTONIO DE HUERTAS - DETAILS



@Pepa Cassinello

In 1956 Félix Candela built his first free edges work, the San Antonio de Huertas church. Architects Enrique de la Mora and Fernando López Carmona.

The volumetric of the church is formed by the set of three reinforced concrete shells, whose geometry corresponds to that of a four-groove vault generated by the crossing of hyperbolic paraboloids with parabolic edges, the result of the vertical cutting of the surfaces.

The three concrete shells are built separately from each other, and are joined by light metal reinforcements, on which a cylindrical arch of reinforced concrete rests. The metal reinforcements are used to support glazed skylights, which allow natural light to pass between the concrete shells, thus emphasizing the perception of the lines of their free edges. In this way Felix Candela highlights the most relevant contribution of this laminar set, the first in which he built edges free of stiffness bands in this type of hypar geometry. Continuous thickness of 4 cm.

Another of the original features of this project is the solution that Candela uses in the crypt of the church. In view of the need to keep the height of the crypt's slab as low as possible so as not to raise the height of the church's crown too high, and the architects' interest in ensuring that there were no intermediate supports to break up the diaphragm of the floor plan, Candela designed complex folded vaults that were almost flat. Each of these vaults is formed by the intersection of twelve segments of hypar. Due to their flatness, as well as the heavy loads that these vaults had to bear, it was not possible to leave their edges free, but both the edge bands and the ribs that were executed on their extrados to support the floor slab of the church were hidden.

As we can see in the image, the details were important for Félix Candela. The shell shows us how slender is by do not put the metal skylight structure in its free edge.

FREE EDGES BEAUTY - Jacaranda Night Club, Acapulco. 1957

SELECTION OF HIS BEST WORKS

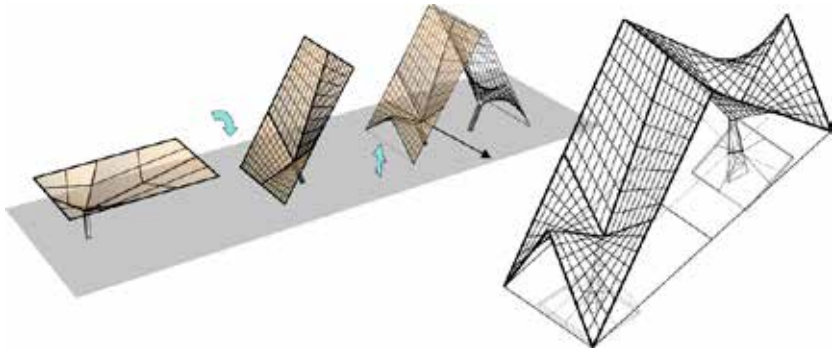
@Pepa Cassinello

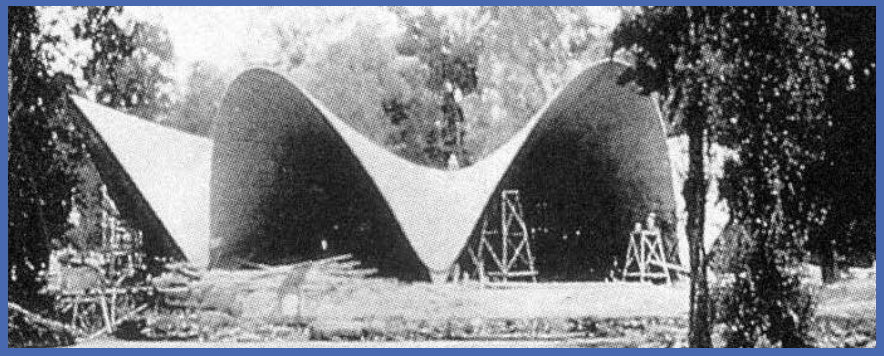
OUR LADY OF THE MIRACULOUS MEDAL

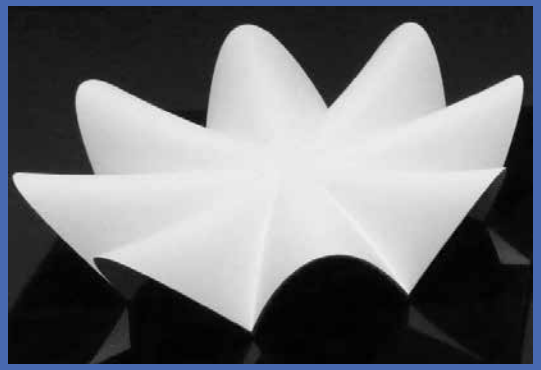
Between 1953 – 1955, Felix Candela designed and built one of his most famous shell structures: The Church of Our Lady of the Miraculous Medal in Narvarte, Mexico City, in which no other collaborator intervened.

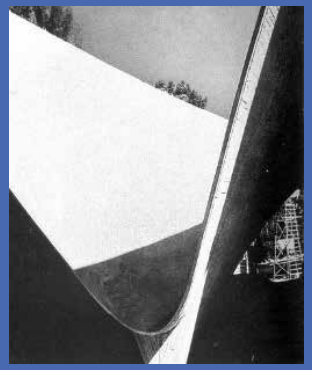
He designed this church with three naves, like the Gothic Cathedral, with the central nave higher than the lateral ones. Its final form is generated by a bold discourse on the mastery of structural efficiency of form, in which Candela uses its already famous inverted umbrellas, formed by four twisted segments of hyperbolic paraboloid, this time asymmetrical hypar. This umbrella module, as if moving to the sound of a harmonic musical score, tilts and folds up the central edge of the smaller of its sides, until its corners touch the horizontal plane. Then another identical module appears, which, positioned in front of it, and joining its higher edges, generates a new module formed by two umbrellas. In this way, the balance is guaranteed by the facing and union of these two asymmetric umbrellas that form the module of the central nave of the church.

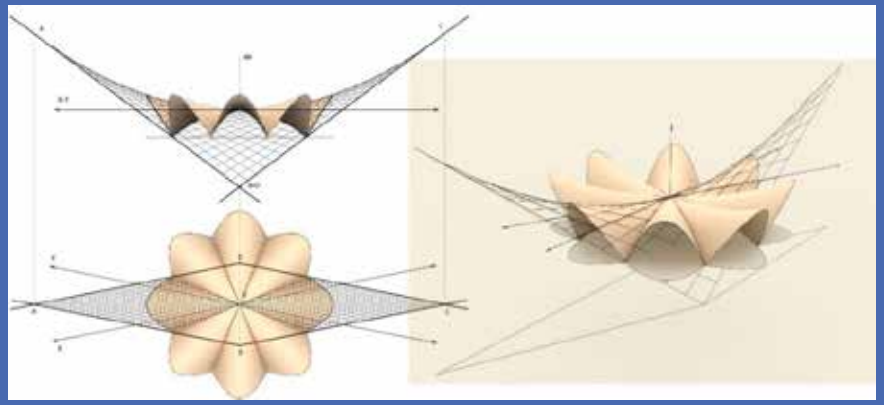
And as in a single gesture, maintaining spatial continuity, the pillars adopt the same warped shape, which gives continuity to the loads and sharp edges, giving the architectural space a sculptural interior image.











@HCH Model 2010 centenary Exhibition

@Pepa Cassinello

RESTAURANT LOS MANANTIALES

Felix Candela inaugurated in 1958 his most relevant concrete shell, the Manantiales Restaurant, in Xochimilco, Mexico City. It is the most admired, not only because of its great slenderness and free edges, but also because of the undoubted impact of its spatial composition. It is an octagonal groin vault formed by the intersection of four equal hyperbolic paraboloids, in which the curves of its edges are hyperbolic, having cut the surface by means of planes inclined towards the outside.

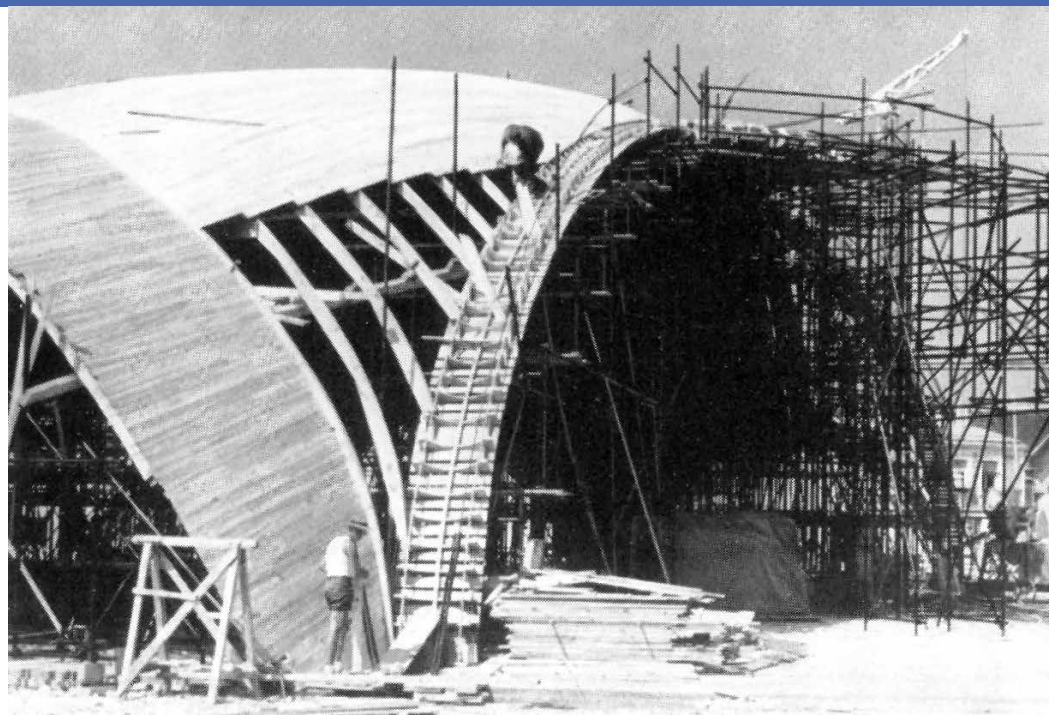
Visually, the shell has only one wavy free edge, but as Candela explained, since, in order to have a free edge, each hypar segment needs two edges to transmit the edge stresses to the supports, from the structural point of view it is really the bold spatial set of eight hypar fragments with eight free edges. (Colin Faber). The shell has eight equal cannons, whose supports are located describing a circular plan, whose free span is about 30 m, and the outer projection of its edge is 42 m in diameter. The reinforced concrete shell was built with a continuous thickness of 4 cm, being one of the slenderest built in the Shell Adventure of Modern Architecture.

The keys to its beauty are the spatial composition and free edges and the feat of its great slenderness and simple construction process is undoubtedly the use of the hyperbolic paraboloid, which not only has double curvature but also allows the use of simple straight plank formwork. In this way the cost was cheaper and rational. In the international context of the 1950s these keys made the difference. Another aspect that Candela takes care of, with special interest and expertise, is the encounter of the concrete shell with its supports. Generally, instead of visually integrating the shell surface into the mass of the support, it flies over the support, in such a way that it fully preserves the disturbing scenography image of its slenderness and free edge. According to Colin Faber, this was the structure that Felix Candela considered the most significant in his own work.

The architectural design was by Joaquin and Fernando Alvarez Ordoñez.

LOS MANANTIALES
LOW COST STRUCTURAL ART

Restaurant Los Manatiales. Xochimilco, México 1957-1958



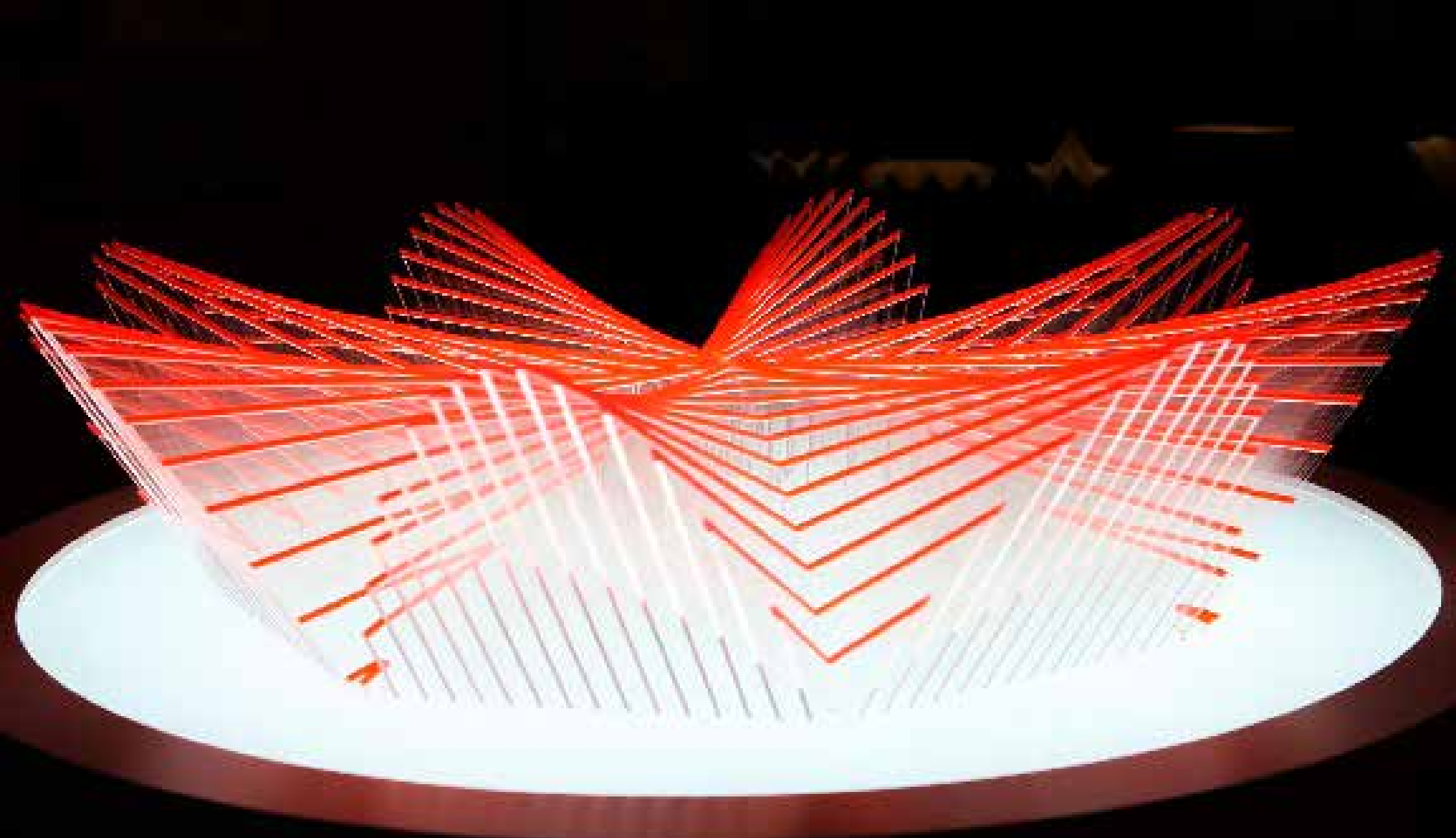
Royan Market Hall. Paris, France 1954-1955

Félix Candela found in the hyperboloid parabolic not only a strong structural form because of its double curvature to optimize his structural behaviouir but also very suitable to optimize the cost of its construction because the formwork could be built by wood straight planks following its straight generatrixes.

To understand the importance of this fact, we have to remember what was happening in the international contexts. Some years before, in 1955 the beautiful concrete shell of the Royan Market Hall was inaugurated at Paris. It was designed by the architects Louis Simon and André Morisseau and the engineer René Sager. It was a fantastic and innovative building. It has a circular plant 52,40 m diameter and it is covered by a groined concrete Shell formed by the intersection of 13 equal modules. One of the fundamental differences between these concrete shells it is the construction cost because the geometric form of Royal Market Hall needed a expensive formwork built by arches of different sizes.

How Félix Candela wouldn't fall in love with the hypar. He founded in it the possibility to build low cost Structural Art

Pepa Cassinello



LOS MANATIALES´MODEL – Authors HCH Model. Madrid. Spain

Model shows how it possible to make curves by straight lines

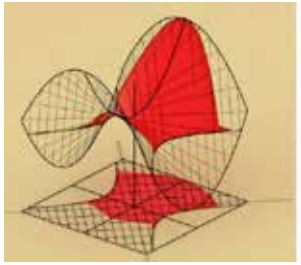
2010 EXHIBITION *"Félix Candela Centenario-Centenary – The Achievement of Slenderness".* Curator: Pepa Cassinello

@Pepa Cassinello

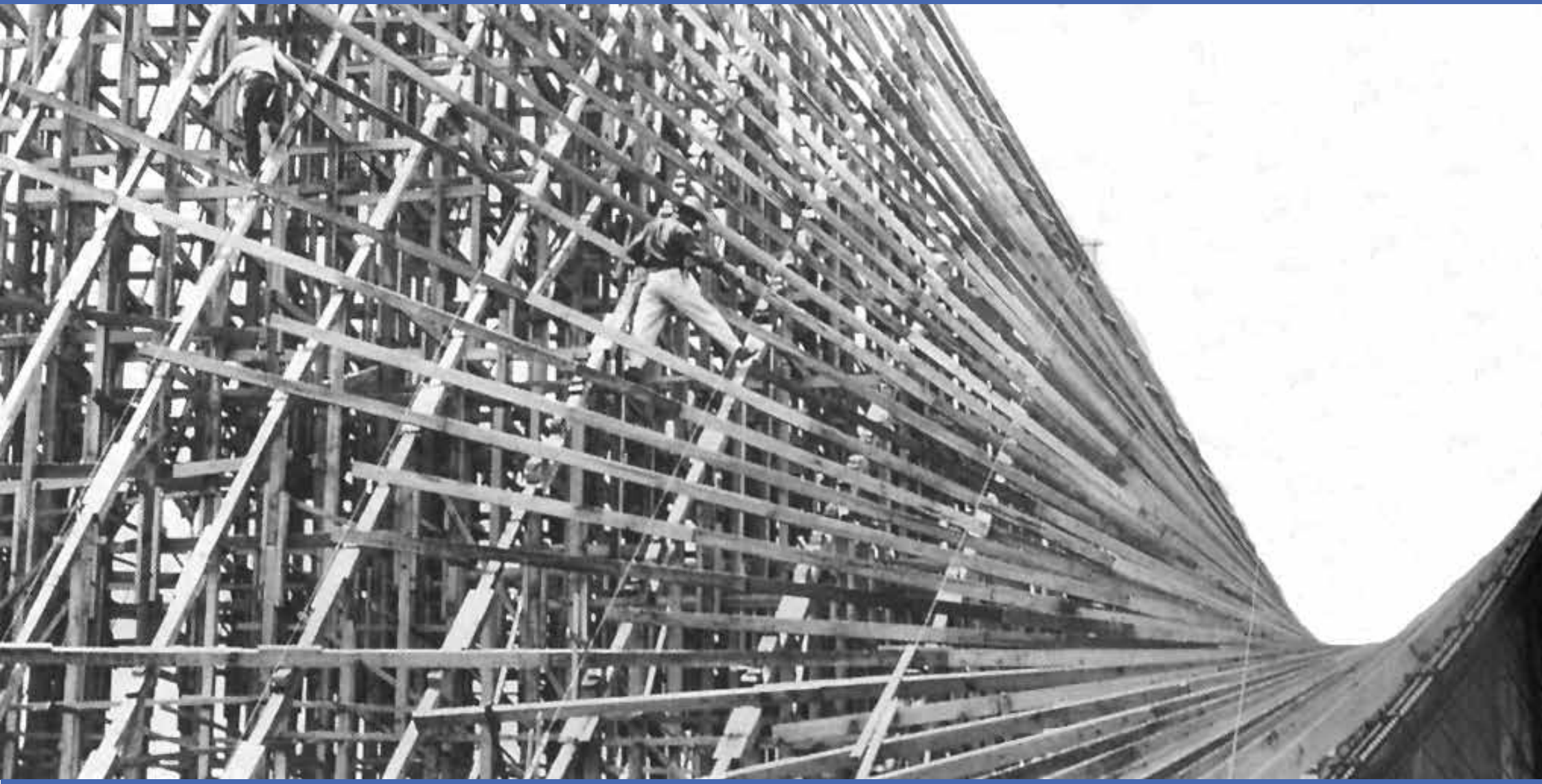
CUERNAVACA OPEND CHAPEL

The open chapel at Cuernavaca is one of the most striking thin concrete shells built by Félix Candela, and the tallest one he ever designed. Located at the top of a hill, it stands out against the horizon, catching the eye of anyone in the near or far environs. Its total lack of enclosures allows the viewer a panoramic vista of the shell's spatial geometry, including the play of lights and shadows resulting from the sunlight that floods it and the surrounding landscape.

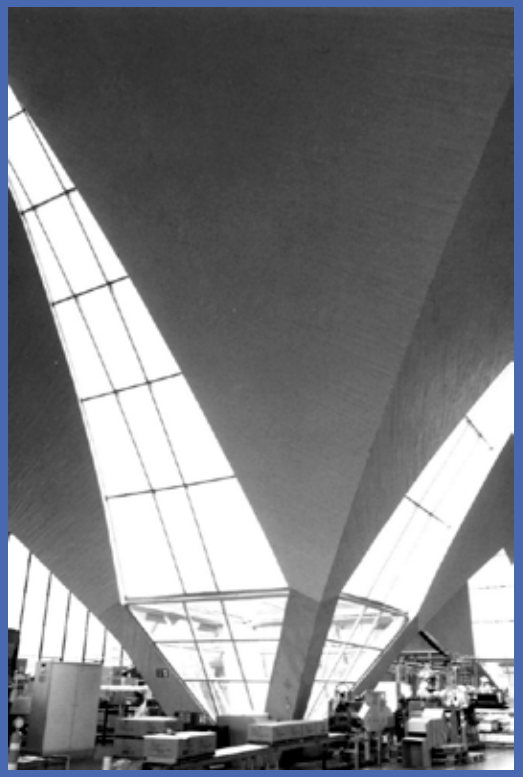
The geometry is generated by a single *hyperbolic paraboloid* intersected by several planes to form what is commonly known as a *"saddle"* shape, whose two curved, open mouths differ greatly in height and span. The plan view consists in two identical parabolas: mirror images that constitute the curved sides embedded in the terrain. The other two ends are open. The larger of the two, with a span of 30 m, was originally designed and built to be 24 m high. But after the top collapsed when the formwork was removed, Candela re-built it to a lesser 21,90 m. Following his own criteria, developed based on the simplified engineering afforded by hypar geometry, he designed and built this shell with a single free edge. For this he chose the one with the longest span (30 m) and height (24 m), while stiffening the opposite edge with a rib. In this case, considering the size of the shell, its thickness, instead of being a continuous 4 cm, was gradually deepened, reaching 52 cm over the supports. The shell structure also has a compression rib along the entire lip to resist the significant wind action to which the structure is exposed. (Colin Faber). Architectural design: Guillermo Rossel and Manuel Larrosa



FORMWORK - STRAIGHT LINE



As we have already said several times so that no one forgets, the use of the hyperbolic paraboloid was a fundamental key to economizing in the construction of its Concrete Shell. The formwork could be made by using wood straight planks following its straight generatrixes.



@Pepa Cassinello

BACARDÍ BOTTLING PLANT, 1959-1960

Cautitlán, Mexico. Collaborating architects: Sanez, Cancio, Martín, Álvarez and Gutierrez

Consultant engineer: Luís Torres Landa

Félix Candela built a wide variety of thin concrete shells at the Bacardí factory, the most attractive and innovative of which is indisputably the **cross-vault roof over the bottling plant**. Its free edge shells rise over a square measuring 30 m on each side. The supports positioned at the four corners constitute an extension of the arises formed at the vault intersections. With 30-m spans, this is the largest cross vault ever built by Candela. The bottling plant was initially designed to measure 90 x 30 m, with three 30 x 30-m modules roofed by three identical cross vaults, but it was subsequently enlarged to 90 x 60 m with a total of six modules.

Each shell consists in two identical ruled hyperbolic paraboloids. The curved edges of the resulting four barrels are cut obliquely to form hyperbolae. The structural slenderness can be attributed to the shell thickness, a *mere 4 cm throughout.* Another highly attractive feature of the roof is its spatial composition, in which skylights were built in the ample space in between the three initial shells.

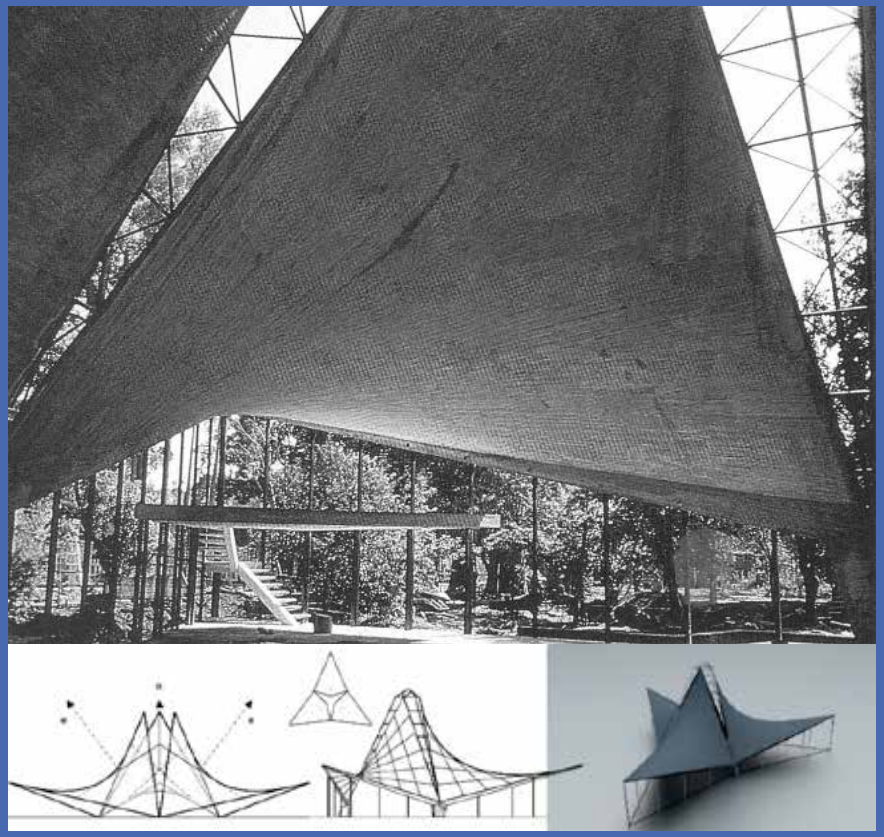
To understand the importance of this work it is enough to remember that in 1954, an interesting set of shell roofs had been built at St. Louis Airport in the U.S.A., intervening, Hellmuth, Yamasaki and Leinweber, Robert and Schafer Co. Antonio Tedesko, William C.E. Becker. They were three groin vaults of simple curvature, generated by the crossing of two cylindrical cannons. The great difference was that they have a big ribs, they were not “free edges” and the thickness of the shells were not continuous, counting with 11,5 cm in the highest parts of the surfaces, and 20 cm in the areas of the supports. An example of how the use of single-curved surfaces requires rigidizing elements, that double-curved surfaces do not need, at least in a certain and specific size range, that the Laws of Nature show to be different for each geometrical shape.

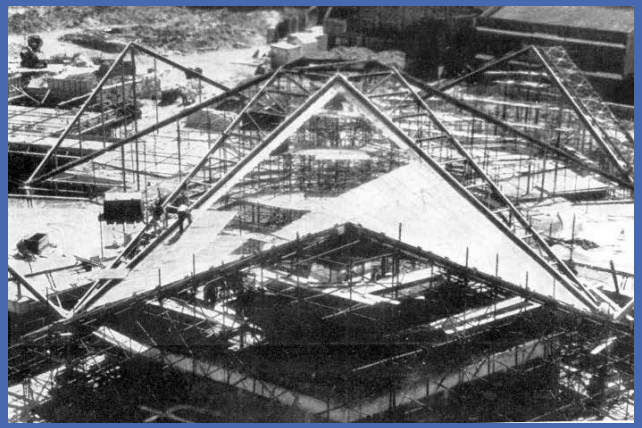
BACARDÍ BOTTLING PLANT – Formwork and Concreting

Félix Candela is not just an engineer or an architect or a builder but all three together in one person. And perhaps this is the most significant fact of all. He is in a fortunate position to master all the factors that affect his design.

Ove Arup 1968

SKYLIGHTS





ST. VICENTE DE PAUL CHURCH 1959-1960

As we said at the beginning, Félix Candela's educated creative intuition enabled him to design and build many different spatial forms from a single geometry, the hyperbolic paraboloid or hypar.

On the other hand, he also introduced in his hypar compositions some of the innovations made before by some pioneer master. It was the case of the skylights made of glass-clad steel trusses used in the Market of Reims (1932) by Eugene Freyssinet and in the Sport Palace of Rome (1957) by Pier Luigi Nervi. But was his friend Heinz Hossdorf who used steel trusses to generate mixed rims by connecting concrete shell with the steel trusses. In this way he got a mix structural work between these elements. It was in the Industrial building in Gossau, Switzerland (1954).

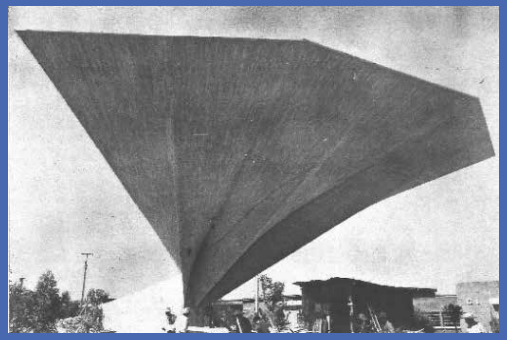
Félix Candela used this innovation in the St Vincent de Paul Church, located at Coyoacán, Mexico. The architecture was in collaboration with the architects Enrique de la Mora and Fernando López Carmona. In a plan view, the church consists in three isosceles triangles that Candela roofed with an innovative shell. Its three-straight edge, asymmetrical hypar fragments are joined by skylights made of glass-clad steel trusses. Each hypar fragment, measuring 20 m long, 15 m wide and only 4 cm thick, covers one of the three parts of the building.

The horizontal wings of the steel trusses allowed to support the wood formwork.

Fantastic modern architectural space in which the daylight pouring in through the skylights between the concrete fragments casts shadows that reproduce their geometry.

@Pepa Cassinello

CANTILEVER SHELL SCULPTURES



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CANTILEVER SHELL SCULPTURES

Félix Candela also built cantilever concrete shells as canopies or simply beautiful Modern Sculptures.

This is the case of the Band at Social Security´s new housing project in Santa Fe, Mexico City (1956). Large overhang supported by a vertical generator that is braced in two small concrete walls anchored to the ground to prevent overturning as can be seen in the model made for the exhibition commemorating his centenary at Madrid in 2010. The roof is formed by three equal folded pieces and each one covers a triangular area with the vertex at the support and the base of 6.4 meters at a distance of 12 meters, resulting in a total span of the canopy of 12.5 meters.

Candela's cantilever sculptures are undoubtedly iconic pieces of Modern Architecture. During the 1950s he designed other cantilevered concrete shells such as the one at the entrance to a residential complex on Lake Tequesquitengo (México 1957). This concrete sculpture was form by two cantilever fans connected by means of reinforced concrete V beams and tie rods that guarantee the balance of the whole. The fans are formed by 4 folded sectors of 4 cm thickness and a cantilever of 10 meters.

Another of its most relevant cantilevered shells is the one designed for the Plaza de los Abanicos in the Lomas de Cuernavaca (México). This concrete sculpture is located on a sheet of water. It is formed by three fans that are in the vertices of a triangular plant of 10 meters of side and they have 10 meters high. The fans are folded concrete plates of 4 cm thickness and a cantilever of 6 meters. In the upper part of its folds there are cylindrical perforations that favor the decrease of the wind pressure. The whole is balanced by the straps that connect the three fans. From these straps hang the tubes that shoot water jets and bathe the structure.

1959 IASS - MADRID - SPAIN

Eduardo Torroja

International Association for Shell Structures

@Pepa Cassinello

In 1959 the **Concrete Shell Adventure of Modernity** had reached a great development. Concrete shells had built all over the world for four decades. It was time to put together the knowledge and experiences gained in each country and continue to move forward together.

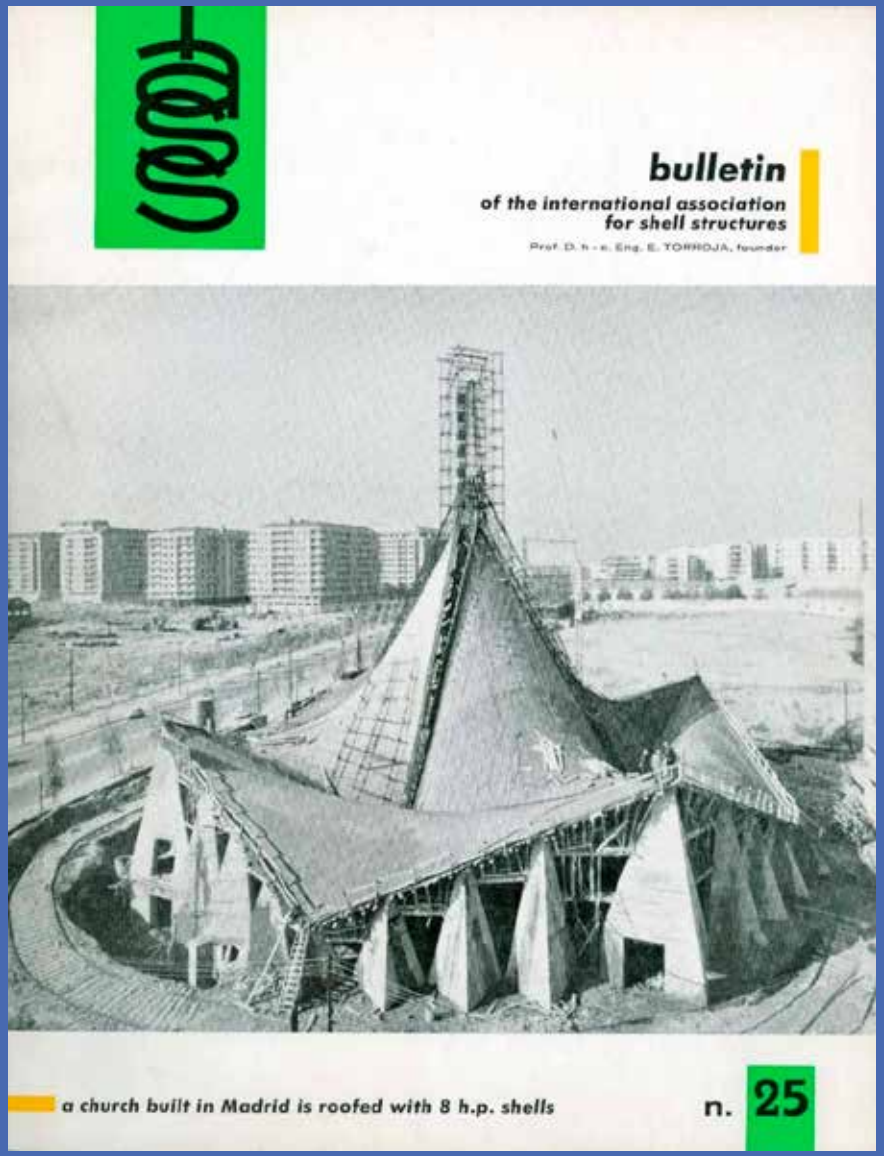
This year Eduardo Torroja organized an **International Colloquium on Nontraditional Processes for Thin Shell Construction**. The outcome of that meeting was the decision, further to a proposal sponsored by Eduardo Torroja the **International Association for Shell Structures** (IASS) was founded.

The specialists participating in the colloquium, more than 100 in all, haled from over a dozen countries: Argentina, Belgium, Brazil, Denmark, Finland, France, Germany, Italia, Japan, Netherlands, Norway, Poland, Portugal, Spain, Sri Lanka, Sweden, Switzerland, United Kingdom and Uruguay. Some of the most prominent designers and builders of thin concrete shells chaired the working sessions and/or read unpublished papers on their works. A. Paduart, W. Zerna, K.W Johansen, H. Rüle, Müller, R.S. Jenkins, W. Poniz, A. L Parme, E. Giangreco, A.M. Hass, M. Hahn, N. Esquillan, Tsuobi, Arup, H. Isler, among many others, were present. Pier Luigi Nervi and Mario Salvadori, however, frequent speakers at the Institute's events, were unable to attend on this special occasion, and so it was that Eduardo Torroja himself chaired the session that they were initially slated to lea **Félix Candela** was not present either, although he made it a point to keep abreast of all the activities sponsored by the Institute managed by Eduardo Torroja and subsequently the IASS.

Eduardo Torroja built as a tribute to the participants, two full scale experimental models. These were the last two thin shells to be designed and built by Eduardo Torroja. One, known as "The Whales", was a thin shell 3 cm thick consisting in 10 precast double curvature members joined by prestressed concrete and forming a modular shell 10,25 m long and 1,85 m wide. The other experimental structure consisted in triangular modules 4 cm thick.

Félix Candela collaborated with the IASS and in 1962 was named honorary member, along with Pier Luigi Nervi.

1962 CHURCH IN MADRID, SPAIN



@Pepa Cassinello

@Félix Candela

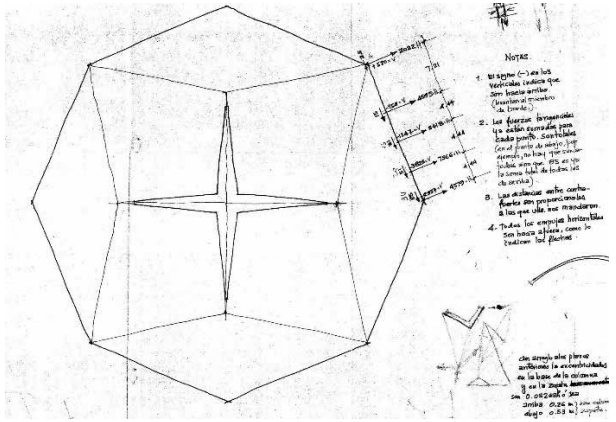
Félix Candela was an advisor to the Church built in Madrid between 1962 -1963, known as the Church of the Mexicans. It is in the Berlin park.

The architects were the Mexican Enrique de la Mora y Palomar and the Spanish José Ramón Azpiazu and the engineers were José Antonio Torroja and Avelino Sanmartín.

The church has an octagonal plan inscribed in a circumference of 53.74 m in diameter. The concrete shell roof is formed by eight hyperbolic paraboloids, with a central vertex higher than likeness of a Mexican hat. The plant is a 20.5 meters octagon. The edges of the eight paraboloids are straight edges.

The eight outer edges are supported by a continuous sequence of pyramidal buttresses and eardrums. The central paraboloids are attached by means of glass panes held in place by metal elements. Due to its large size the shell is supported internally by 4 pillars, and it has a stiffening reinforced concrete beam that more effectively support the shell.

This church was chosen to illustrate the cover of number 25 of the International Association for Shell Structures bulletin when it was still under construction.



1969 THINGS WERE CHANGING

Madrid, 29 Octobre 1969. Eduardo Torroja´s Institute

@Pepa Cassinello

The year 1969 was a special year. The things were changing to the concrete shells. Ten years after the **iass** was founded its new president Andre Paduart decided that it was time to change the name of this international association. The reason was that Concrete Shells had lost its primacy, even though they were still being built. At the end of the 1960s new structural types had emerged to be conquered as the **lightweight structures**, which Frei Otto built in the German Pavilion in 1967 in Montreal with the architect Rolf Gutbrodt and the engineers Leonhardt and Andrä, is the iconic building which represents the next generation. Tent-like tension structures made of cable-nets covered by membranes became possible.

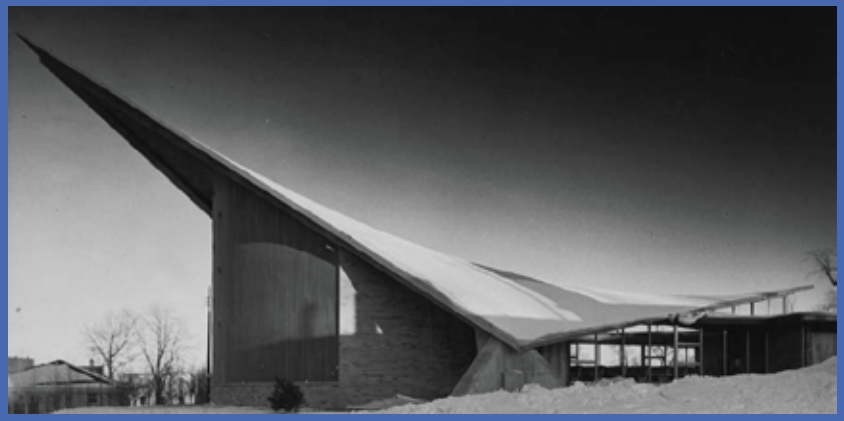
On the other hand, double curvature concrete shell started to be more expensive because the standards for the protection of the building construction process were a reality and its formwork were so laborious. **The Concrete Shell Adventure no longer was an adventure**. They had already been conquered.

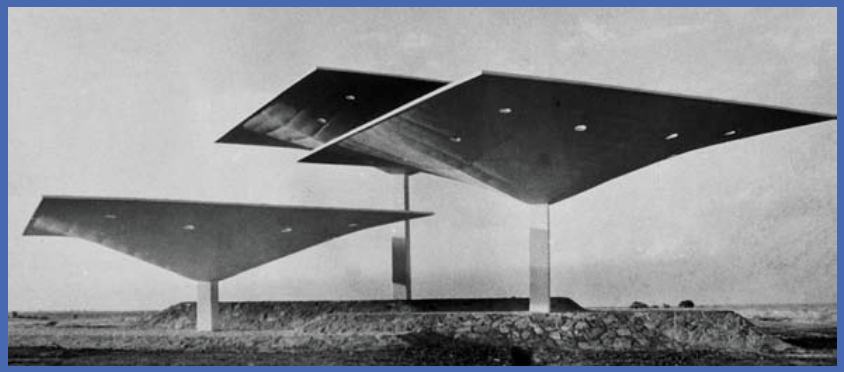
For this reason, the International Association for Shells Structures changed its name in 1970 keeping its acronym and logo. Since then it has been called the I**nternational Association for Shell and Spatial Structures** and it continues to lead, at the international level, the progress of spatial structures of all kinds.

In 1969, to commemorate the “Shell Adventure History” and birth of the **iass** a concrete shell was built at the Institute in the same place that Eduardo Torroja had built his experimental shells to the first iass colloquium in 1959. The shell called “**The Rib**” and was designed by the architect Fernando Cassinello and the engineer Jose Antonio Torroja. Not in vain, it was the same year that **Félix Candela** left his company Cubiertas Ala in the hands of his brother. It was also in 1969 when Félix Candela went to Madrid invited by his friend Fernando Cassinello who was then the Director of the Institute founded in 1934 by Eduardo Torroja. Félix Candela also visit the School of Architecture, his old school. Two years after, in 1971 Félix Candela **emigrated to the United States** and he was professor at the University of Illinois at Chicago until 1978, when he got his American nationality.

Finally, Félix Candela had three nationalities: **Spanish** (1910-1941), **Mexican** (1941-1978) and **American** (1978- 1997). He died on 7 February 1997 in Durham (North Carolina) USA.

1970s FÉLIX CANDELA - UNITED STATES





In 1971 **Félix Candela emigrated to the United States** and started to teach at the University of Illinois at Chicago. He had been a relevant professor at the UNAM in Mexico DF (1953-1971).

He was known in USA mainly from his participation in the conference on *Thin Concrete Shells* held in Massachusetts Institute of Technology (MIT) in Cambridge, June 21-23, 1954. But it is a fact that since he founded his company *Cubiertas Ala* in 1950 in Mexico, he established relationships, in one way or another, with other countries, mainly with Spain and the United States where his work was disseminated through different architecture and engineering journals. In Spain fundamentally by the journal *Informes de la Construcción* founded by Eduardo Torroja in 1948.

From this moment, Félix Candela participated in congress and conferences of the different American Institutions as, between others the American Institute of Architects, the Prestressed Concrete Association. He was invited to give lectures in some universities: Boulder, Colorado, Milwaukee, MIT, and Harvard, in Columbia, in the Virginia University, Carolina del Norte University, and Atlanta. He spread his knowledge and works in a tireless way. In 1969 he was named *Andrew D. White Professor-at-large* at the Cornell University.

Felix was also interested in building shells in the USA and demonstrate that even though labor was not as cheap as in Mexico he could get to build cheap shells in the United States, and he did it.

Among the works that Félix Candela built in the United States are Umbrella in front of the restaurant in the Great Southwestern Corporation in Texas, St. Edmonds Episcopal Church, and the set of three Umbrellas of different sizes at the entrance of the Great Southwestern Corporation industrial park in Texas (1958). This set reminds us of the Repsol service stations built many year later in Spain (1997) by Norman Foster and made in galvanized steel plate using inverted pyramids planes and not hyperbolic paraboloids concrete shells.

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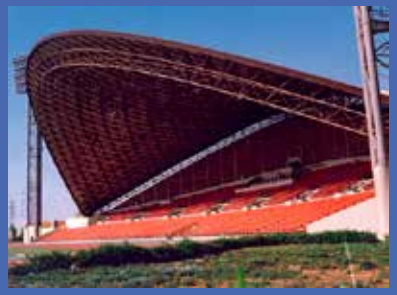
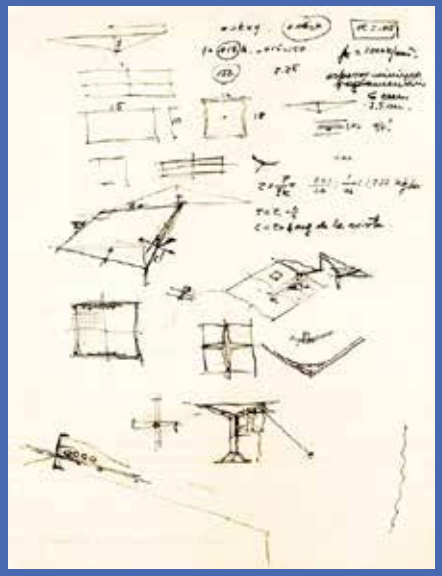
1970s FÉLIX CANDELA - UNITED STATES





Félix Candela collaborated since 1980 with the company **TYPSA in Madrid**, Spain, carrying out several projects in Arabia and Spain. He joined the TYPSA team in 1981 as special collaborator.

His first job at TYPSA was to join the team that was developing the new campus of the Islamic University of Riyadh. He intervened in the proposal for the revision of the university's Master Plan and he designed the roofs of the Boy Scout Center Service Station and the secondary stands of the Stadium, with cantilevers between 10 and 15 m long.

He was happy to have the opportunity to build his famous shell umbrella again. It was the roof he designed to the **Boy Scout Service Station**. he worked in the structures department as a consultant, designer, and builder, collaborating with the Spanish engineers Luis Catalán, Fernando Tejedor y Miguel Ángel Ezquerra.

His most important participation in this design phase was the conception of the roof of the main stand of the Stadium as a large sector of **hyperbolic paraboloid** limited by two inclined planes that intersected in a horizontal line parallel to the largest side of the field. The stadium's inner parabola arch flew beyond the stands, covering not only the grandstand but also a good part of the pitch. The most important novelty of this unique design is that, given the dimensions (150 m between supports and 60 m high), it led him to design the "shell" in metal structure.

He carried out many other works in TYPSA. Between them heads up the preliminary projects for the Legislative Palace of the State of Veracruz and for the State Attorney's Office in Xalapa (Mexico), in collaboration with Fernando Higueras, as well as the roof of the new vestibule of the **Puerta del Sol Metro station in Madrid**.

@Pepa Cassinello

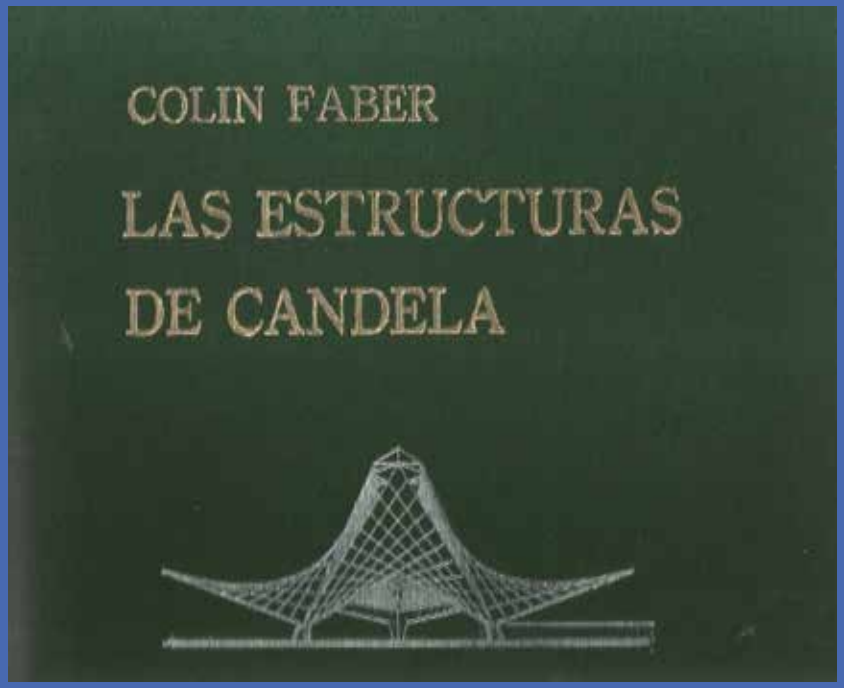
HIS LAST COLLABORATION - VALENCIA, SPAIN

The Oceanographic is the largest aquarium in Europe. It is part of the *City of Arts* and Sciences of Valencia in Spain. A great and fantastic place inaugurated in 2003.

Félix Candela was an advisor to the Oceanographic and he allowed a reproduction of his famous work "The Restaurant Los Manantiales" to be built. It was built with a span of 35,50 m and thickness 6 cm. The structural engineers were Carlos Lázaro and Alberto Domingo. It was built using white- colored steel fiber reinforced shotcrete (SFRS).

It is a nice remember form Félix Candela to Valencia but his innovative and pioneer work is in Xochimilco, México. Félix Candela died on 7 February 1997 in Durham (North Carolina) USA, before the construction was ended.

SMALL SELECTION OF PUBLICATIONS BY FÉLIX CANDELA



Félix Candela turned the reinforced concrete shells into real room able sculptures. Not in vain, Ove Arup, Frei Otto and David P. Billington, defined his work as a Structural Art.

We can add a Low Cost Structural Art because Félix Candela as the pioneer shell master builders such as Eugene Freyssinet, Pier Luigi Nervi, and Eduardo Torroja, he optimized not only the structural behavior of his concrete shells, elegance an beauty modern image, but also its construction cost. But a difference of these pioneer master Félix Candela built the largest legacy of concrete shell structures ever built in the world.

Pepa Cassinello

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-En defensa del formalismo y otros escritos. Xarait Madrid. 1985

Journal of the American Concrete Institute

1951 Simple Concrete Shells Structures. Nº 48

1953 Skew Shell utilized in unusual roof. Nº 49

Journal – Revista Ingeniería México

1952 Una pequeña demostración práctica de la validez de la teoría de membrana en superficies alabeadas.

Journal – Revista Espacios. México

1953 Divagaciones estructurales en torno al estilo. Nº 15

Journal Progressive Architecture. New York

1954 Stereo structures.

Journal Art and Architecture. California

1955 The shell as space encloser, Nº 1

Journal- Informes de la Construcción. IETcc. Spain

1955 Estructuras laminares parabólico – hiperbólicas Nº 76

1956 Sala de fiesta Jacaranda. Nº 80

1956 Iglesia de la Milagrosa. Nº 86

1958 Palacio de los Deportes, México. Nº 205

Journal Architectural Forum

1955 A new way to span space. Nº 11

1959 Hacía una nueva filosofia de estructuras.

Journal- L´ Architecture d´Aujourd´hui. Paris

1956 Les voûtes minces à l´espace architectural. Nº 64

Journal- Revista Nacional de Arquitectura. Madrid. Spain

1959 láminas de Hormigón Armado. Nº10

1963 Arquitectura y Estructuralismo. Nº 59

1967 El escándalo de la Ópera de Sídney. Nº 108

1995 La experiencia en el exilio. Nº 303

@Pepa Cassinello

SELECTED AWARDS AND DISTINCTIONS

Para los que hemos llevado una vida destartalada y errante, sin acabar de echar raíces en ninguna parte, no hay mejor compensación que las pruebas de afecto y simpatía de sus compañeros y paisanos. Como tal prueba recibo emocionado este título honorífico…. Félix Candela

10 May 1994. Honorary Doctor of the Polytechnic University of Madrid

1961 Gold Medal – Institution of Structural Engineers. London. England

1961 August Perret Prize of the International Union of Architects. UIA

1962 Honorary Member of the International Association for Shell and Spatial Structures

1977 Honorific Professor of the Universidad Nacional Federico Villareal, Lima.

1978 Honorary Doctor of Santa María University. Caracas. Venezuela

1978 Honorary Doctor of Nuevo México University. Alburquerque

1979 Honorary Doctor in Fines Arts. University of Illinois

1979 Honorary Member ACI American Concrete Institute USA

1980 Medalle d´Argent de la Recherche et de la Technique, Academie d´Architecture, Paris

1981 Gold Medal of Architecture awarded by the Superior Council of Architects of Spain

1983 Silver Medal. Union des Architectes Bulgares. Sofia

1985 Antonio Camuñas Architecture Award. Spain

1990 Honorary Doctor of Sevilla University. Spain

1991 Correspondent Member. Academie d´Architecture. Paris. France

1994 Honorary Doctor of the Polytechnic University of Madrid. Spain

1995 Prize of the Colegios Oficiales de Arquitectos y de Ingenieros de Caminos, Canales y Puertos. Madrid. Spain

@Pepa Cassinello

TIMELESS LEGACY

Pero la belleza, que no está reñida con la economía, ya no está muy de moda en arquitectura y la búsqueda de ambas se considera casi como un pecado.

Félix Candela 10 mayo 1994 Madrid, Spain

Félix Candela is an **international referent** not only to the past and nowadays professional of the Architecture and Engineering but also to the future new generations. Beyond his innovative work and his teachings, he left us a certain model of thought and action, a path to progress. A timeless legacy we must spread.

He was **free through knowledge** to make his dream come true – Build Concrete Shells- His path was not easy. As we had remembered before, he had to emigrated in 1939 from his county – Spain- to México after the Civil Spanish War. He arrived at México with just his illusion to work as architect and participate in the "**Concrete Shells Adventure of the Modernity**" which was the most international interesting structural and architectural type at that moment. Many famous architects and engineers had built an iconic concrete shell, between others; Frank Dichinger, Eugene Freyssinet, Auguste Perret, Robert Maillart, Ove Nyquist Arup, Anton Tedesko Pier Lugi Nervi, Eduardo Torroja.

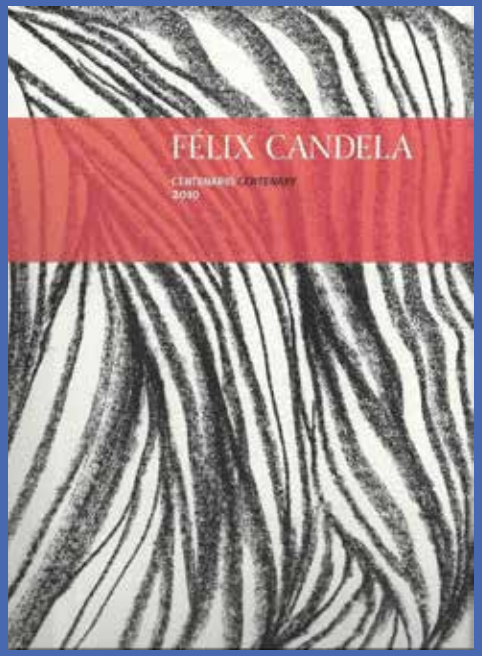
He alone, in the exile, studied all documents and data he founded. He learned in **a self-taught way**, and in 1950 he founded his own company Cubiertas Ala in México. We have seen a relevant part of this exciting story, and we know he got his international fame just in 1951. Félix Candela built over 800 shells (cascarones), the largest legacy of shell structures ever built in the world.

The Félix Candela´s path to make his dream come true was based in his continuous **effort and illusion**. These were the "magic" of success.

From 1950s to nowadays many people had study his legacy, write about it and made exhibitions, competitions, colloquies, or workshops in his honor to **spread his legacy**. The most important thing is that we **don't stop** doing it and hopefully other people are encouraged to join us to ensure the continuity of the dissemination of his exciting legacy to the new generations that will come in the future.

Pepa Cassinello

CREDITS



Book 2010- Félix Candela Centenario-Centenary

Guide of Exhibition 2010. Palacio Conde Duque
Ayuntamiento de Madrid

Guide of Exhibition 2010
Deutsches Museum
Munich

DIGITAL EXHIBITION

- Design and text *Félix Candela. Structural Art* 2020: Pepa Cassinello
- Layout: Enrique Ramírez

- Texts their authors
- Images, drawings and models from the catalogue book and Exhibition **2010** - Title: **Félix Candela. Centenario/Centenary.**

2010 Catalogue Book Authors
Exposición / Exhibition
Pepa Cassinello, Curator

Thematic Articles:
T1. Contexto Internacional de las Thin Concrete Shells / *International Context*
Pepa Cassinello, Mike Schlaich
T2. El legado de Félix Candela / *Félix Candela´s Legacy*
María Eugenia Moreyra Garlock and David P. Billington, Juan Gerardo Oliva Salinas, John Abel, Agostino Catalano, Massimiliano Savorra, Antonio Lamela, Pablo Bueno
T3. Forma Estructural / *Structural Form*
José Calavera Ruiz, Enrique González Valle, Florencio J. del Pozo Vindel, Jose María Goicolea, Gonzalo Larrambebere, Javier Manterola, José Antonio Torroja
T4 Geometría / *Geometric*
Carmen García Reig (dibujos utilizados en el texto)
T5 Material: Hormigón armado / *Material: Reinforced concrete*
Rafael Talero
T6 Félix Candela
Ricardo Aroca, Antonia Candela Martín, Julia Gómez Candela, Juan B. Artigas, Fernando Serrano Migallón. José Ávila Méndez

Edition: Fundación Juanelo Turriano, Universidad Politécnica de Madrid
Editor: Ricardo Lampreave, Madrid 2010

2010 Exhibition: **Félix Candela. Centenario/Centenary** was in the Technische Universität Berlin with Mike Schlaich and Annette Bögle, and in the Deutsches Museum Munich with Dirk Bühler.

CONTRIBUTION
Mike Schlaich

Félix Candela would have had his 100th birthday in 2010. On this occasion I feel honoured to have been invited to express my thoughts on someone I unfortunately never had the pleasure of meeting personally. However, I consider Candela as one of the greatest “Baumeister” of the 20th century, a man whose work still impresses me every time I look at it. I have a strong feeling of empathy for his thin concrete shells, their extreme lightness and elegance and their extraordinary ability to stimulate the mind. I am impressed not only by the large number of structures Félix Candela built but also by the variety of forms he developed. In his field of work, he is a real “Maestro de obra”, a “Baumeister”, a master builder!

Trained as an architect Candela ingeniously combined the abilities of an architect, engineer, and contractor all in one person. He developed a holistic approach to his work which resulted in structures which often come close to a “Gesamtkunstwerk”. Reading his publications reveals not only Candela’s deep affection for his profession and his profound knowledge of engineering but also a humble and frank personality which defined his structural gifts as “genio es 99% de trabajo abnegado y un 1% de inspiración”

Mike Schlaich

Prof. Dr. sc.techn.
Slhaich bergermann und partner

CONTRIBUTION
Dirk Bühler

Deutsches Museum

Félix Candela: Architect, Engineer and Artist

The search for slender reinforced concrete structures can be traced back to the origins of this wonderful building material. Perhaps Joseph-Louis Lambot, when building his concrete boat with a thin concrete shell in 1848, was the first to try. The first successes with larger structures were achieved by the construction company Dyckerhoff & Widmann when it erected the dome of the Zeiss planetarium in Jena between 1922 and 1924. Since then, the intensive development of slender structures in Europe and America has started, driven by engineers and construction companies.

In Spain Eduardo Torroja was the most important protagonist, both for his innovative structures and his architectural design. It was precisely his student at the Escuela Técnica Superior de Arquitectura, Félix Candela, who would perfect this technology both structurally and artistically. Felix Candela, especially from the 1950s onwards, succeeded in casting modern concrete technology with pure and vigorous geometrical shapes. With his reinforced concrete shells, he created suggestive structures that were well thought out and constructively optimized. He designed, especially in Mexico, more than 800 works of engineering of impressive elegance and beauty that managed to change the way modern architectural thought was conceived. Ove Arup, Frei Otto and David P. Billington rightly recognized his work as "artistic construction".

His works are still of enormous importance for civil engineering, architecture and urbanism: His Cupola of the Palacio de los Deportes is a landmark for those who arrive in Mexico City by plane: shortly before landing, the building can be recognized from the air. The Los Manantiales restaurant in Xochimilco is still a major tourist attraction. When visiting the National Autonomous University of Mexico, the Cosmic Ray Pavilion stands out. Even shopping at the Coyoacán Market is done in a no less admirable work by Félix Candela. The Open Chapel of Palmira represents a surprising example of integration of its architecture to the landscape of Cuernavaca.

The interest in his person and work continues to this day. More than anything else, its appeal was evident in the great success of the exhibition that was shown in Madrid and Munich on the occasion of the centenary of its birth.

110th Anniversary of the Birth of Félix Candela

International Ideas Competition for students of Architecture and Engineering

The "Fundación Eduardo Torroja", promoter of the initiative and organization of this international ideas competition for Architecture and Engineering students, would like to expresses its gratitude to all the collaborating entities, which have supported this initiative, and to the generous financing of the SIKA SAU Spain company that always participates in spreading illusion to promote the well done work.

Organization Directors
Pepa Cassinello, Director of the "Fundación Eduardo Torroja"
Fernando Vela Cosío, Deputy Director of Academic Planning and Relations with Latin America. ETSAM

Secretaria-Contacto del Concurso
contacto@fundacioneduardotorroja.org
Enrique Ramírez, Colaborador de la Fundación Eduardo Torroja

FINANCIACIÓN – SPONSOR
SIKA, SPAIN

PARTICIPATING ENTITIES

FUNDACIÓN EDUARDO TORROJA

CONSEJO SUPERIOR DE COLEGIOS DE ARQUITECTOS DE ESPAÑA

DIRECCIÓN GENERAL DE ARQUITECTURA. MINISTERIO DE FOMENTO

UNIVERSIDAD POLITÉCNICA DE MADRID- UPM

ESCUELA TÉCNICA SUPERIOR DE ARQUITECTURA- ETSAM-UPM

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS UPM

INTERNATIONAL ASSOCIATION FOR SHELL AND SPATIAL STRUCTURES

IABSE- SPANISH GROUP

OBJECTIVE AND DESTINATION

The fundamental objective of the International Ideas Competition had been that the students of the Polytechnic Universities, at international level, are directly involved in this tribute to the architect Félix Candela and know, not only his work but also that invisible part of his legacy that has made him an international reference of the new generations of architects and engineers - his model of thought and action -, in which it is clear that the "magic" of success is nothing more than the illusion and effort to innovate.

In order to continue spreading the work of this distinguished architect of Spanish origin, an Exhibition was planned under the title "110th Anniversary of Felix Candela: The Structural Art of Thin Concrete Shells".

In this way, the effort made by all the participants (students, collaborating professors, organizations and organizing and collaborating universities) will contribute to continue disseminating his legacy among the new generations.

The Ideas Competition had two different sections

A) Poster announcing the anniversary of the 110th anniversary of the birth of Felix Candela

B) Drawing on one of Félix Candela's works, because of the geometric analysis of its resistant form and / or its specific structural behavior

During the worldwide COVID pandemic 2020, 208 students from 37 Schools of Architecture and Engineering, belonging to Universities of 10 countries. They presented a total of 208 proposals to the International Ideas Competition.

Proposals by countries: **75** Spain, **61** Russia, **24** Mexico, **19** Puerto Rico, **15** Argentina, **8** Italy, **2** Colombia, **2** Venezuela, **1** Peru and **1** Belgium.

All participating entities appreciate the great response received in these difficult moments in which both universities and professors and students have been overwhelmed by a situation that has forced them to improvise, immediately, the organization of classes and exams by resorting to university management and non-contact teaching.

The monetary prizes have been financed by SIKA Spain
A total of **7.500 euros** will be awarded distributed in 6 Awards
2 prizes of 2000 euros + 2 prizes of 1000 euros + 2 prizes of 750 euros

Section **A) POSTER**
1st Prize 2,000 euros + 2nd Prize 1000 euros + 3rd Prize 750 euros

Section **B) DRAWING**
1st Prize 2,000 euros + 2nd Prize 1000 euros + 3rd Prize 750 euros

JURY MEMBERS


José Antonio Torroja


Pepa Cassinello


Javier Martín Ramiro


Laureano Matas Trenas


F. Javier Jiménez Leube


Manuel Blanco Lage


F.J. Martín Carrasco


R. Fernández Sánchez


Carmen Pinart


Gonzalo Causín Sánchez

President: José Antonio Torroja, President Fundación Eduardo Torroja

Secretary: Pepa Cassinello, Director Fundación Eduardo

Javier Martín Ramiro, Director General de Arquitectura. Ministerio de Fomento

Laureano Matas Trenas, Secretario General CSCAE

Fco. Javier Jimenez Leube, Virrector UPM

Manuel Blanco Lage, Director Escuela Técnica Superior de Arquitectura UPM

Francisco Javier Martín Carrasco, Director ETS de Ingenieros de Caminos, Canales y Puertos UPM

Rafael Fernández Sánchez, Secretario de la Fundación Eduardo Torroja

Carmen Pinart, Pintora Artística

Gonzalo Causin Sánchez, Director General de SIKA, SAU España

The Jury of the International Ideas Competition held two consecutive votes until the 6 prizes were awarded and, based on the quality of the proposals presented, unanimously approved increasing the number of Mentions to 20 (10 on POSTERS + 10 on DRAWINGS).

CONGRATULATIONS TO ALL

ARTIST - JURY CONTRIBUTION
Carmen Pinart

Félix Candela necesitaba tener artistas cerca (él lo era) y hacer participar su arte, fundirlo con las estructuras, arquitecturas, ingenierías, publicaciones.

Ojalá haya más personas como él.

Para mí ha sido un honor poder participar como miembro del jurado en este concurso internacional.

Carmen Pinart
Painting Artist

SIKA, SPAIN - PRESENTATION
Gonzalo Causin

Congratulations to the winners of the two categories, posters and drawings of this International Ideas Competition, in commemoration of the 110th Anniversary of Félix Candela, they have shown great creativity and elegance in their work, both highly valued in our society, where the expression " a picture says a thousand words" is fulfilled more than ever. Thanks to all participants, without them we would not have made it this far, especially in such dramatic moments.

To thank Pepa Cassinello, Director of the Eduardo Torroja Foundation and organizer of the contes, for her effort and dedication so that all its phases have been completed, despite the terrible pandemic for which we are still living, although weakened. Thanks to his commendable effort, the contest has had an extraordinary international participation, which has undoubtedly served to further enhance the memory and legacy of Félix Candela through future generations.

This contest has also been possible through the collaboration of the Dirección General de Arquitectura, CSCAE, Universidad Politécnica de Madrid, Escuela Técnica Superior de Arquitectura, Escuela Técnica Superior de Caminos, Canales y Puertos and private companies such as Sika whom I represent.

Gonzalo Causin
General Manager, Sika S.A.U.

PARTICIPATING UNIVERSITIES

SPAIN

Technical Schools - Universities

Universidad Politécnica de Madrid
Escuela Técnica Superior de Arquitectura
Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos

Universidad San Pablo CEU
Escuela Técnica Superior de Arquitectura. Madrid

Universidad Carlos III de Madrid

Universidad de Alcalá

Universidad de Castilla la Mancha
Campus de Ciudad Real

Universidad Europea. Madrid

Universidad de Zaragoza
Escuela de Ingeniería y Arquitectura

Universidad de Castilla la Mancha
Campus de Toledo

Universidad de Sevilla
Escuela Técnica Superior de Arquitectura

Universidad Politécnica de Cataluña
Escola Tècnica Superior d'Arquitectura de Barcelona
Escola d'Arquitectura del Vallés

Universidad Politécnica de Valencia
Escola Técnica Superior D´Arquitectura
Escola Técnica Superior D´Caminos

La Salle Campus Barcelona

Universidad San Jorge
Campus de Ciudad Real

Universidad de Alicante

RUSSIA

Technical Schools - Universities

Saint Petersburg State University of Architecture and Civil Engineering
SPbGASU

MÉXICO

Technical Schools - Universities

Universidad de las Américas Puebla

Universidad Nacional Autónoma de México

Universidad Autónoma Metropolitana.
Unidad Azcapotzalco

Universidad Autónoma Benito Juárez de Oaxaca
Facultad de Arquitectura de la UABJO

Instituto Tecnológico de Chihuahua II

Universidad del Valle de México
Campus de Chihuahua

Universidad Iberoamericana
Campus Ciudad de México

ARGENTINA

Technical Schools - Universities

Universidad Católica de Santa Fe

Universidad Nacional de la Plata

Universidad Nacional de Rosario

Universidad Nacional de Tucumán

Universidad Nacional del Litoral

ITALY

Technical Schools - Universities

Sapienza Università di Roma

Politecnico de MIlano

Tor Vergata Università degli Studi di Roma

COLOMBIA

Technical Schools - Universities

Universidad Nacional de Colombia

BELGIUM

Technical Schools - Universities

Universidad Católica de Louvain

PUERTO RICO

Technical Schools - Universities

Universidad Politécnica de Puerto Rico

VENEZUELA

Technical Schools - Universities

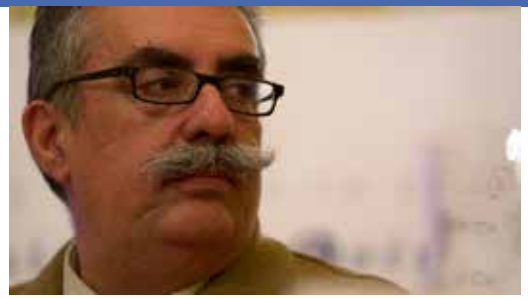
Universidad Rafael Urdaneta

PERÚ

Technical Schools - Universities

Universidad Católica de Perú

SPAIN - PROFESSORS CONTRIBUTION
Fernando Vela



In his work “España en América” (1909) Rafael Altamira (1866-1951) stated that the future would be in America. He remarked the decisive importance that the construction of the Ibero-American community would have and he pointed out the existence of a trend of opinion in Spain regarding the need of our economic relations with America. But he also warned about the lack of interest in what concerned to the intellectual relations and he pointed out how “some sporadic manifestations, mostly of an individual nature, that undoubtedlyshow some concern about the problem, can be felt, but, in general, those manifestations do not delve into it, they do not go beyond its surface and, of course (with one or two exceptions), they do not realize about the gravity that this represents to our future”.

Only three decades later, at the end of the Spanish Civil War, America was to become the only opportunity for many of the Spanish exiles who, thanks to the hospitality of these Ibero-American nations, were able to rebuild their lives and move on. Even with the great personal and professional difficulties that the new situation imposed on them, over the years many of those exiles became indisputable references of Spanish culture in the world. The legacies we have received from poets, intellectuals or artists of the importance of Juan Ramón Jiménez, Claudio Sánchez Albornoz, Ramón Pérez de Ayala, Salvador de Madariaga, Ramón Gaya or José Vela Zanetti, to name just a few of those who had to undertake the difficult path to exile, would not be the same if they had not undergone that American experience.

The case of the architect Félix Candela (1910-1997) shows us, in an exceptional way, one of those extraordinary trajectories, without which contemporary architecture would be different. Candela, nationalized Mexican in 1941 and professor at the National Autonomous University of Mexico since 1953, was able to develop a brilliant professional career with important projects in North America. His example today constitutes an inescapable reference for architecture students and also for the architects of the future. Therefore, calls such as this international competition that commemorates the author’s 110th anniversary, sponsored by the Torroja Foundation with the sponsorship of the SIKA company and with the collaboration of numerous institutions, as well as the participation of Schools and Faculties of Architecture of all over the world, brings us all together again to build that intellectual community of thought in which very remarkable fruits have also been collected in the field of teaching and learning of architecture, as well as urban planning of our time, which, in addition, allow us to finally understand the undeserved privilege that we have had, being able to share all that great constellation of architectures that, risen in spanish, have made possible the construction of our America.

Fernando Vela Cossío
Professor at the Universidad Politécnica de Madrid
Vice Dean of Academic Planning and Relations with Latin America of the Escuela Técnica Superior de Arquitectura de Madrid.

SPAIN - PROFESSORS CONTRIBUTION
Pepa Cassinello

My dual activity as Professor at the Higher Technical School of Architecture of the Polytechnic University of Madrid and the Director of the Eduardo Torroja Foundation, unit to my valued and unconditional friends, allow me to organize many different things for students, teachers, researchers and professional of the Architecture and Engineering. Two disciplines which must walk together as Eduardo Torroja always defended. Not in vain, the Eduardo Torroja Foundation participates with the Spanish *Ministerio de Fomento* in the Eduardo Torroja Award which is given to the architect and the engineer of the most relevant work built in Spain. Also, the Award to the Final Project - Final Master Work- is given to the best work at the Spanish universities of architecture and engineering.

Another of the activities common to the university and the foundation is to contribute to the necessary diffusion of the knowledge of the legacy of the international referents who belong to the **History of Innovation** in Architecture and Engineering, as **Félix Candela** is.

The year 2010 was the Centenary of the Félix Candela´s birth. At that moment, as Deputy Director of Students at the Higher Technical School of Architecture, we organized an international ideas competition for students and an exhibition "Félix Candela Centenary – The Achievement of Slenderness" with the Juanelo Turriano Foundation and the Polytechnic University of Madrid. It was inaugurated at the Conde Duque Palace in Madrid and shown at the TU Berlin with Mike Schlaich and Annette Bogle, and the Deutsche Museum Munich with Dirk Buhler.

This year 2020, although the COVID 19 pandemic has closed our universities and confined us to our homes, **all together,** students and teachers, we have made this **digital exhibition** in homage to **110th Anniversary of the Birth of Félix Candela – The Structural Art of Thin Concrete Shells.** We have to continuous working to spread not only knowledge, but also the **illusion to get it** and desire for innovating, as Ortega y Gasset said in his famous text on what the University should be. Illusion and desire which Félix Candela had and transmitted.

We will not stop or lose this illusion that we must distribute among the new generations that are about to arrive. Thank for collaborating!

SPAIN - PROFESSORS CONTRIBUTION
Hugo Corres

Félix Candela genio en el uso de una geometría, la de los paraboloides hiperbólicos. Nadie la utilizó como él, nadie la explotó tan creativamente como él, nadie pudo aprovechar tan genialmente sus potencialidades y capacidad de conseguir unas composiciones extraordinarias, como él.

Félix Candela mostró no solo la capacidad de imaginar geometrías emocionantes con paraboloides hiperbólicos, sino que comprendió profundamente su comportamiento y busco y experimento, incansablemente, para poder construirlos de forma segura, rentable e inimaginable.

Félix Candela vaya desde aquí y ahora mi más profunda admiración y reconocimiento.

Civil Engineer, MSc and PhD from the Technical University of Madrid.
Professor of Structural Concrete and Conceptual Design of Structures at the School of Civil Engineering at the Technical University of Madrid.
Doctor Honoris Causa from the Technical University of Bratislava.
Honorary President of fib (International Federation of concrete).
Former president of ACHE (Structural Concrete Scientific Association of Spain).

SPAIN - PROFESSORS CONTRIBUTION
Rafael Fernández Sánchez

Ha sido una experiencia profesionalmente enriquecedora haber tenido el honor de participar en este Concurso Internacional de Ideas para recordar a un genio español de las cubiertas laminares usando las formas de paraboloides hiperbólicos.

La cantidad de propuestas presentadas y la gran calidad de la mayoría de ellas han hecho difícil la labor del jurado para seleccionar a los ganadores. Como Fundación Torroja nos sentimos satisfechos y agradecidos de haber podido contribuir a este nuevo y merecido homenaje a Félix Candela gracias a todos los colaboradores y participantes.

Enhorabuena a los ganadores y muchas gracias a todos los colaboradores y participantes por su gran trabajo.

Dr. Ingeniero de Caminos, Canales y Puertos.
Patrono y Secretario de la Fundación Eduardo Torroja
Exprofesor de la Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos de Madrid.
Expresidente de la Confederación Española de Asociaciones de Fabricantes de Productos de Construcción (CEPCO)

SPAIN - PROFESSORS CONTRIBUTION
Enrique González Valle

El establecimiento del esquema estructural es tal vez la fase más creativa del proceso: en ella se establecen los mecanismos resistentes para soportar los efectos de las acciones, a fin de garantizar el comportamiento, en principio solamente estático, de la estructura. Es normal que el profano intente identificar en el proyectista de estructuras al científico, al técnico, ingeniero o arquitecto, con profundo conocimiento de la resistencia de materiales y de los métodos de cálculo, dando una importancia, tal vez desmedida, a las fases del proceso que se refieren al cálculo estructural. Ello lo reconoce Eduardo Torroja cuando señala que el proyectar estructuras: "…..si bien tiene mucho de ciencia y de técnica, tiene mucho mas de arte, de sentido común, de afición, de aptitud, de delectación en el oficio de imaginar la traza oportuna, a la que el cálculo solo añadirá los últimos toques con el espaldarazo de su garantía estático-resistente".

Félix Candela: concibe la forma, selecciona el material y establece unas dimensiones previas. Sobre esta base define y concreta la idea. A continuación, desarrolla el proyecto para confirmar, más que para definir y concretar, las dimensiones de los elementos estructurales. Si hay coincidencia entre lo uno y lo otro, ideas y cálculos, se tiene garantía; en otro caso no hay por qué dudar sólo de las ideas, sino que asimismo se podría cuestionar la modelización estructural o los propios procesos de cálculo de esfuerzos, dimensionado o comprobación, porque son tan susceptibles de error, o al menos de desviación tan significativa frente al comportamiento real de la estructura, como las ideas cuando menos. Esta forma de actuar es la que preconiza Eduardo Torroja.

Enrique González Valle
Exprofesor de la Escuela Técnica Superior de Ingenieros de Caminos Canales y Puertos.
Universidad Politécnica de Madrid
Expresidente de INTEMAC

SPAIN - PROFESSORS CONTRIBUTION
José M. Goicolea

Candela: ¿Arquitecto, Constructor, Ingeniero o Artista?

Candela fue un arquitecto atípico, por distintos motivos. Su obra más relevante fue realizada como constructor de cubiertas laminares en Cubiertas Ala, propiedad suya y de sus hermanos, en la cual promovía, diseñaba, calculaba y se comprometía económicamente con sus propias creaciones. Su obra y sus propuestas estuvieron guiadas por requisitos funcionales y económicos, siempre con una base sólida de mecánica estructural. En 1955 Candela afirma: «Debo aclarar en primer lugar que, aunque soy arquitecto por educación, mi actividad profesional es la de constructor o contratista de obras, y por tanto mis preocupaciones sobresalientes son, por lo general, de tipo económico.»

Su colaborador Colin Faber en su excelente libro lo titula como constructor de láminas. Según Faber, «la cuestión sobre si Candela es un arquitecto, ingeniero, matemático es más bien académica. Cuando se le pide definirse es proclive a responder “Soy un contratista, trabajando en lo que realmente me gusta, lo que es una situación muy feliz”.» La identificación de Candela con la ingeniería proviene tanto de su capacidad matemática para el cálculo como de su compromiso con la mecánica estructural como base del diseño, además de los factores estéticos. En un reciente y muy cuidado libro Garlock y Billington tras un detallado análisis de su vida y obra reivindican su calificación como artista estructural, concepto que definen como «un ingeniero con todas las cualidades de un maestro de obras y que posee adicionalmente motivación estética.»

El logro principal de Candela fue la realización de su obra arquitectónica de manera económica, funcional y al mismo tiempo bella, superando las importantes dificultades de la guerra y el exilio, con el mérito añadido de la modestia, sinceridad y honestidad

José María Goicolea Ruigómez
Dr. Ingeniero, Catedrático de la Escuela de Caminos, Canales y Puertos, Universidad Politécnica de Madrid
Presidente de la comisión asesora de la Fundación Juanelo Turriano

SPAIN - PROFESSORS CONTRIBUTION
Mª Dolores G. Pulido

Candela, una de las figuras fundamentales de la arquitectura del siglo XX, expresó su sensibilidad proyectando espacios mágicos mediante el desarrollo de nuevas formas estructurales de hormigón armado; espacios que han inspirado a numerosas generaciones de ingenieros y arquitectos.

Siempre se interesó por divulgar su obra en artículos, conferencias, clases magistrales, donde también plasmaba su vigoroso espíritu crítico y actitud rebelde.

La presente exposición digital no sólo pretende rendir un homenaje a su figura, sino, también, remarcar la pasión que subyace en toda su obra e intentar transmitirla.

M. Dolores G. Pulido
Universidad Politécnica de Madrid
Instituto CC Eduardo Torroja - CSIC

SPAIN - PROFESSORS CONTRIBUTION
Ivan Cabrera

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

ESCOLA TÈCNICA SUPERIOR D'ARQUITECTURA

Architects educated in Spain are worldwide acknowledged not only for their creative skills and humanistic culture but also for their strong technological background. Perfectly trained in building techniques, conditioning systems, and structural analysis and design, Spanish Architects perfectly know how to build the outcome of their inventiveness.

The Higher Technical School of Architecture of the Polytechnic University of Valencia is a good example of that profile. Therefore and inevitably our students feel attracted by those architects who have stood out along history because of their ability to put their technological knowledge at the service of their creativity. That is undoubtedly the case of Félix Candela, whose vast and expressive plastic repertoire is always born out of structural optimization and logic. His legacy has inspired many generations of Valencian architects who will for sure celebrate his 110th Anniversary.

Ivan Cabrera i Fausto
Director of the Higher Technical School of Architecture
Polytechnic University of Valencia

SPAIN - PROFESSORS CONTRIBUTION
Carmen Jordá Such

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

ESCOLA TÈCNICA SUPERIOR D'ARQUITECTURA

Conocí y traté a Félix Candela en los años 90, con ocasión de que nuestra Dirección General de Arquitectura autonómica le había contratado para editar un libro a partir de sus apuntes biográficos que periódicamente enviaba ó traía a Valencia, algunos de ellos ya depositados junto a sus archivos en las universidades neoyorkinas de Columbia y Princeton. Yo sería la responsable del texto introductorio y nunca he tenido un encargo profesional más gratificante. Por añadidura con el regalo de viajar a México para conocer in situ las obras.

Primeramente, tuve que estudiar la historia de las estructuras laminares desde que aparecieron hace un siglo, analizando las construcciones o proyectos más significativos, generalmente de ingenieros. Conviene destacar, de la evolución, la rápida diseminación internacional y también el trasvase cultural hacia el mundo de la arquitectura, sin duda propiciado por el despliegue de variadas soluciones de gran expresividad que las cáscaras de hormigón iban ofreciendo. El canon del movimiento moderno se estaba transformando, de la severidad ortogonal de sus primeros tiempos a la exuberancia curvilínea que había contagiado la tipología laminar. La evidencia llegó con la Exposición Universal de Bruselas donde el paraboloide hiperbólico ya era una figura recurrente, en gran parte debido a la ingente producción de Candela. Sus fórmulas para el cálculo simplificado, no solo destinado a especialistas, popularizaron el uso, con garantías técnicas, de esta geometría.

Sin embargo, a nuestro querido arquitecto le gustaba afirmar que no había inventado nada, lo cual no era cierto si además tenemos en cuenta otra aportación personal: el borde libre, un refinamiento estético pensado para percibir la esencia de las láminas, su ligereza, sin obstáculos ópticos de vigas perimetrales de refuerzo.

Le divertía que, por ello yo le calificara de triple formalista pues, más allá de su beligerante defensa de la contribución resistente de la forma, también era formalista cuando se enfrentaba a la escritura. Confesaba que antes releía a Ortega y Gasset porque le inspiraba su estilo literario. No es casual que este filósofo se sitúe dentro de la tradición de la "pura visualidad".

Los encuentros con Félix Candela me permitieron conocer una trayectoria eminente, cuyos méritos han sido y son ampliamente divulgados, de una persona muy culta que siempre amenizaba nuestras conversaciones con un gran sentido del humor, relatando experiencias insólitas como su aventura de productor cinematográfico y posterior ruina. En definitiva, una delicia. El recuerdo, ahora, activa mi afecto y gratitud.

Carmen Jordá Such
Catedrática del Área de Composición Arquitectónica. Universitat Politècnica de Valencia.

SPAIN - PROFESSORS CONTRIBUTION
Ignacio Paya Zaforteza

Candela es un ejemplo y una inspiración para ingenieros y arquitectos de todas las edades y todas las épocas. Y lo es por motivos técnicos como su talento para crear nuevas formas estructurales, eficientes, económicas, elegantes y totalmente adaptadas a su contexto histórico y social.

Pero también por motivos no estrictamente técnicos, como su carácter inquisitivo demostrado por el aprendizaje autodidacta de la construcción laminar, su generosidad al compartir el conocimiento adquirido y su valor probado por la coherencia de sus actos con sus ideas, aunque eso le llevara al exilio, y por su salida de la zona de confort al proyectar formas nuevas.

Ignacio Paya Zaforteza
Universitat Politècnica de València

SPAIN - PROFESSORS CONTRIBUTION
Carlos Lázaro

The shell of the restaurant of L'Oceanogràfic in Valencia

How to design and build a Felix Candela hyperbolic paraboloid shell in the year 2000? This is the challenge we took up when we were involved in the structural design and execution of the roof of the restaurant at L'Oceanogràfic.

Candela, in his last years of life, participated in the conception of the roofs of the Valencia aquarium, whose design was left unfinished due to his death in 1997. The proposal for the restaurant's roof was a very similar structure to the famous shell of the Los Manantiales restaurant in Xoximilco: a groined vault resulting from the intersection of four hyperbolic paraboloids that form eight lobes with a free edge, of proportions similar to those of the Mexican shell. The challenge was to design a structure that, in addition to the shape, would respect Candela's philosophy as much as possible, but at the same time would be economical and viable in today's technological context (so different from the Mexican one of the 1950s and 1960s) and, of course, would comply with current regulations. We designed a shell with 6 cm base thickness, using shotcrete with the addition of steel fibres - a technology used in other fields, but novel at the time in the realm of architectural shells - which allowed us to provide answers to the mentioned questions.

Although I did not get to know Candela, listening to the stories of his collaborators and studying and visiting some of his works, I find increasingly admirable the process he followed to conceive, project and build his structures, as well as the beauty they convey. The one in Valencia, which can be considered his posthumous work, does not bring any formal innovations, but it does show that it is possible to continue designing and building shells in an economical and viable way.

Carlos Lázaro
Universitat Politècnica de València
Vicepresidente iass / International Association for Shell and Spatial Structures

SPAIN - PROFESSORS CONTRIBUTION
José Antonio Lozano Galant

Escuela de Ingenieros de Caminos, Canales y Puertos de Ciudad Real
UNIVERSIDAD DE CASTILLA-LA MANCHA

La obra de Félix Candela representa uno de los mejores ejemplos de la adecuada integración de la función, la forma y la ejecución del concepto estructural para crear diseños económicos y transgresoramente ligeros.

Sin duda, es fundamental que las futuras generaciones conozcan la obra de este gran ingeniero para que la ingeniería estructural pueda seguir evolucionando y caminando a hombros de los grandes gigantes que nos precedieron.

José Antonio González Galán
Universidad de Castilla La Mancha – Campus de Ciudad Real
Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos

SPAIN - PROFESSORS CONTRIBUTION
Juan José Sendra

The competition has been an incentive for students to know more in depth Félix Candela's work. Whilst he is well known and highly regarded by architects in my generation, he is not so much among current architecture students and young professionals. The new possibilities of access to diverse sources of information has allowed them to have a broad understanding of what his global work represents. They have been particularly impressed by the quality of such work, which can contribute to the consideration of his figure in the present.

Juan José Sendrá
Catedrático de Construcciones Arquitectónicas
Universidad de Sevilla

SPAIN - PROFESSORS CONTRIBUTION
Ernesto Echeverría

Félix Candela Legacy

The figure of Félix Candela is a great benchmark in the teaching of contemporary architecture. Heir to the love of his teacher Eduardo Torroja for the form of the works carried out, especially studying the world of light covers based on hyperbolic paraboloids. He has a great connection with other geniuses of his time also related to structural innovation throughout the 20th century, such as Buckmister Fuller and Pier Luigi Nervi.

The figure of Félix Candela is of great importance for architecture students (and teachers) because in his works he is able to unify and make sense of the fact that form and function are closely linked and the structural solution is the same for both problems, fleeing from the lack of coherence of others (architects) for whom once a distribution is defined in a whimsical way, it is others (architects or engineers) who must ensure that this project does not fall.

Ernesto Echeverria Valiente
Universidad de Alcalá, Madrid.

SPAIN - PROFESSORS CONTRIBUTION
David García y Nacho Costales

Después de muchos años analizando estructuras de grandes luces metálicas o de madera laminada, por primera vez y coincidiendo con el 110 aniversario de Félix Candela, dos grupos de alumnos de cuarto año de arquitectura, se atreven a analizar dos estructuras con una geometría muy sencilla, pero con una complejidad de modelizado mayor que la de una estructura de barras. Conseguir que los paraboloides coincidan con exactitud con la geometría definida por Candela no fue un trabajo fácil, así como la de encontrar las secciones de intersección entre las cáscaras, mediante el uso por primera vez para ellos, de paneles de elementos finitos.

El restaurante los Manantiales y la planta embotelladora de Bacardí en Cuautitlán, fueron los dos edificios elegidos libremente por cuatro estudiantes. Posiblemente sean dos edificios muy conocidos a nivel internacional, pero son dos soluciones que 60 años después, siguen siendo un hito estructural que tardará en repetirse, pues combinan tecnología, simplicidad constructiva y austeridad.

David García Carrera y Nacho Costales Calvo
Escola Tècnica Superior d'Arquitectura del Vallès
Universidad Politécnica de Cataluña

SPAIN - PROFESSORS CONTRIBUTION
Renata Gómez

ETSAB Escola Tècnica Superior d'Arquitectura de Barcelona

La exhibición “The structural art of Thin Concrete Shells” nos ha brindado una gran oportunidad para profundizar en la obra de un visionario como Félix Candela. Valoramos muy positivamente esta iniciativa que, tanto para estudiantes o profesionales de la arquitectura, cómo para gente fuera de éste mundo, logra tender puentes hacia el conocimiento de proyectos que exploran la sensibilidad de la construcción a niveles muy superiores a los que estamos acostumbrados a ver. Personalmente, hemos disfrutado mucho el proceso de investigación, comprensión y posterior abstracción personal de la obra de este estructurista y estamos encantados de colaborar en la visibilización de este trabajo tan destacable. Muy agradecidos también por la oportunidad de exhibir nuestros trabajos en una exposición, de la cual será un honor formar parte.

Y como parte de esta experiencia nos gustaría compartir una reflexión y es que, son este tipo de iniciativas y obras de talentos como el de Félix, las que permiten demostrar que la arquitectura no es únicamente un oficio de construcción con la intención de cubrir una necesidad básica, es una disciplina políglota en su esencia, capaz de hablar el idioma de la escultura, la pintura, el tratamiento de la luz, el cálculo, la sensibilidad o la poesía y es justamente ahí donde reside su belleza. Una complejidad que hemos podido experimentar plasmada en cada una de las obras de Félix Candela, del cúal hemos podido aprender innumerables lecciones y que esperamos puedan seguir expandiéndose gracias a ésta exposición. Un orgullo ser parte de un movimiento que acerque esta disciplina a un público más amplio que merece conocer.

Renata Gomez
Universidad Politécnica de Cataluña

SPAIN - PROFESSORS CONTRIBUTION
Roger Molas i Bernabé

laSalle
Universitat Ramon Llull

Hello,
First of all, thank you for the opportunity to participate in an exhibition of such caliber and to include students from all over the world in it. As a professor of Descriptive Geometry, Félix Candela is one of our references, as it perfectly combines form-function and structure. We saw in this conjunction a great possibility of taking students beyond what is visible in their buildings and delving into the geometric base of them. An analysis exercise fully aligned with the geometric rigor of his works.

I enclose Mariia's impressions and reflections on both the elaboration process and her subsequent feedback: "I enjoyed the experience of learning about Felix Candela and his building, discovering the shape and analyzing its formation. Nevertheless, I feel disappointed by the results, because from my point of view they are not reflecting the initial contest request about the precise geometrical explanation of the shape or use of materials. Thus, I don't see any difference between two different tasks (poster and drawing) and feel the lack of professionalism of architectural representation in these works. In any case, thank you for giving me a chance to participate! "

Mariia carried out an exemplary exercise in the analysis of structural geometric shape that helped her understand its shape and its structural function beyond its appearance. His panel reflects this process beyond wanting to be a graphic-artistic exercise. To get there he had to understand the essential elements of the form and what was the order and rules that regulated it. Through this analysis she was able to incorporate them into the essential element of the building. Surely it served to get closer to the way of thinking and projecting of Félix Candela and will allow her to analyze and understand any other architectural form.

Thank you very much for the great experience.

Roger Molas
La Salle Campus Barcelona

SPAIN - PROFESSORS CONTRIBUTION
Antonio Maciá Mateu

Universitat d'Alacant
Universidad de Alicante

The students have worked from a double action. In the first they have studied works by Félix Candela individually or in groups of two students. On the one hand, they have analyzed the works, influencing three types of relationships: architectural structure-space, structure-geometry and structure-material. Finally, they have experienced the results of the analysis through the construction of structural models.

The second action has consisted of using the learning of the first for the realization of an original project by each student. These architectural projects take as a starting point the low-thickness concrete mesh structures used by Félix Candela.

The students have learned and experienced how to project in Architecture taking the shell structures as a starting point.

Antonio Maciá Mateu. PhD. Architect
Full Professor E.U. Dept. I.C. Architecture
5th course GF Architecture: The structure in the architectural project
Deputy director of the HPS. Coordinator of the Architecture Degree.
Higher Polytechnic School. University of Alicante.

SPAIN - PROFESSORS CONTRIBUTION
José Parra

Universitat d'Alacant
Universidad de Alicante

En primer lugar, quiero destacar que la iniciativa de participar en este concurso ha partido del propio alumnado, que se ha mostrado especialmente interesado en la figura de Félix Candela. Como profesor de historia y teoría de la arquitectura moderna, asignatura impartida en un único cuatrimestre, siempre tengo la sensación de que el tiempo alcanza para muy poco en el estudio de personalidades tan fascinantes como la suya, a la vez, arquitecto, constructor, comunicador y excelente escritor. Por ello es reseñable que el alumnado haya tomado parte activa en esta experiencia motivado por su propia necesidad de profundizar en el legado de Candela, esto es, en su inteligente, fructífera y desprejuiciada fusión entre arquitectura e ingeniería, espacio y estructura, forma y técnica, imaginación y oficio, contexto social y cultura material.

En segundo lugar, más allá de sus pioneras aportaciones al desarrollo de las tipologías laminares y, en concreto, a la figura del paraboloide hiperbólico, a la que el conjunto de su obra contribuyó decisivamente simplificando sus métodos de cálculo, evidenciando sus ventajas constructivas y resistentes y, sobre todo, explorando sus posibilidades espaciales y expresivas, como ha estudiado la profesora Carmen Jordá, Félix Candela es un autor que, aún hoy, ejerce un enorme magnetismo sobre nuestras y nuestros estudiantes de arquitectura, que siguen reconociendo en él a un profesional ejemplar, capaz de reinventarse tras el trauma de la guerra y el exilio, de abrir todo un universo creativo y de oportunidades empresariales partiendo desde cero, en un país nuevo, armado solo con sus conocimientos y una inquebrantable determinación y confianza en sí mismo.

José Parra
Universidad de Alicante

RUSSIA - PROFESSORS CONTRIBUTION
Oleg Fedorov

Oleg Fedorov, Associate Professor of the SPbGASU Faculty of Architecture, who has been coordinating our students' participation in the competition, has underlined the significance of the undertaking and commented on our students' distinguished performance: "Every culture keeps the memory of its national heroes, geniuses who have played a major role in forging national cultures. But in addition to preserving the memory and those historic achievements, it is equally important for the modern-day society to disseminate this experience, knowledge, and cultural traditions on a global scale. If we talk about architects of the middle and second half of the 20th century and their work, this appears to be even more relevant, as the idea itself, the philosophy of the modernist and functionalist architecture of that time was international – the "international style" was predominant.

Félix Candela undoubtedly belongs to those great masters who succeeded in creating a new architectural language. His outstanding personality, his professionalism and vision made it possible to bring to life the idea of the "internationality" of modernist architecture in the literal sense: he worked on his projects in Spain, Mexico, and the USA, and he can be considered both a Spanish and Mexican architect. And it may seem paradoxical in this context to talk about the national culture, but, of course, he became one of such heroes for the both countries, leaving behind a remarkable architectural heritage. Certainly, his method, his approach and projects are recognized today as a global asset. I am glad that students of our university have had a chance to get acquainted with the legacy of this prominent architect and it is a special pleasure to see they could demonstrate a high level of skills fairly appraised by the competition jury and helped to present SPbGASU as one of the leading educational institutions in the field of architecture and civil engineering. I think, the experience of holding this competition should not only encourage participants and organizers for further achievements, but also urge us, teachers and architects, to arrange more similar events in memory or support of those outstanding national masters whose buildings and ideas have become an integral part of our culture, and their views and achievements are worthy of popularization and global acclaim."

Oleg Fedorov
Associate Professor/ Saint Petersburg State University of Architecture and Civil Engineering

RUSSIA - HEADS CONTRIBUTION
Svetlana Petrova

The International Ideas Competition devoted to the 110th Anniversary of Felix Candela is a unique opportunity not only to tribute Felix Candela's architectural legacy and enhance students' creative and professional skills, but also to feel team spirit and facilitate closer international cooperation. The Competition reminds us of importance to strengthen our collaboration for harmonic development of the world architecture and conservation of architectural heritage.

Our university thanks organizers and sponsors of the Competition for such great event uniting students, architects, professors from 10 countries.

Svetlana Petrova
Head of International Relations Office. Saint Petersburg State University of Architecture and Civil Engineering

Maria Makarova

Specialist International Relations Office

Fedor Perov

Dean, D.Sc. in Architecture

MÉXICO - PROFESSORS CONTRIBUTION
Juan José Oliva Salinas

Félix Candela is acknowledged as a master builder who designed and built innovative thin reinforced concrete shells. Since the beginning of the 20th century, double inverse curvature was cleverly used by many builders to provide stability and rigidity to reinforced concrete shells. Candela skillfully took advantage of the geometric properties of the hyperbolic paraboloid (HP), which was reflected in the elegant and diverse shells on which he imprinted a great seal of modernity and structural efficiency. The HP previously used by Antonio Gaudí and later by Eduardo Torroja and other builders, became a wide range of possibilities that Candela knew how to take advantage of and materialize. Although Candela was not the discoverer of the HP, he was the one who masterfully knew how to apply, combine, section and add different HP surfaces to generate the almost 900 projects that were built in Mexico and in other countries around the world. Candela's shells with only 4 cm thick on average warrant recognition as exemplars of sustainability. David Billington and María Garlock describe Candela as a structural engineer whose elegant forms should be considered works of art, just as Ove Arup and Frei Otto consider him too.

Candela's legacy was imprinted in Mexico City with his many covers for religious temples, markets, factories, workshops, warehouses, schools, and metro stations, among others. Candela left a school of his knowledge for more than 17 years, in which he was a professor at the National School of Architecture of the Universidad Nacional Autónoma de México. In 1971, when he left Mexico to settle in the United States, Candela continued his teaching activities at various North American universities until his retirement in 1978 at the University of Illinois. Candela was an architect with a solid training in structural calculation obtained during his studies from 1929 to 1935 at the School of Architecture of Madrid. In 1949, ten years after his arrival in Mexico, Candela founded his own architect's office "Cubiertas Ala". Many factors were combined in Mexico with his great ability and interest in creating and innovating, allowing him the beginning of an outstanding professional career as a designer and builder of reinforced concrete shells.

Candela's shells became a source of inspiration for many other builders worldwide such as Ulrich Müther in East Germany or Heinz Isler in Switzerland. The shells designed and built for Los Manantiales restaurant in Xochimilco became an icon of architecture that was several times repeated all over the world. During his later years, Candela was commissioned to build two similar shells in the Oceanographic Park of the City of Sciences and the Arts in Valencia, Spain. However, Félix Candela died on December 7, 1997; without being able to see the construction of these shells finished.

Félix Candela received many important recognitions for his outstanding professional achievements. In 1961 he received the Auguste Perret Prize, during the 1961 UIA Congress in London. The International Association for Shell Structures – IASS, was founded by Eduardo Torroja in 1959 in Madrid. In 1967, the IASS awarded to Candela a diploma accrediting him as honorary member of the association. In the 1960s, the IASS conferred such recognitions only to Félix Candela and Pier Luigi Nervi. In 1981 Candela received in Granada, the Gold Medal from the Higher Council of Architects of Spain. Finally, Félix Candela was named Doctor Honoris Causa in 1978 by the University of Illinois, in 1990 by the Universidad de Sevilla and in 1994 by the Universidad Politécnica de Madrid.

It is especially important that the new generations of architects and engineers know the legacy and the outstanding contributions that Félix Candela bequeathed to Mexico and to the whole world. The International Ideas Competition, and the Exhibition "110th Anniversary of Félix Candela: The Structural Art of Thin Concrete Shells" strongly contribute to achieve these goals. Both events were organized by the Eduardo Torroja Foundation to commemorate the 110th Anniversary of the birth of Félix Candela. Several international associations, government and academic bodies in Spain and other universities around the world also collaborated to pay a well-deserved tribute to the memory and legacy of Félix Candela.

Juan Gerardo Oliva Salinas
UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO. Mexico City, June 6, 2020

MÉXICO - PROFESSORS CONTRIBUTION
Edwin González

UDLAP
UNIVERSIDAD DE LAS AMÉRICAS PUEBLA

"In architecture, the design of geometry and structure are an essential part of an architectural project. Felix Candela in the middle of the 20th century became a master of the use of geometry to stabilize a structure with the least possible weight, being the concrete shell his favorite. The lightness of his structures solves complex proposals that become precursors of contemporary styles of the 21st century.

Felix Candela's imagination had no limits designing a form, with a double curved or ruled geometry, the hypar was the chosen one. He designed an unlimited number of shapes depending on the methodology he used to generate the geometry by sectioning it with planes. Candela showed us that in our present any structure with a complex composition can be built, where the only limitation is the thought of the contemporary architect."

Edwin González
Profesor de ARQUITECTURA de la Universidad de las Américas Puebla

MÉXICO - PROFESSORS CONTRIBUTION
Fabricio Lázaro Villaverde

La experiencia de participar en un concurso internacional de cartel y dibujo sobre el arquitecto español Félix Candela, para nuestros cuatro estudiantes fue un desafío que implicó la conformación de dos equipos que participarían en las dos modalidades del concurso. Iniciar un proceso de trabajo calendarizado para controlar el tiempo y los avances esperados, así como dedicarse a investigar y debatir sobre las obras a elegirse para trabajar cartel y dibujo.

En este proceso se detectaron las fortalezas pero también las áreas de oportunidad para desarrollar mejores propuestas. A Félix Candela se le conocía poco, sin embargo, la búsqueda de información dio como resultado un mayor conocimiento de la obra del arquitecto, de la cual, se originó, un proceso creativo colectivo basado en la retroalimentación para detonar reuniones intensamente colaborativas para este concurso. L

Los alumnos ganaron confianza en sus ideas y como desarrollarlas mejor para obtener premios en próximos concursos, porque es precisamente a través de los concursos, conocemos mejor como pensar, conceptualizar, intervenir y transformar la realidad desde la oportunidad que continuamente nos ofrece el diseño en sus distintas modalidades.

Fabricio Lázaro Villaverde
Edith Cota Castillejos
Juan Manuel Gastéllum Alvarado
Universidad Autónoma Benito Juárez de Oaxaca

ARGENTINA - PROFESSORS CONTRIBUTION

María Victoria Silvestre and Carmela Filí Tujchneider

UCSF
Universidad Católica
de Santa Fe

Innovative Intelligence

Félix Candela's work has been the outmost expression of his innovative and artistic intelligence. In his diverse architectural productions, there is a convergence of his personal searches with material and theoretical inquiries. His work also expresses a rigorous geometric analysis in connection with tectonics.

Remembering his birth by organizing this tribute has been an opportunity to revisit not only his legacy but his particular way of projecting and building. In the contemporary context marked by the culture of the ephemeral and visual fragment that flows through touch screens master Candela teaches us something different. For example, that architectural culture is a process of innovative intelligence through evolution. In his Works, the constructive rigor is as sharp as the geometric one. His way of projecting structures that expresses a singular and unique poetics of architectural space worthy of being timelessly recognized, contributes to rethinking our work as architects and teachers.

The contest has been a great opportunity for our students to connect with creativity as a playful and immersive experience through a process of search and reflection, analysis, and projection. All these possible by revisiting the life and work of Félix Candela. At this particular moment, applying creativity and insight on the innovative intelligence of the Master illuminates the students broadens their horizons. It allows them to enrich their resources for thinking and making architecture, recognizing through Felix Candela's poetic expressions their own capacity to innovate as a distinctive feature of human intelligence.

In days when humanity faces the opening of new horizons and challenges globally, this contest has engaged all participants in the joint of a different kind imprinting the spirit of innovation through master Candela´s work towards rethinking the disciplinary scape and the dawn of its new global perspectives.
We are very grateful for the opportunity to visit Candela's legacy together with our students and also very comforted with the first prize of the Announcer Poster mention. This recognition fills us with honor, pride, and hope for the future.

ARGENTINA - PROFESSORS CONTRIBUTION
Claudio Solari

Apreciaciones

Concurso Internacional de Ideas “110 Aniversario Félix Candela”

La convocatoria abierta a estudiantes, a participar del concurso internacional de ideas en homenaje a Félix Candela, anima diversos y lúcidos trayectos de indagación acerca del legado representado por las estructuras laminares diseñadas por el arquitecto español.

Despierta el interés, alrededor del mundo y en una generación de jóvenes inquietos, por el estudio de superficies regladas de doble curvatura, de escultural belleza, que han marcado hitos en las historias de la arquitectura, de la ingeniería y de la construcción.

Inspira asimismo la elaboración de dibujos, croquis y diagramas, donde se sintetizan y exhiben, maravillosamente, la agudeza geométrica, la perspicacia constructiva y la sensibilidad estructural de sus paraboloides hiperbólicos.

Bienvenida la oportunidad abierta entonces, por este catálogo, para dar a conocer tales reinterpretaciones, ciertamente desprejuiciadas y renovadas, acerca de la obra del maestro Candela.

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Facultad de Arquitectura Planeamiento y Diseño. Universidad Nacional de Rosario. Argentina

ITALY - PROFESSORS CONTRIBUTION
Patrizia Trovalusci

FELIX CANDELA 1910 - 1997

Although we are convinced that a well-designed and sized structure is not enough guarantee of achieving good architecture, we can affirm that Felix Candela in his work always shown the opposite. His ability to use structural language in an architectural vision has been the backbone of his work over 50 years, which helps in creating structural types becoming architectural archetypes over time. From hyperbolic paraboloids, passing through thin shell vaults, up to structural umbrellas, it is evident that its wealth of structural knowledge, not only technical but also more properly scientific, has integrated with contemporary architectural culture, outlining an awareness capable of significantly conditioning the design process.

Like other great engineers of his time, he was able to take advantage of the experience acquired in the practice of the construction site to 'build dreams', to realize large thin roofs with a shape designed to resist. Reinforced concrete has become for him the main material, which he studied throughout the course of his professional life always with the aim of simplification, looking for solutions that make it easy to realize the large structures he designed.

He was a bold man, as evidenced by his vicissitudes during the Spanish Civil War of the 1930s, and this audacity reverberated in his buildings. The extremely thin roofs of the Pabellón de Rayos Cósmicos, the structural umbrella supported by a single pillar of service stations, the sloping pillars of the Iglesia de la Medalla de la Milagrosa, are all constructions that fixed forever this adventurous yearning in concrete, challenging, but that never end in itself and, above all, never finalised to merely representative purposes. Differently, it aimed to solve construction problems always by looking for the most direct and simple way.

Together with Pier Luigi Nervi, Eduardo Torroja, Sergio Musmeci, and other great engineers who created structural architectures, and not just engineering innovative and well-designed structures, Felix Candela is a figure who significantly influenced the architectural landscape of the twentieth century and it is always of current interest to study his thought and work in the Schools of Architecture.

Patrizia Trovalusci
Full Professor of Solids and Structural Mechanics, PhD
Department of Structural and Geotechnical Engineering - Sapienza - University of Rome

ITALY - PROFESSORS CONTRIBUTION
Ilaria Giannetti

TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

The students of the Master degree in Architecture and Building Engineering of 'Tor Vergata' University of Rome involved in this ideas competition met Felix Candela's work on the reinforced concrete shell- design within the history of structural engineering- and architecture- studies.

This challenging contest was a fresh opportunity to widen their knowledge of Candela's works and design approach. Indeed, through the proposed re-drawings studies both the pure geometrical conception and the spatial effects of efficient- and attractive- shell structures were deepened.

Looking forward, through the study of Candela's research on hyperbolic paraboloid shells, the students experienced a design discipline that relates, in a fascinating unique structural form, architectural expressiveness, and handy building technologies, saving materials and costs.

Isn't this one of the most inspiring design legacy for their future work as engineers and architects?

ITALY - PROFESSORS CONTRIBUTION
Sandro Parrinello and Massimiliano Savora

Félix Candela, "el mayor ingeniero estructural del siglo"

Con Pier Luigi Nervi y Eduardo Torroja, la historiografía consideró Félix Candela como él que, a partir de la década de 1950, revolucionó el modo de entender la forma con cubiertas laminares y membranas de hormigón armado. Bruno Zevi lo insertó en la corriente neoexpresionista, que incluía Hans Scharoun, Eero Saarinen y Oscar Niemeyer, y definió sus paraguas como estructuras "heréticas". Además, Candela – "el mayor ingeniero estructural del siglo", según Giovanni Klaus Koenig – fue también quien cambió el concepto de cubiertas en la arquitectura, en un período extraordinario, casi milagroso, en él que nunca antes se intentaron realizar elaboraciones tan espectaculares. El diseño y la geometría permitieron configuraciones plásticas audaces en hormigón armado. Por esta razón, Candela sigue siendo una figura de referencia hoy en día, no solo para jóvenes estudiantes e investigadores, para comprender el papel de la forma en relación con el concepto de estructura.

El rediseño de sus obras es una importante lección actual para la formación de arquitectos e ingenieros. Gracias a su trabajo, es posible enfrentar, aún años más tarde, la cuestión de la forma, de sus vínculos con la estructura, de ir más allá del cálculo, hasta invertir directamente el concepto de espacio. En un momento en que estamos acostumbrados a observar cuidadosamente la dislocación del trabajo del proyecto entre diferentes habilidades, volver a mirar y leer las obras y los escritos de Candela es un ejercicio saludable. En el trabajo de Candela, como escribió Ove Arup, es posible comprender el modo en que "el dominio completo" de una sola mente en todos los aspectos del proyecto logra producir una perfección equilibrada.

Sandro Parrinello, Massimiliano Savorra
Department of Civil Engineering and Architecture, University of Pavia.

COLOMBIA - PROFESSORS CONTRIBUTION
Jorge Galindo Díaz

Study today the work of the architect Félix Candela in the schools of architecture is a resource that contributes not only to the teaching of structures and the construction, but also a means to know and transmit to the new generations a life story, a critical thinking and a position of honesty in front of the profession and the trade.

On the other hand, although thin shells structures declined for clearly established reasons at the end of the decade ended in 1970, it is no less true that several of the considerations that allowed their rise thirty years earlier have regained validity: the renewed interest in the structural simplicity, the search to reduce the bending stresses in the support elements, the exploration of the plastic possibilities of concrete and the elimination of noise in interior spaces are some of them.

Additionally, thin shells structures, due to their low weight and mass, require smaller amounts of material than many traditional structures, their numerical analysis and their simulation possibilities have been facilitated thanks to the use of computer programs and, even, the problems that their graphic representation demanded are currently the easiest solution from the use of digital tools and 3-D printing. The future, then, is to be written without forgetting the dictates of the past.

Jorge Galindo Díaz
Universidad Nacional de Colombia

VENEZUELA - PROFESSORS CONTRIBUTION
Carlos Marval

Gracias por darnos la oportunidad para participar en este prestigioso concurso, que a través de él pudimos vivir diferentes experiencias que fueron fructíferas en nuestro ámbito laboral y personal.

Conocer más a fondo acerca del arquitecto Félix Candela, sus obras y su manera de pensamiento para plasmar ideas nos llevó a tener otra visión sobre nuestros proyectos personales, tomando como ejemplo su impulso por dar la cara ante las adversidades del entorno y utilizar sus conocimientos y habilidades para salir de las mismas.

Para nosotros fue una experiencia tanto gratificante como agitada ya que nos complacía investigar sobre este famoso arquitecto y al mismo tiempo la lluvia de ideas que teníamos eran infinitas y elegir solo una y poder plasmarlo de la mejor manera fue un reto. Sin duda alguna fue una experiencia inolvidable.

Carlos Marval
Universidad Rafael Urdaneta

BELGIUM - PROFESSORS CONTRIBUTION
Beatrice Lampariello

Beyond the framework

Since the end of the 19th century, reinforced concrete has revealed its revolutionary potential for the design and construction of structures and spaces beyond the traditional ones. Yet, in university teaching of architecture, the discovery and study of that potential are often focused only a few limited aspects such as the evolution of the Hennebique type structural form, starting with Le Corbusier's famous drawing on *Domino System* and its *Five Points of a New Architecture*.

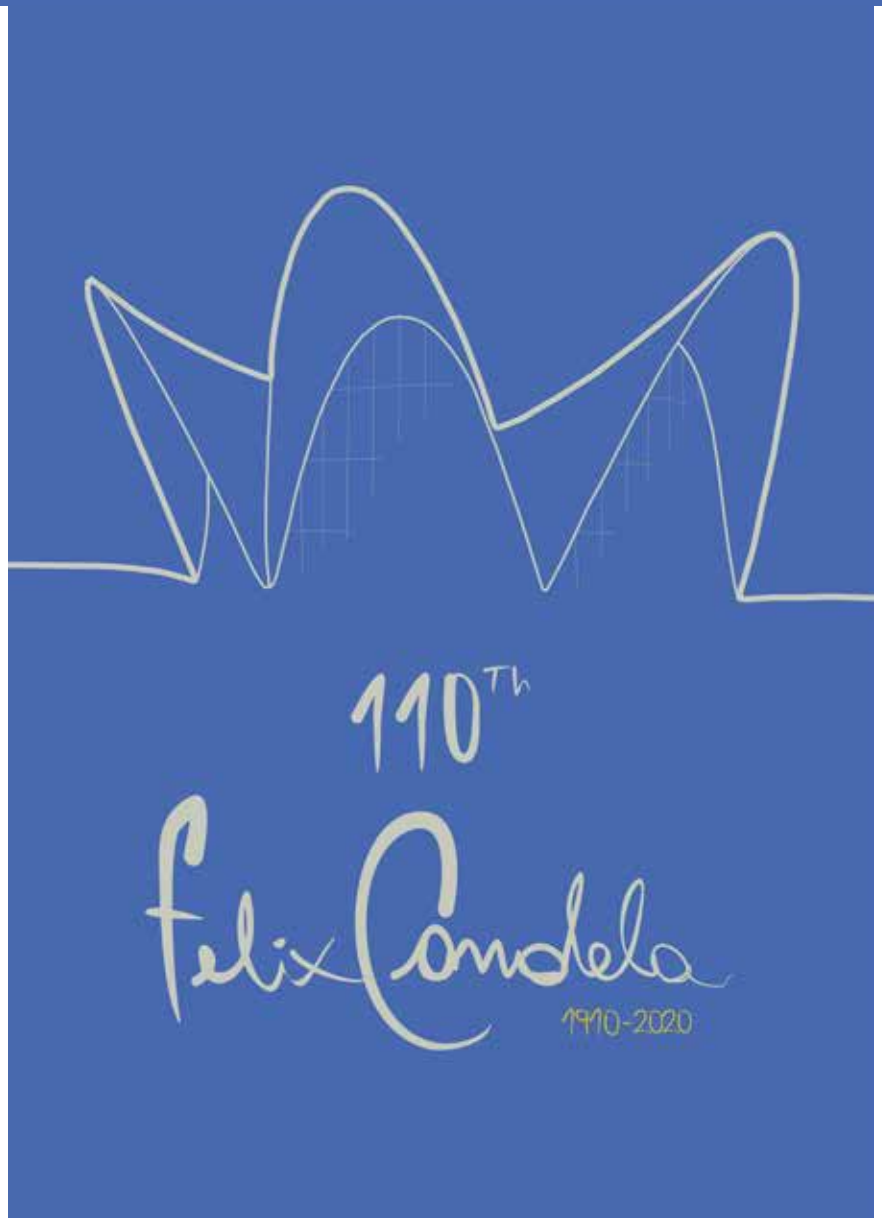
The encounter with the work of Felix Candela meant for the architecture students the discovery of another kind of potential of reinforced concrete, entrusted to one of its preeminent characteristics: its plasticity which distinguishes it from any other building material, such as stone and wood, and which allows it to take on any form starting from the configuration of the formwork. The study of its plasticity revealed them the possibility of conceiving particular forms of roof that, developed at the end of the 19th century as economic and rapid adaptations of the traditional vaults, then became during the first half of the 20th century complex structures capable of delimiting spaces with configurations that were always diversified and far from those of tradition from which they also derived: the shells.

The static calculation, the development of scaffolding, centring and formwork, the manufacture of the concrete mix and therefore the construction phase showed the students the complex stages of definition and construction of Candela's shells, all carefully controlled by him, an architect, engineer and builder of virtuoso structural figures that since the 1950s have also been recognized as works with a sculptural force. Some of those stages, among which do not appear the calculation that Candela has always tried to overcome because "what we need is a structure, not an analysis" , were selected by the students, cut and reassembled in a collage of different pieces recombined in a unit. The aim is to reveal the strength of a structure that did not want to be just an "extraordinary achievement" to go beyond the limits imposed by techniques, but a "simple and flexible" work at the service of man, the one who appears at the center of the collage, its creator, its manufacturer and also its user.

Beatrice Lampariello
Université Catholique de Louvain

1. Felix Candela, Hacia una nueva filosofía de las estructuras, in "Revista Ingenieria", XXV, 2, July-August 1952.

2. Felix Candela, Arquitectura y estructuralismo, in "Arquitectos de México", 6, 21, 1964.



FIRST PRIZE

Lema:
GARABATO

Registration Number:
067

Authors:
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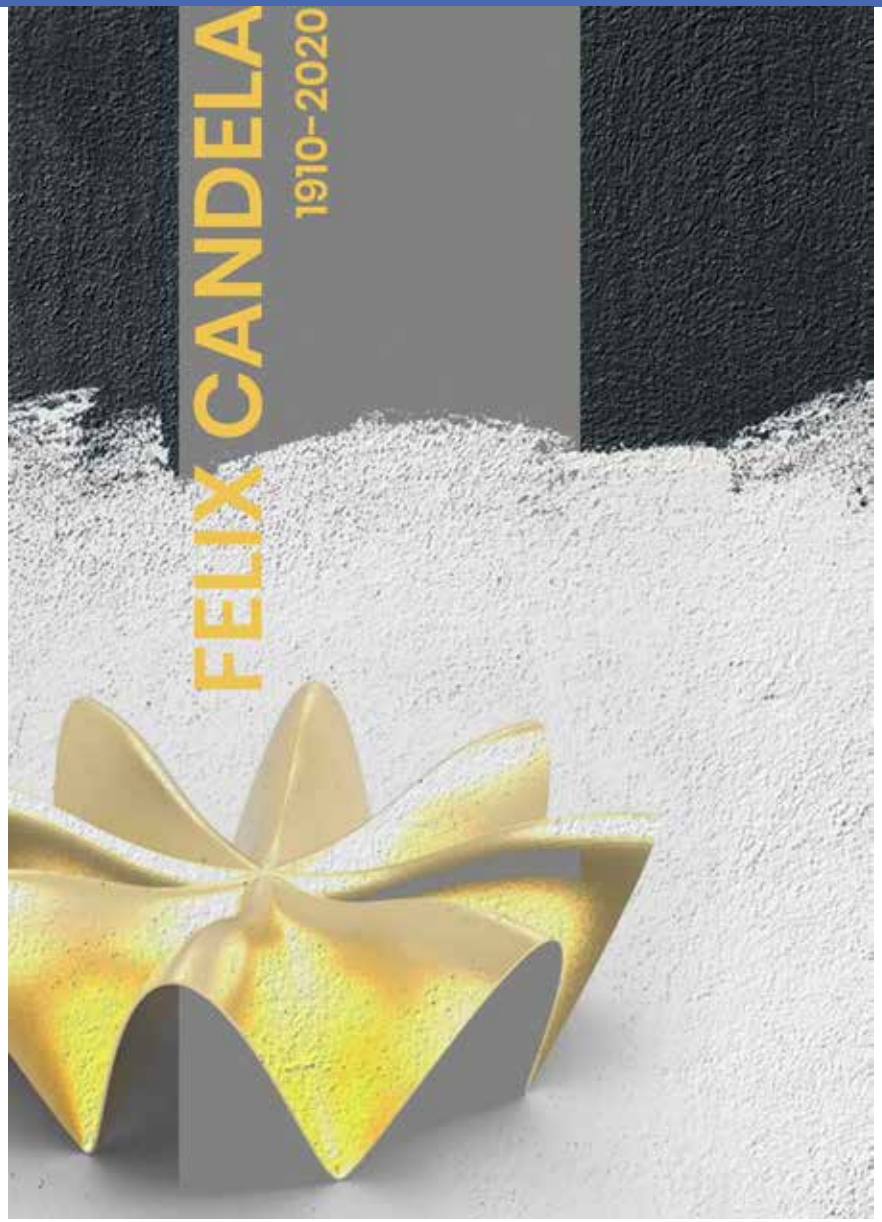

SECOND PRIZE

Lema:
LETSDOIT

Registration Number:
197

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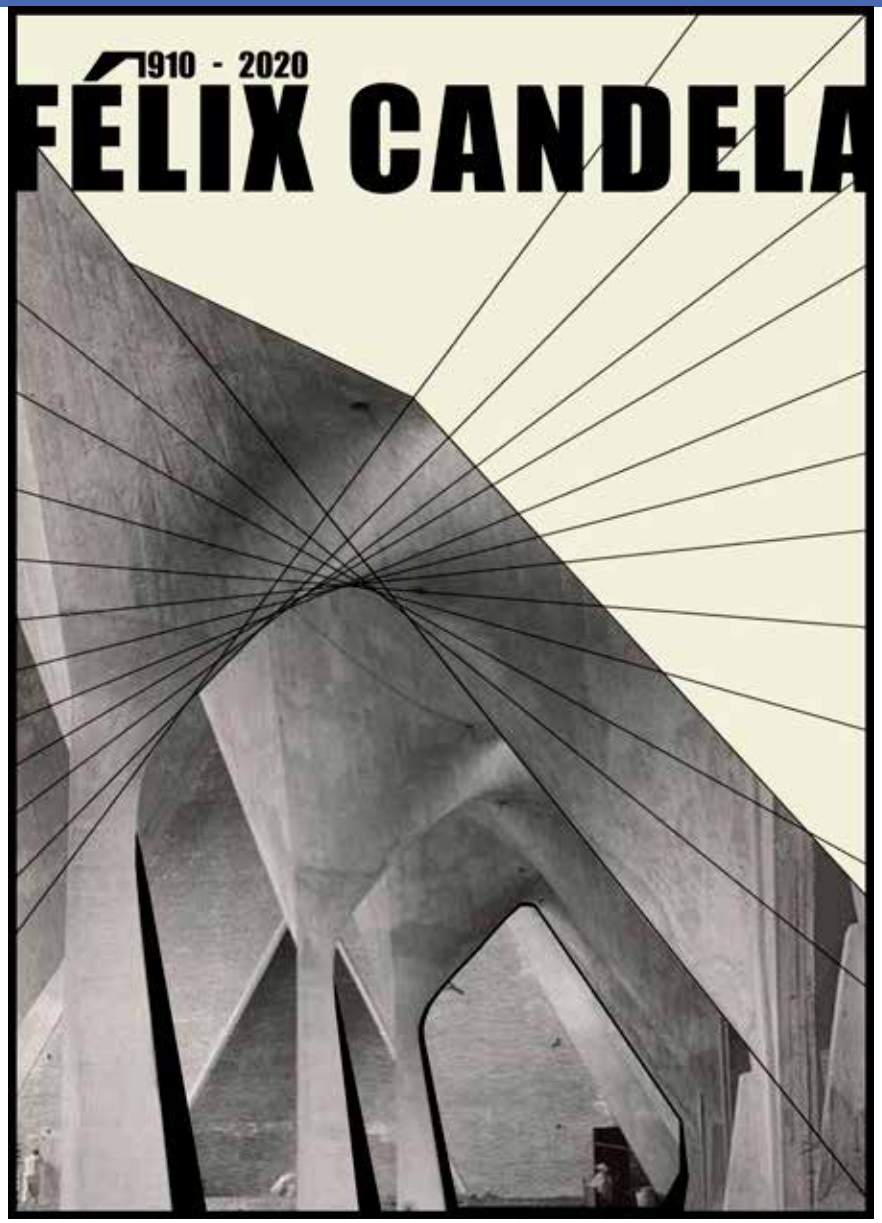
POSTERS - AWARDS



THIRD PRIZE

Lema:
OVENBIRD

Registration Number:
046

Authors:
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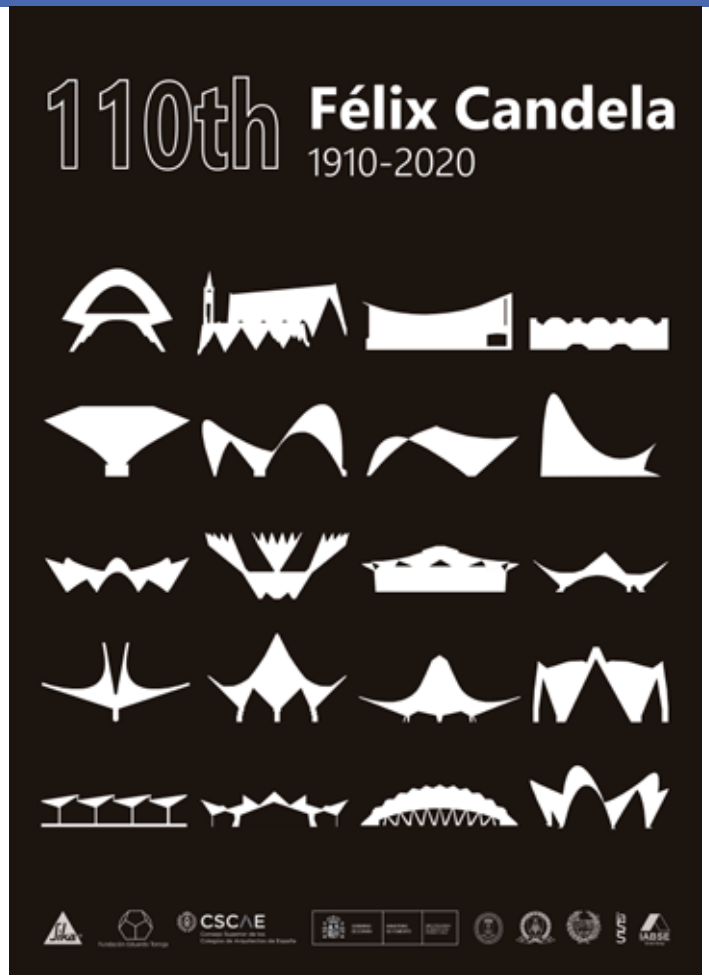
POSTERS - MENTIONS



Lema: EVOLUTIONARY PATTERNS

Registration Number: 30

Author: Patricia Guillén Camisón

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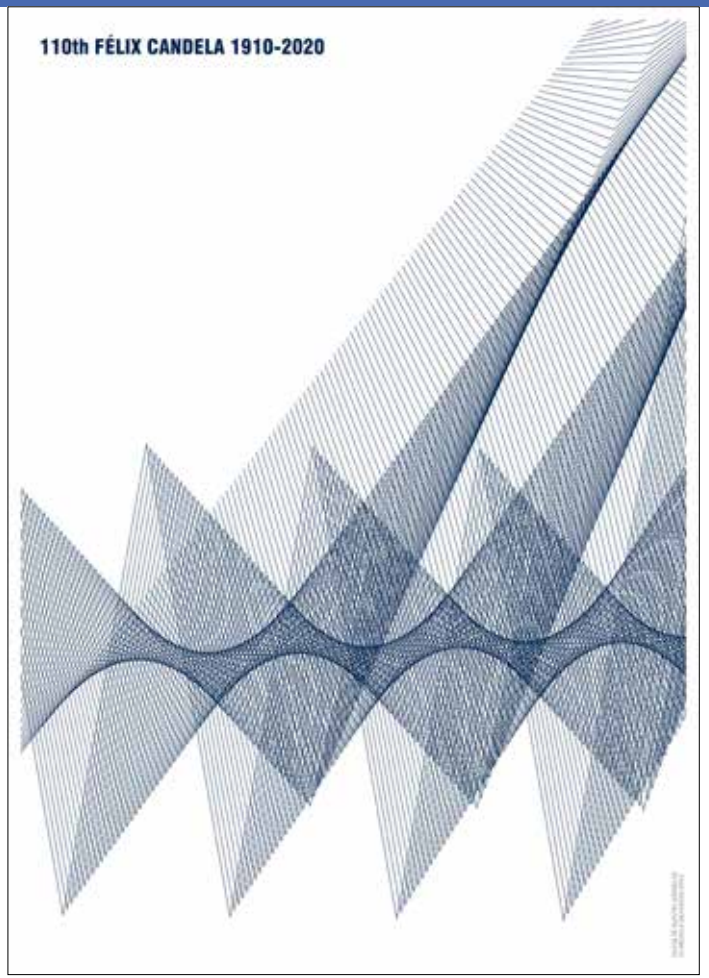
Universidad de Sevilla- SPAIN



Lema: RECTILINEO Y SINUOSO

Registration Number: 55

Author: José Manuel Parrilla López-Brea

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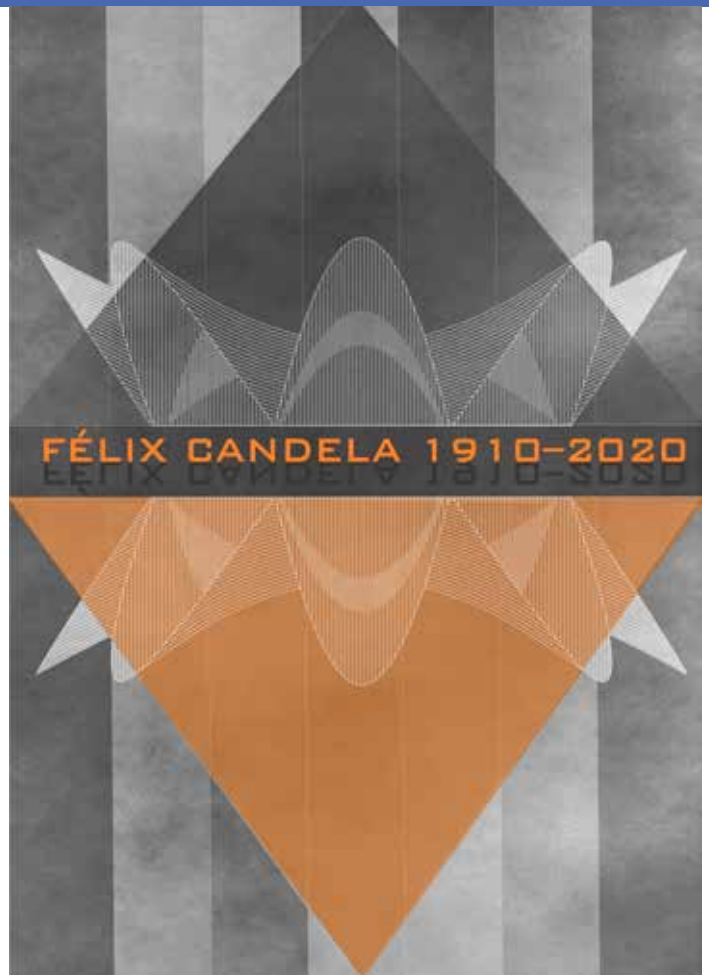
POSTERS - MENTIONS



Lema: WEAVE

Registration Number: 119

Author: Anna Nosova

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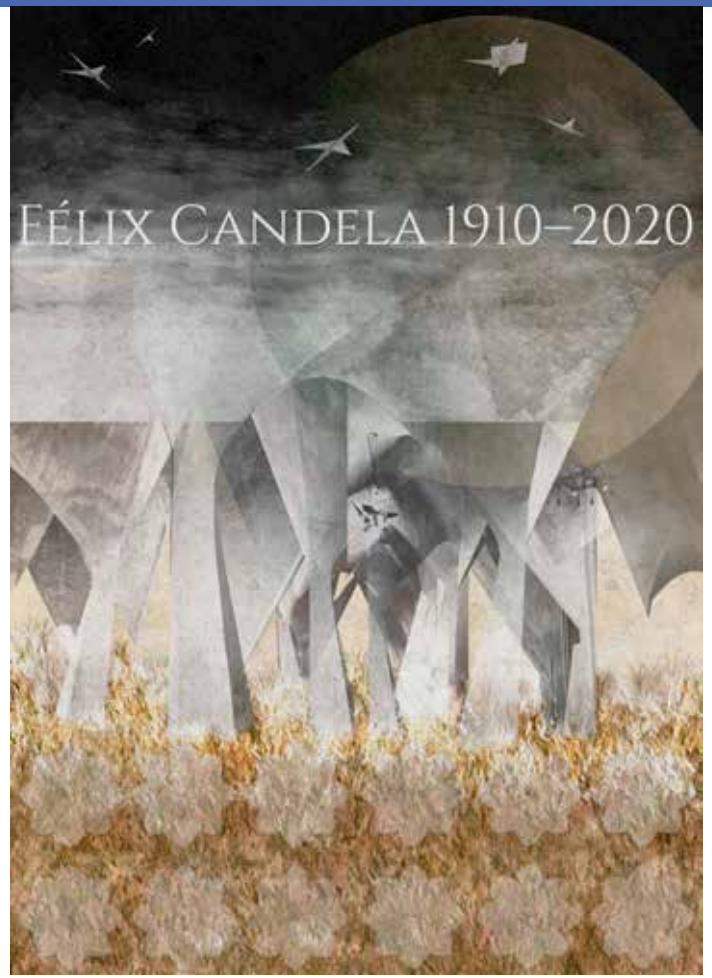

Lema: INFINITY

Registration Number: 111

Author: Ilona Liberman

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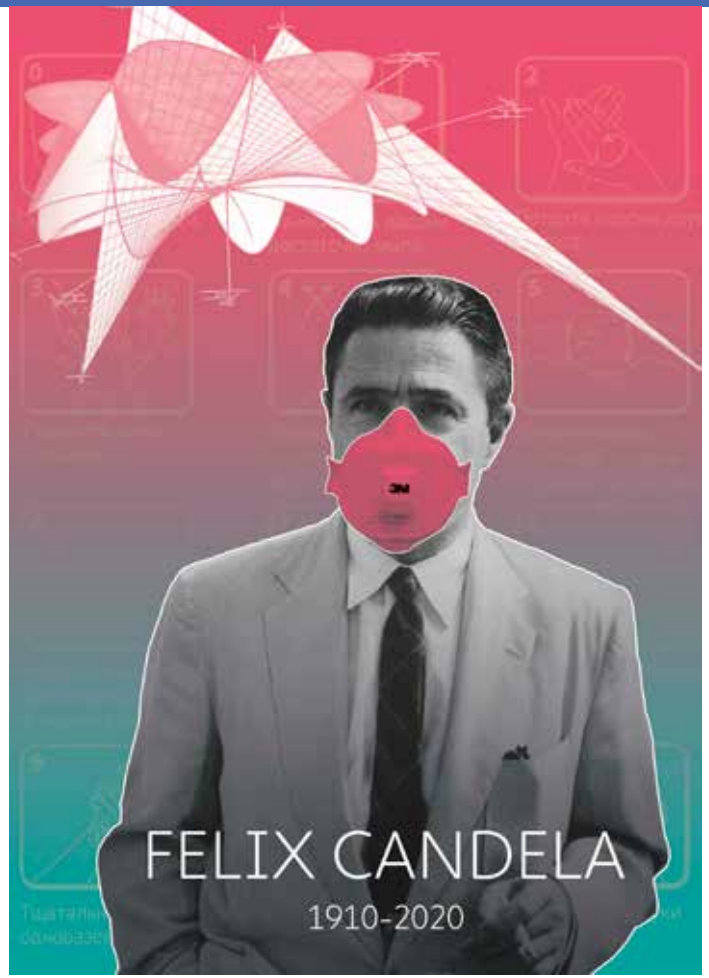
POSTERS - MENTIONS



Lema: FELIXMEGAWOW

Registration Number: 121

Author: Merkulova Ksenia Denisovna

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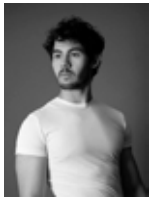
Lema: TRAMA

Registration Number: 65



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POSTERS - MENTIONS

Lema: REPISA BLANCA

Registration Number: 154

Author: Sebastián Alejandro De la Rosa Solis

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Lema: FEELINGGOOD

Registration Number: 88

Authors: Candela Corona,
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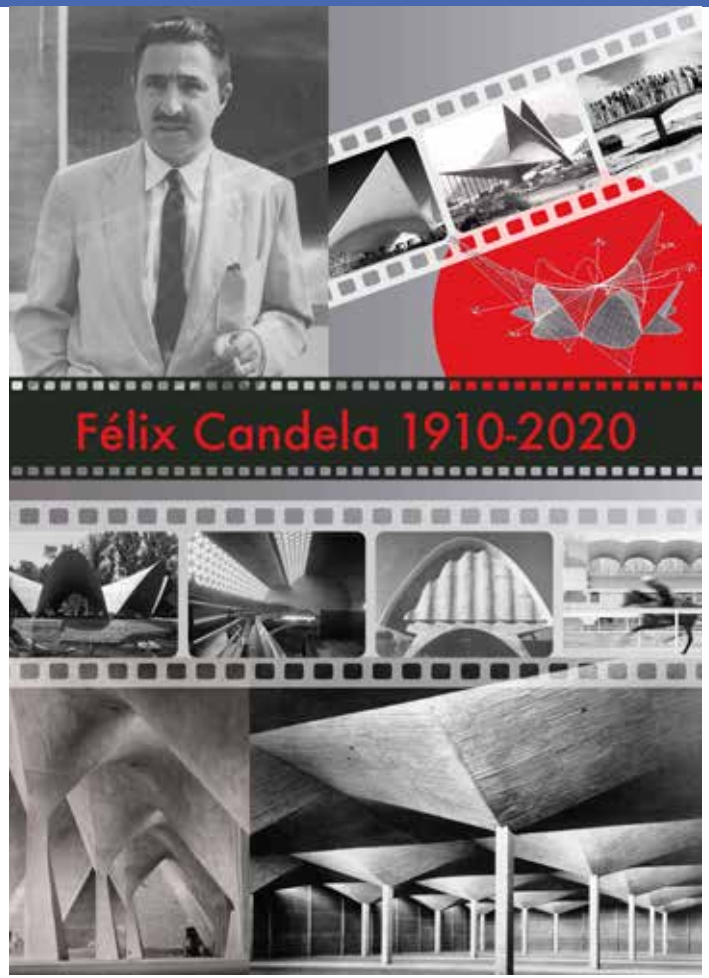
University: Universidad Nacional de Rosario
Facultad de Arquitectura, Planeamiento y Diseño ARGENTINA

POSTERS - MENTIONS



Lema: SHADOW

Registration Number: 83

Author: Gabriele Miglietta

University: Università degli Studi di Roma Tor Vergata- ITALY

Lema: ILLIRIA

Registration Number: 99

Authors: Gabriele Mattei,
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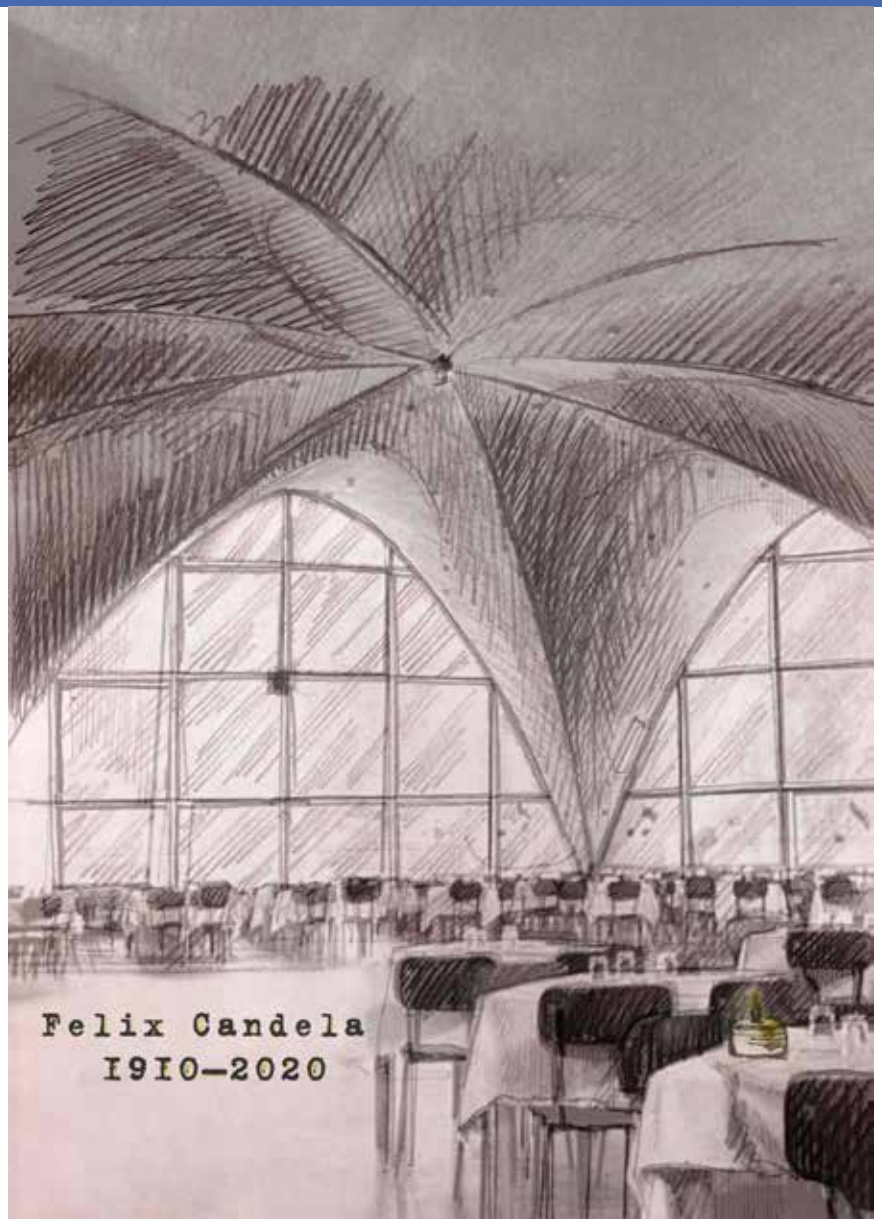
University: Università degli Studi di Roma Tor Vergata- ITALY

DRAWINGS - AWARDS



FIRST PRIZE

Lema:
INSIDE MEMORY

Registration Number:
126

Author:
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University:
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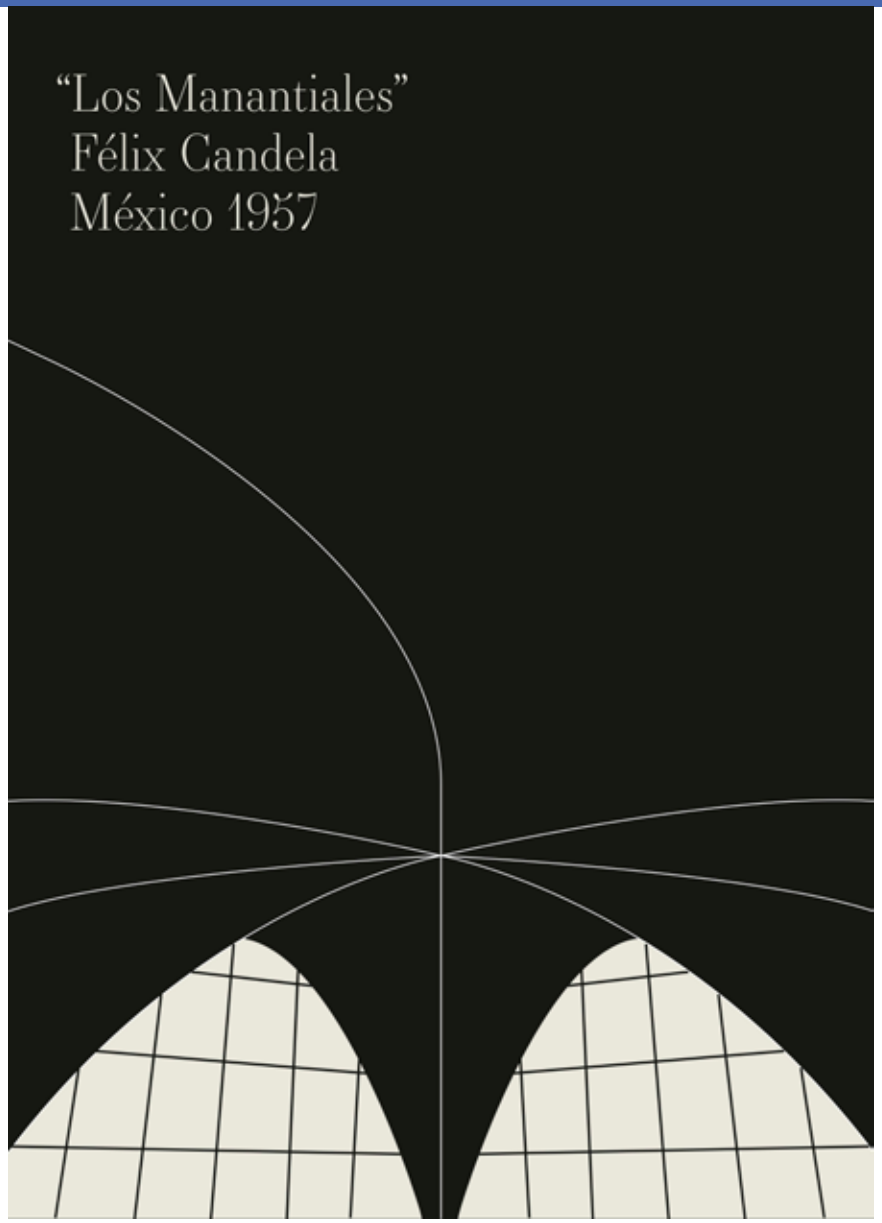
DRAWINGS - AWARDS



SECOND PRIZE

Lema:
PECES GATO

Registration Number:
040

Authors:
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University:
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THIRD PRIZE

Lema:
REINTERPRETACIÓN VISUAL

Registration Number:
012

Authors:
Isabel Gómez Álvarez y Ana Sofía Lichtle Prieto

University:
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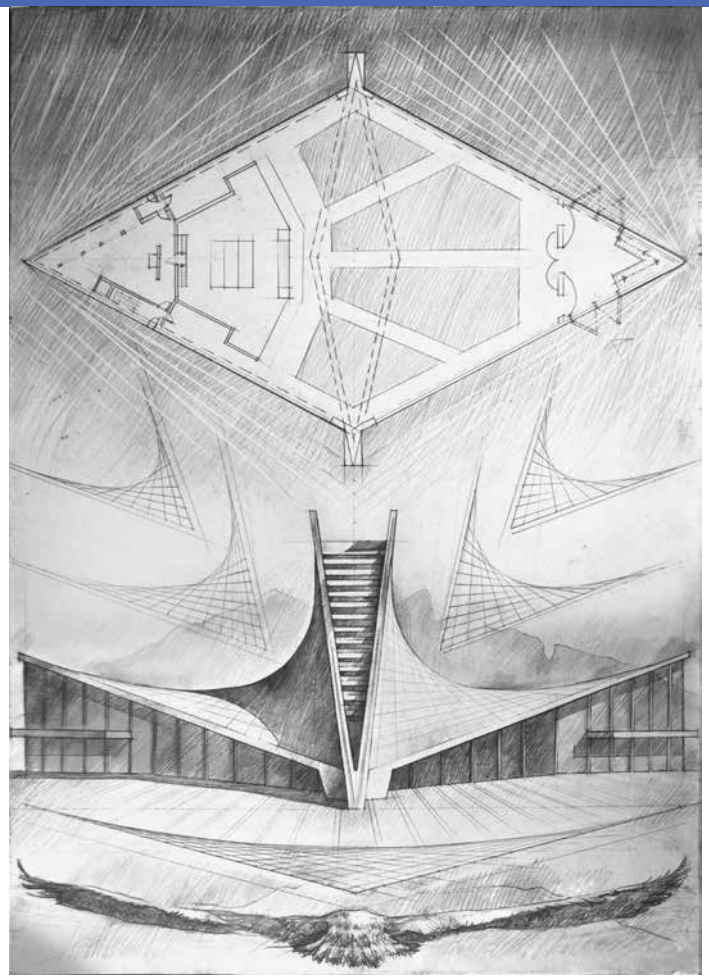
DRAWINGS - MENTIONS



Lema: HORMIGÓN FLOTANTE

Registration Numbers: 143

Author: Anastasiia Atamuratova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU- RUSSIA

Lema: WARPED

Registration Number: 177

Author: Diana Aleksandrovna Akhmedova

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DRAWINGS - MENTIONS

Lema: ORIGIN

Registration Number: 234

Author: Anastasiia Pomozova

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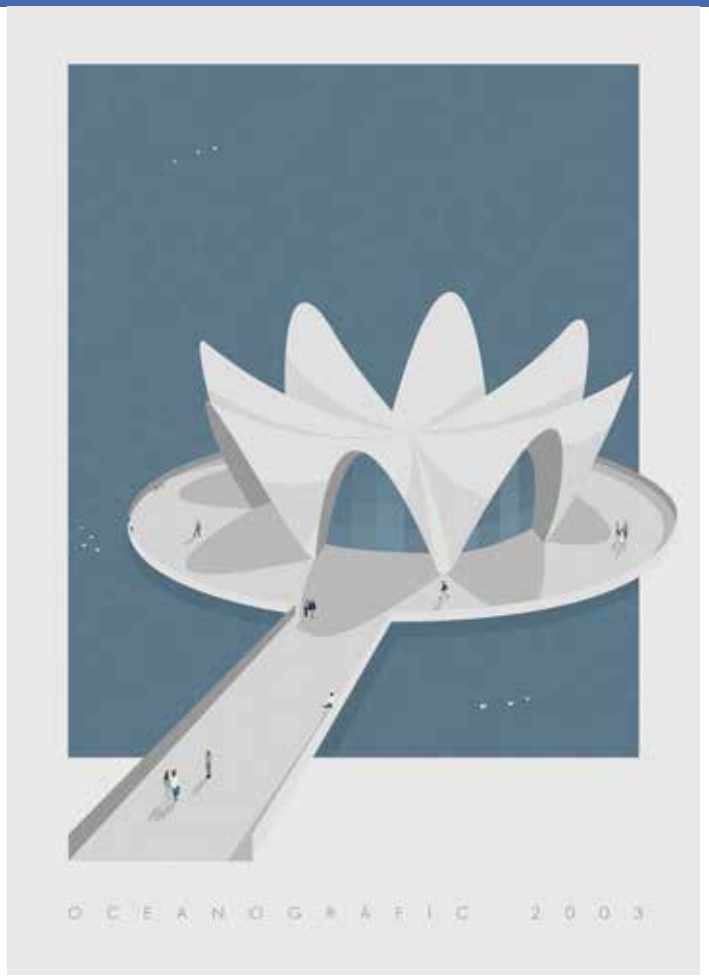

Lema: CROYO

Registration Number: 63

Authors: Pilar Otero y Lucio Mastrogiacomo

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DRAWINGS - MENTIONS

Lema: FEELINGGOOD

Registration Numbers: 88

Authors: Candela Corona,
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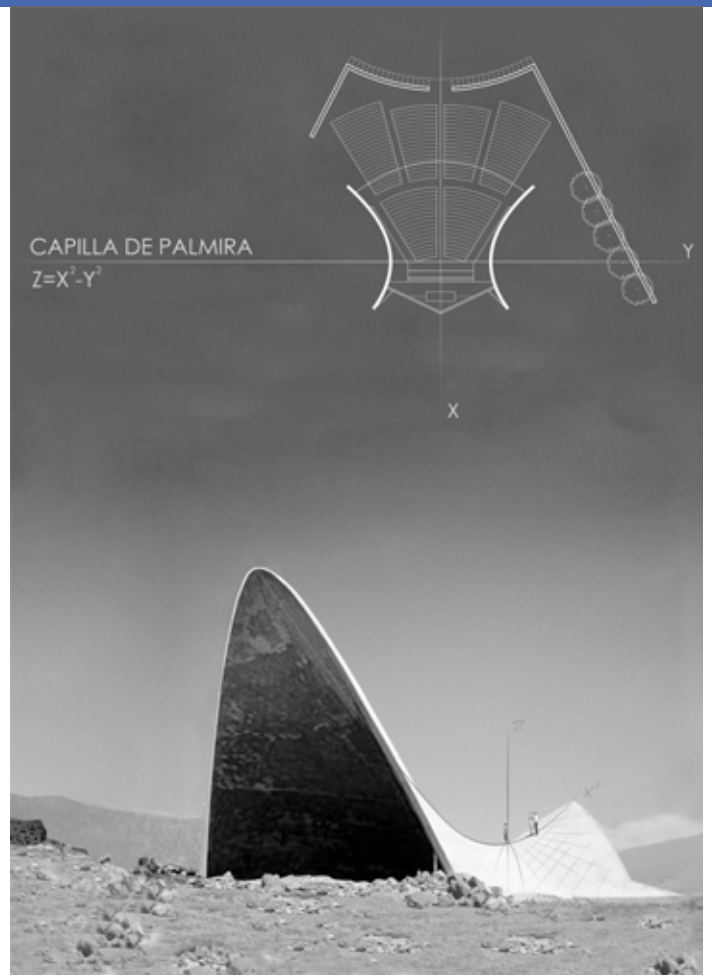

Lema: ANTICLASICO

Registration Number: 86

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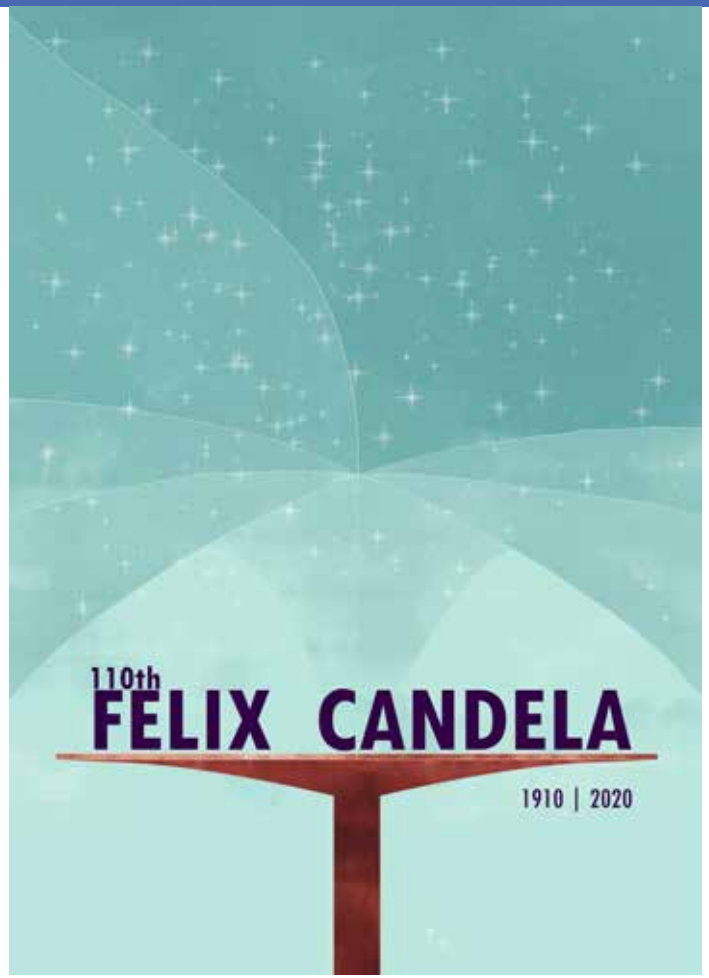
DRAWINGS - MENTIONS



Lema: CRUCE ENLAZADO

Registration Number: 183

Authors: Daniel Avilés Hoyo y Miguel Ángel Díaz Delgado

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Lema: ETERNO

Registration Number: 68

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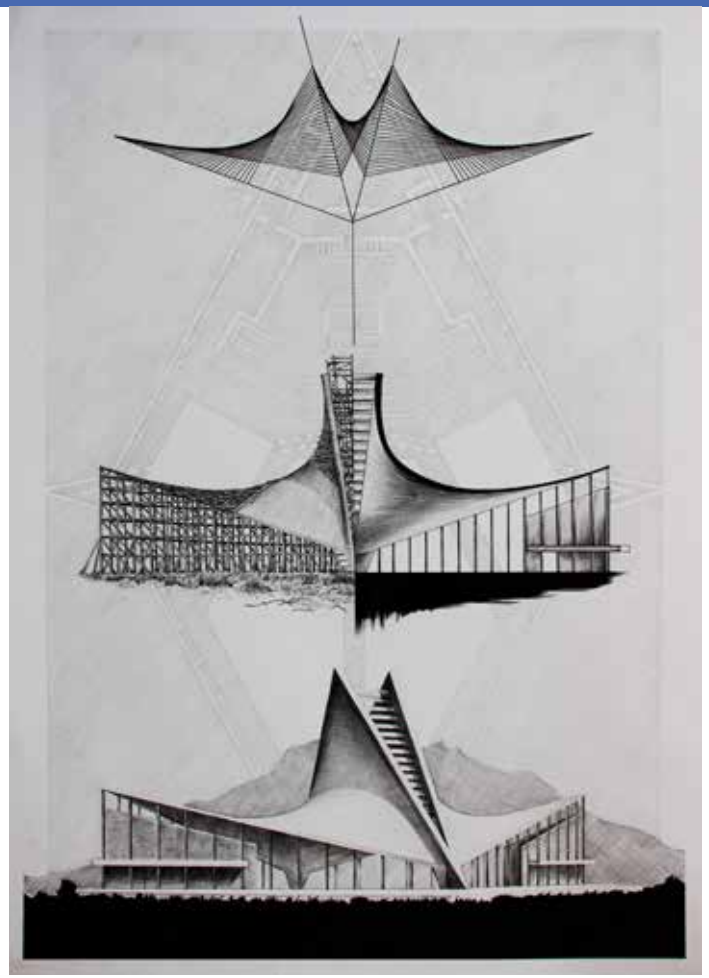
DRAWINGS - MENTIONS



Lema: ESENCIA ESTRUCTURAL

Registration Number: 95

Auhtors: Juan Diego Albornoz,
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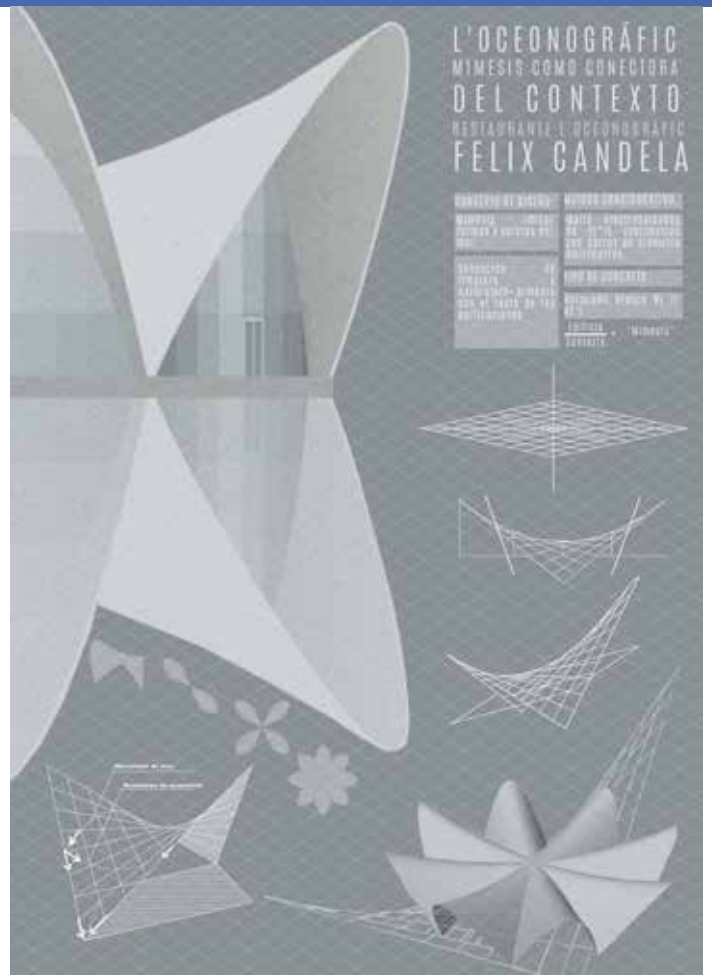
University: Universidad Rafael Urdaneta – VENEZUELA



Lema: MIMESIS CONECTORA

Número de registro: 5

Authors: Gabriela Jiménez Martínez y Valeria Vargas Rodríguez

University: Universidad de las Américas Puebla
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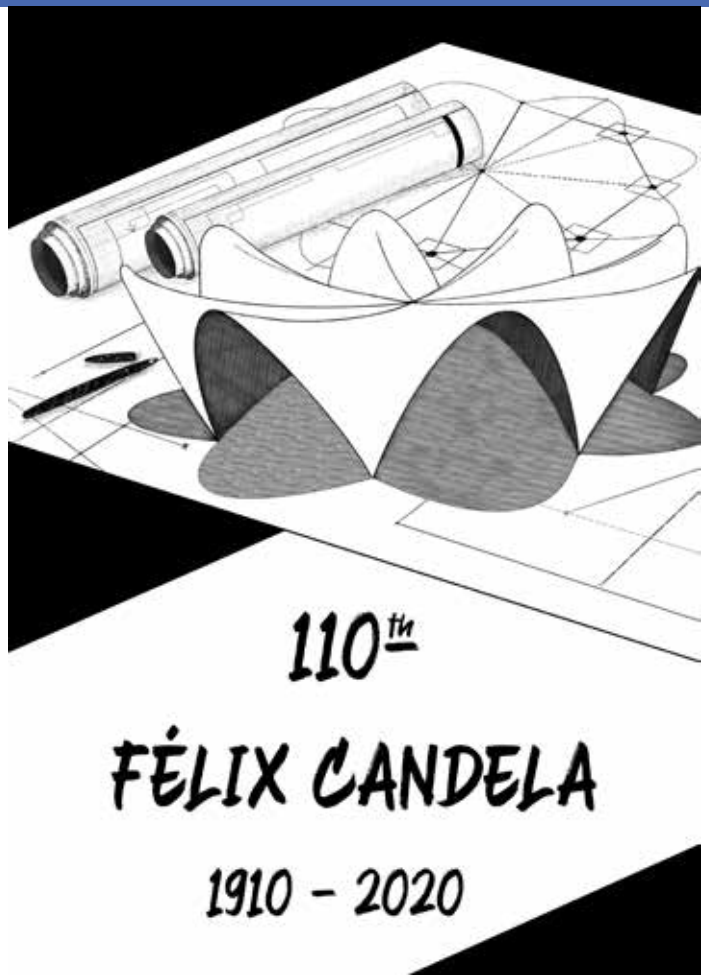
POSTERS - PARTICIPANTS
SPAIN



Lema: WAVY

Registration Number: 085

Author: Irene Iglesias Gómez

University: Universidad Carlos III de Madrid – España

Lema: ESBELTEZ

Registration Number: 243

Authors: Juan Antonio Mengibar y Marcos Rodríguez

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Lema: EL FRENESÍ DE LA CURVA

Registration Number: 148

Author: Almudena Perlaza Bonilla

University: Universidad de Alcalá de Henares (UAH) – España

POSTERS - PARTICIPANTS

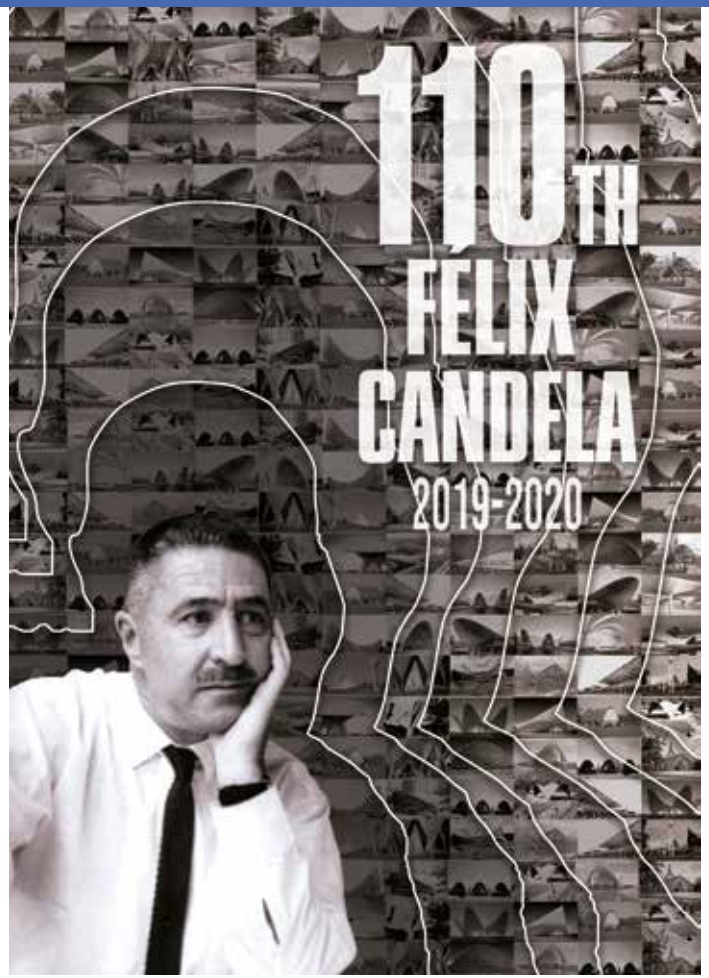
SPAIN

Lema: SEMILLA ROJA

Registration Number: 035

Author: Jesús Díez Rodríguez

University: Universidad de Alcalá de Henares (UAH) – España



Lema: GE(NIO)OMÉTRICO

Registration Number: 150

Author: Claudia Berenguer Redondo

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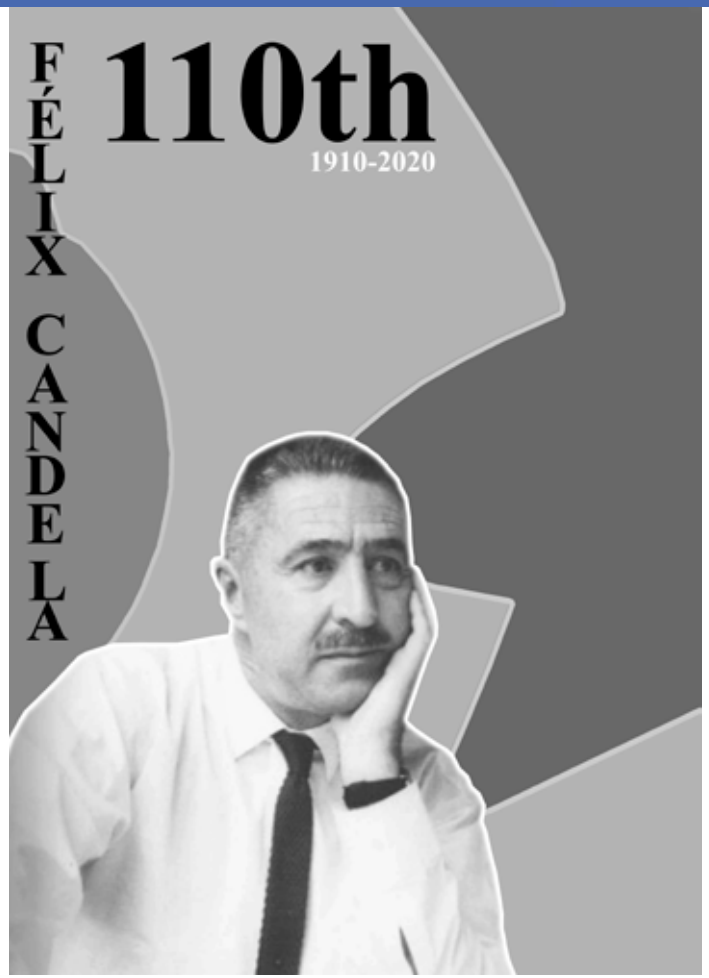

Lema: INEFABLE

Registration Number: 155

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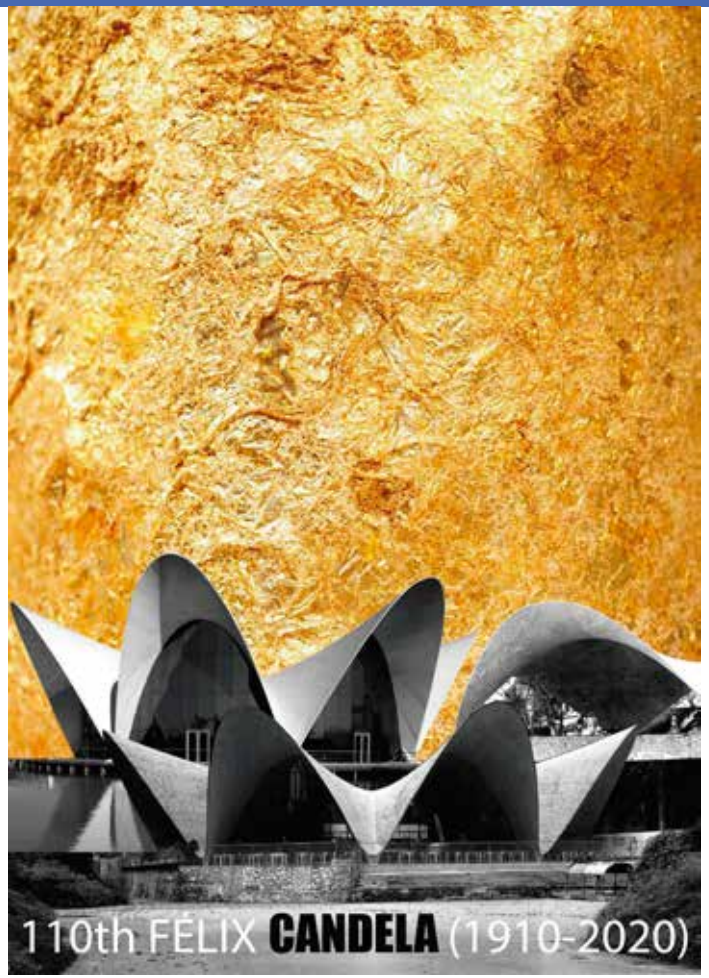
POSTERS - PARTICIPANTS
COUNTRY

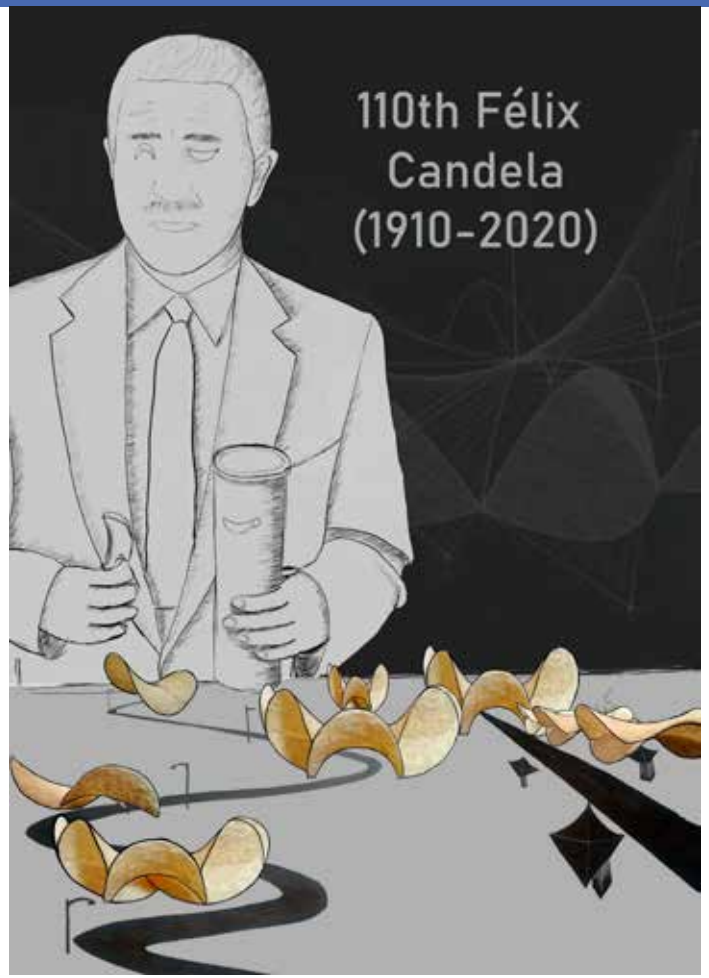


Lema: EXPRESIVIDADYESTRUCTURA

Registration Number: 173

Author: Ana Renedo Prats

University: Universidad de Alcalá de Henares (UAH) – España

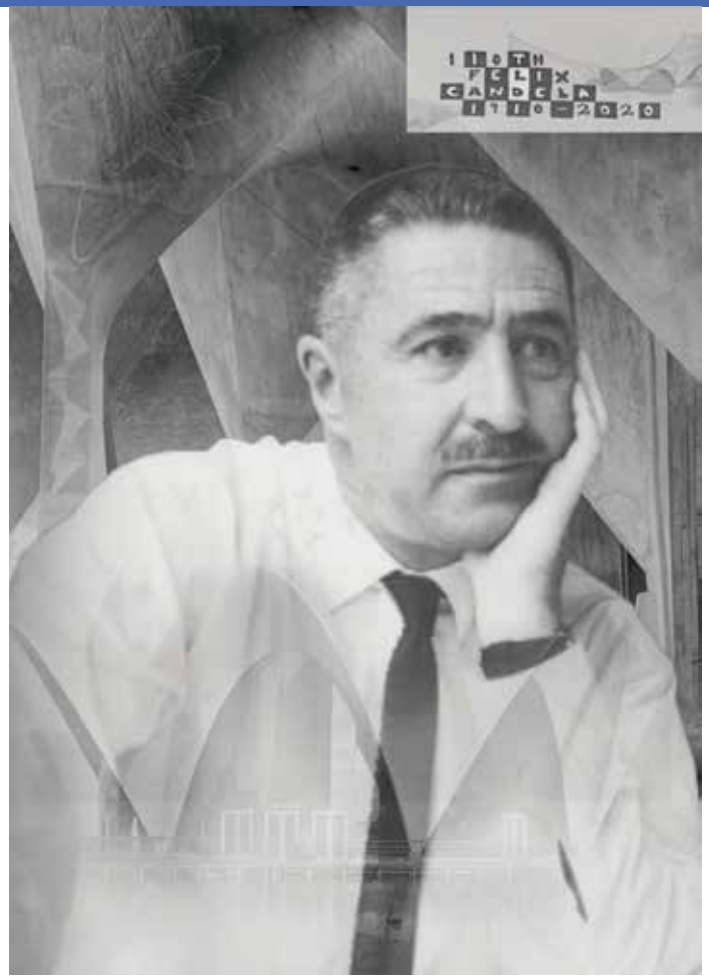


Lema: PATATOIDE

Registration Number: 199

Authors: Ana Ruiz, Patricia Sobrados, Sara de la Fuente

University: Universidad de Alcalá de Henares (UAH) – España



Lema: Schatten Licht

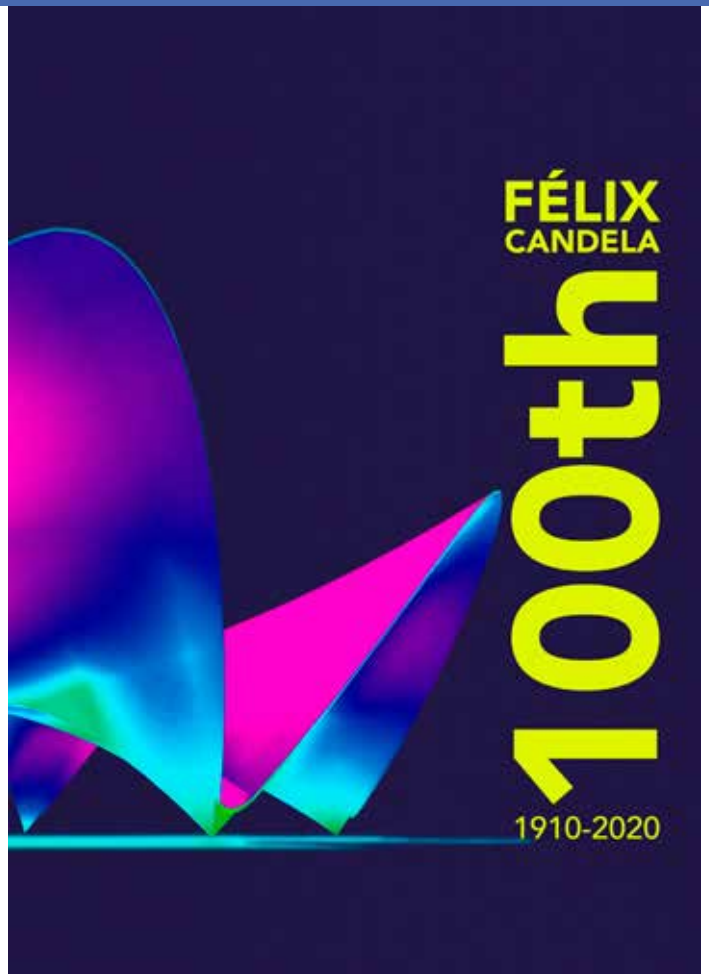
Registration Number: 201

Authors: Carlos Rubio de Frutos, Nicole Pardo Aguirre

University: Universidad de Alcalá de Henares (UAH) – España

POSTERS - PARTICIPANTS

SPAIN

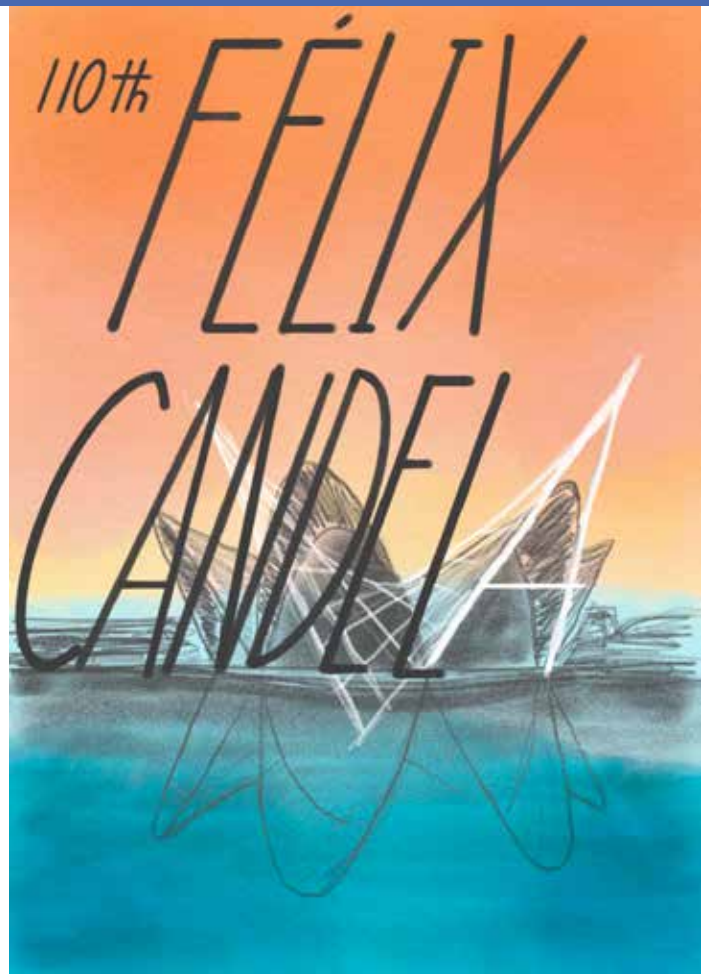


Lema: CÁSCARAS AZULES

Registration Number: 230

Author: Sergio Domínguez Gil

University: Universidad de Alcalá de Henares (UAH) – España



Lema: ETEREO

Registration Number: 235

Author: Daniel Nájar

University: Universidad de Alcalá de Henares (UAH) – España

Lema: TAIRI

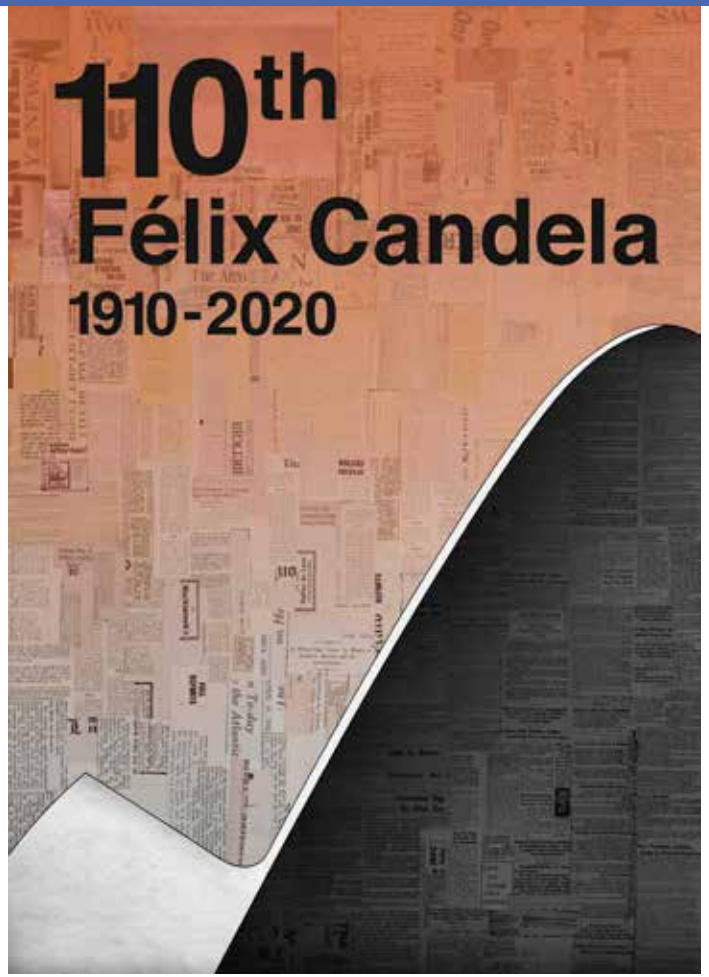
Registration Number: 038

Authors: Maria Elia, Montagud Gaona

University: Universidad de Alicante- España

POSTERS - PARTICIPANTS

SPAIN

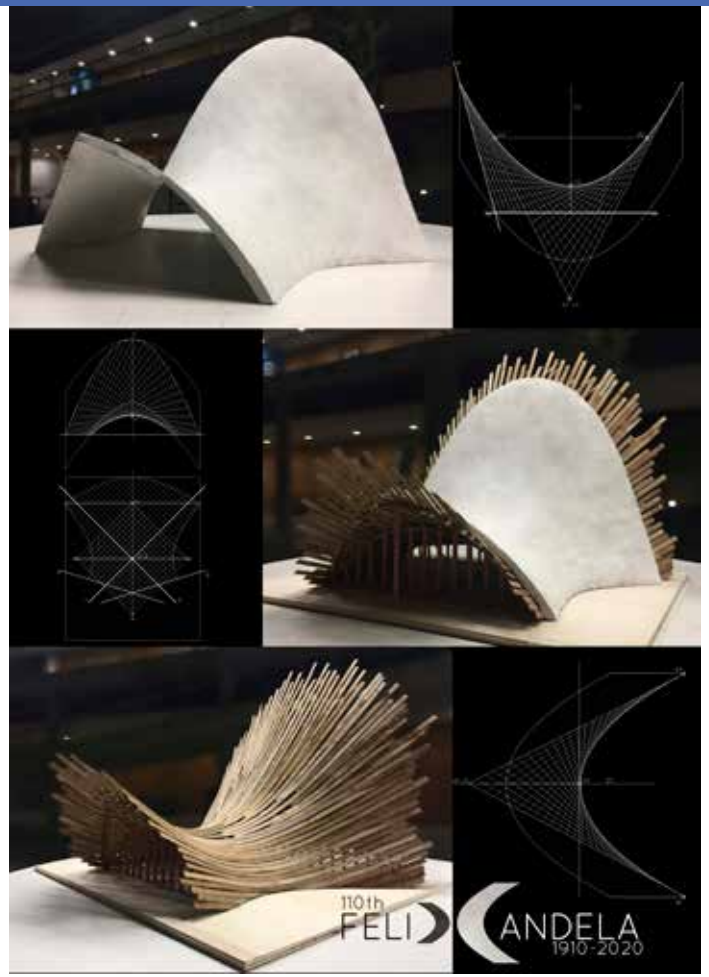


Lema: DELGADEZ

Registration Number: 097

Authors: Francisco José, Navarro Peral

University: Universidad de Alicante- España

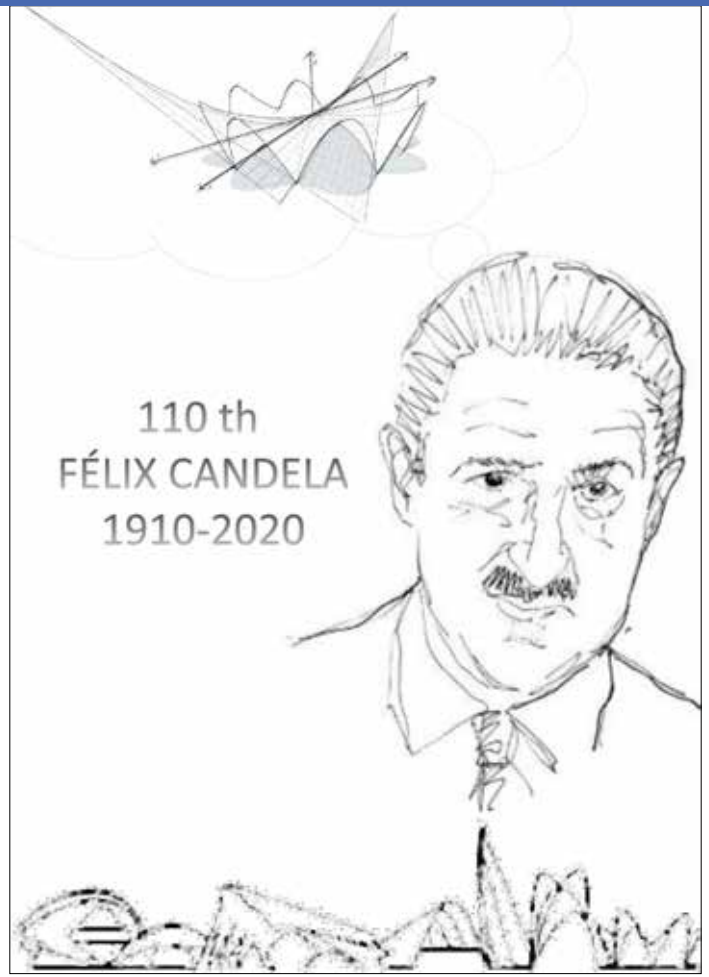


Lema: PASADO FUTURO

Registration Number: 256

Authors: Wilson Alexis Oña Córdova, Mariya Gusenkova

University: Universidad de Alicante- España



Lema: ESTO ES CANDELA

Registration Number: 079

Authors: Claudia Alessandra, Pilla Míguez

University: Universidad de Castilla-La Mancha (UCLM)- Campus de Ciudad Real- España

POSTERS - PARTICIPANTS

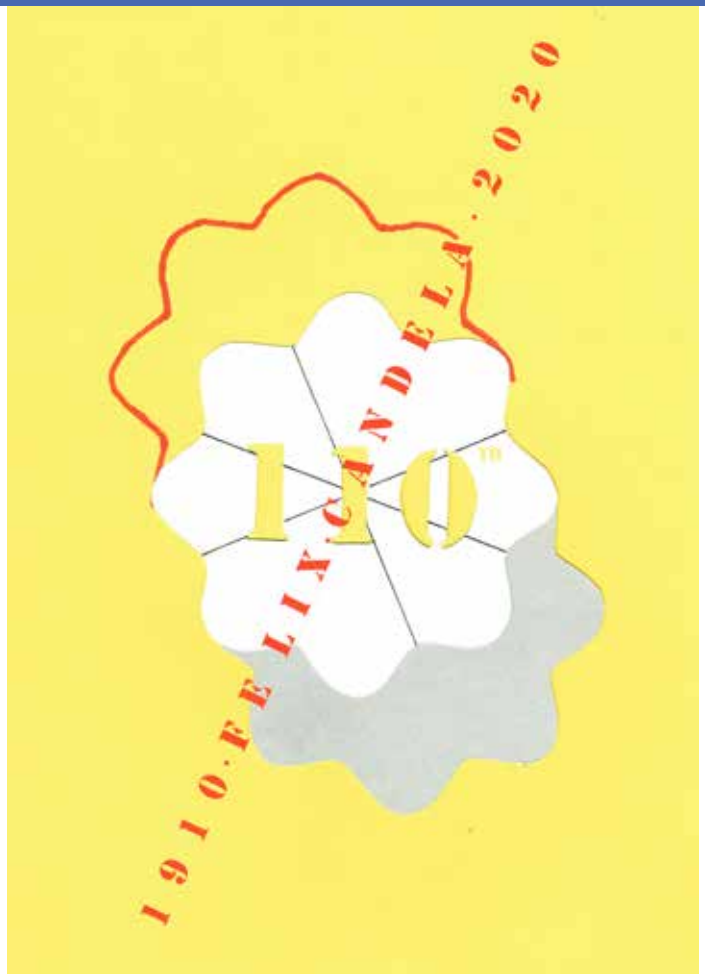
SPAIN

Lema: GEOMETRÍA GRIS

Registration Number: 149

Authors: Alex Yadín Gamboa, Andrea Mañas Ruiz

University: Universidad de Castilla-La Mancha (UCLM)- Campus de Ciudad Real- España



Lema: ESTRUCTURA, ESPACIO

Registration Number: 174

Author: Alberto Esteban Baltasar

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

Lema: SINUOSIDAD

Registration Number: 175

Author: Virginia Sánchez-Cano García

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

POSTERS - PARTICIPANTS

SPAIN

Lema: EXTENSIÓN INVERTIDA

Registration Number: 176

Author: Pilar Pardo García

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

Lema: BLANCO NEGRO

Registration Number: 180

Author: Celia García Ruiz

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

Lema: TRAZADO CONVEXO

Registration Number: 181

Author: Daniel Juan Durán

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

POSTERS - PARTICIPANTS

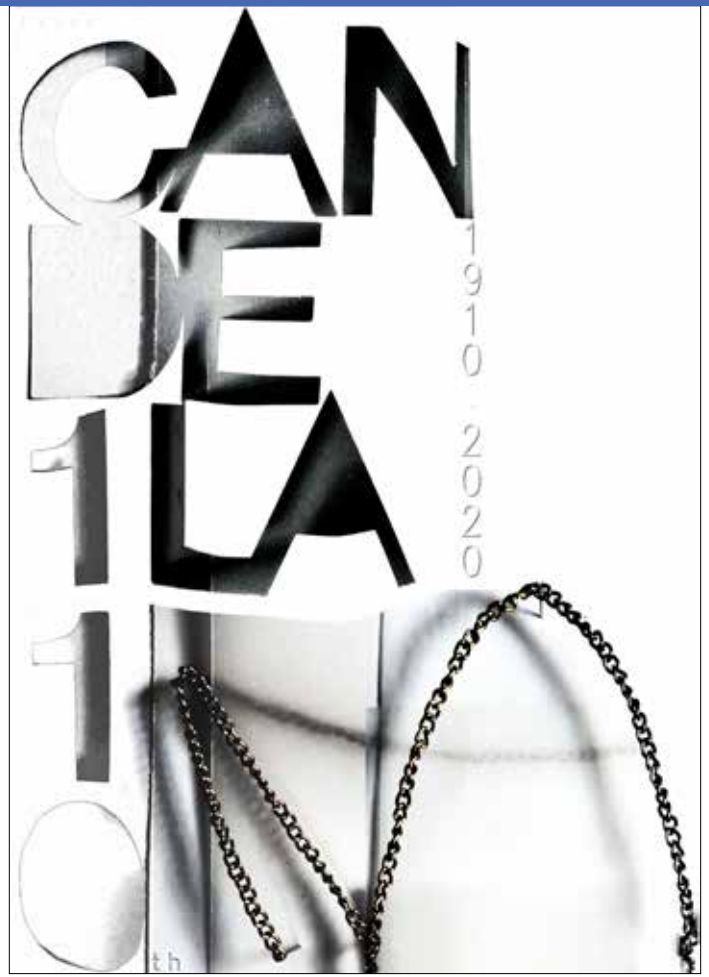
SPAIN

Lema: BUSQUEDA LINEAL

Registration Number: 185

Author: Alberto León Aldarias

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

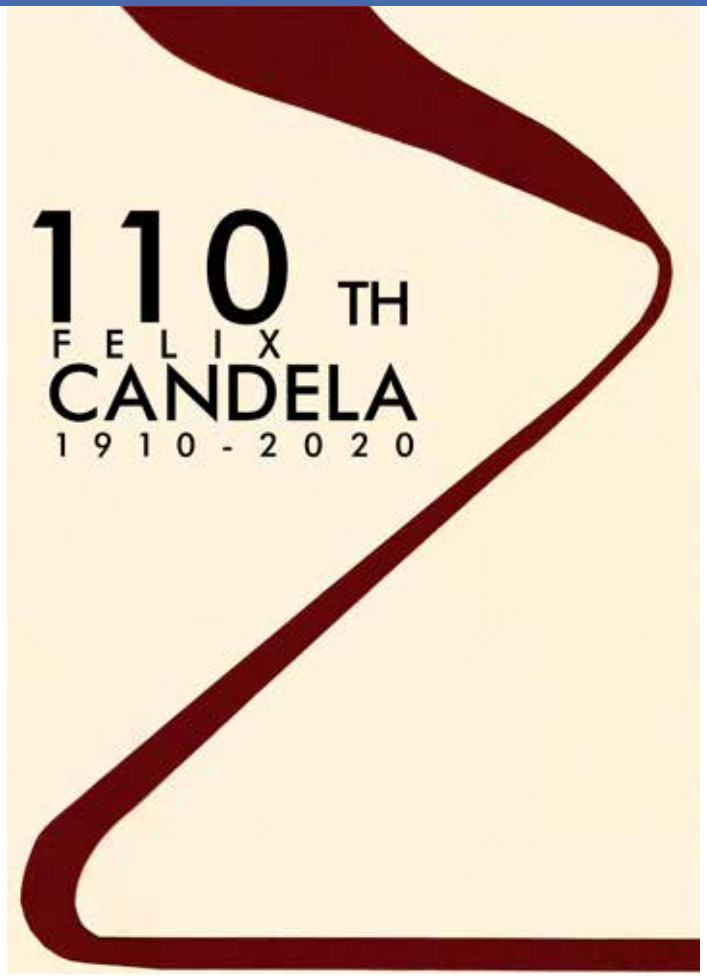


Lema: DOBLANDO PAPEL

Registration Number: 186

Author: Carlos Jiménez Ramos

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España



Lema: HYPAR

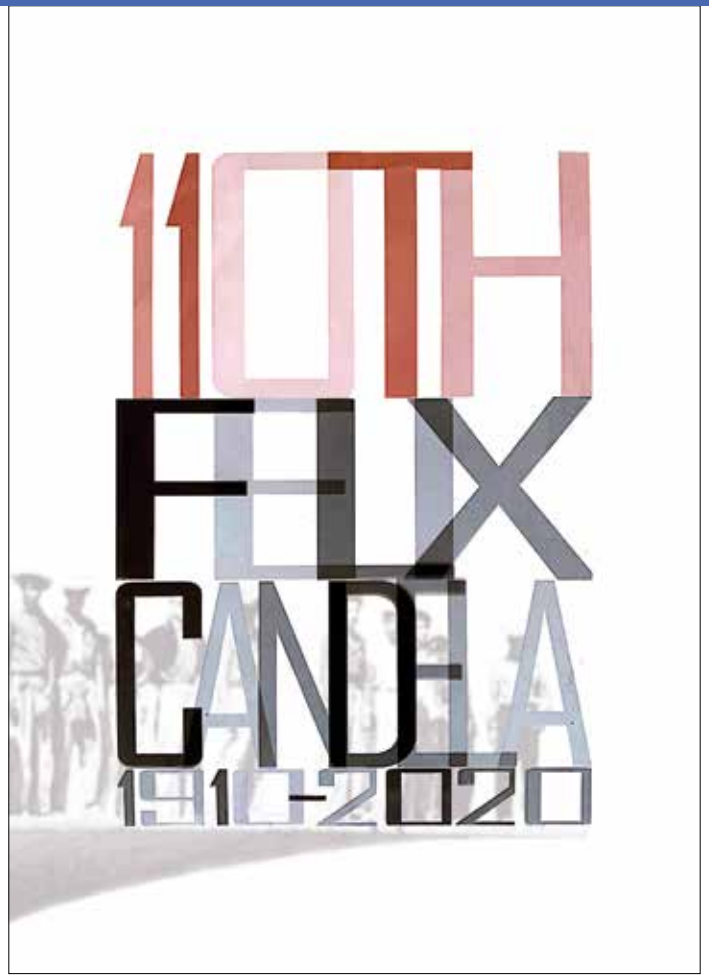
Registration Number: 187

Author: Rocío Sánchez Ayllón

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

POSTERS - PARTICIPANTS

SPAIN

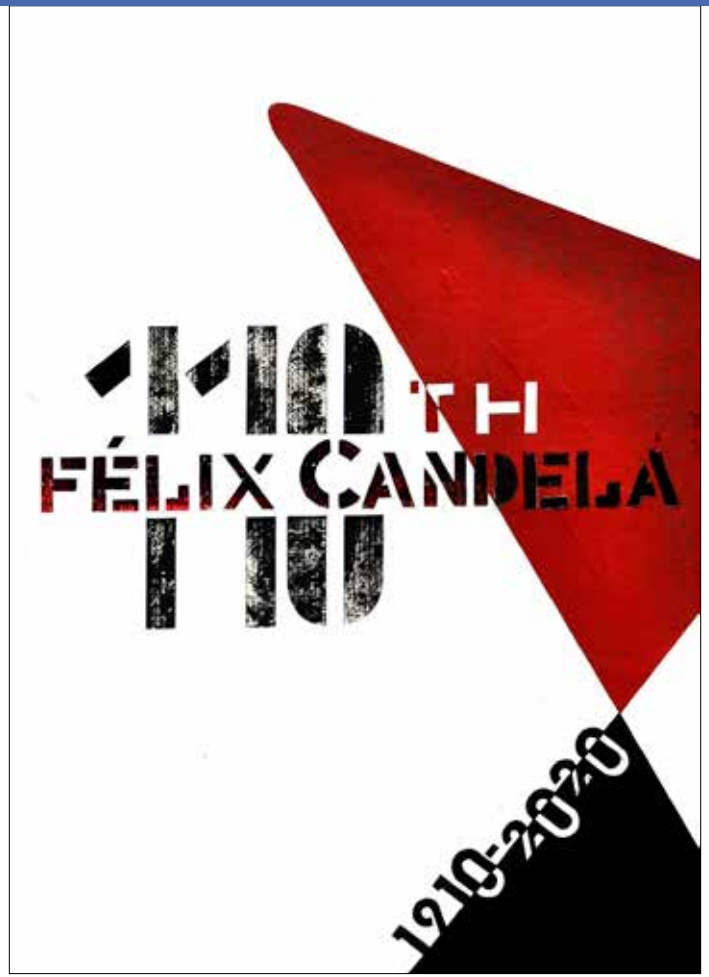


Lema: TRANSPARENCIA ESTRUCTURAL

Registration Number: 188

Author: Arancha García Alberca

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España



Lema: BIAXIAL

Registration Number: 210

Author: Daryna Ramos Chernenko

University: Universidad de Castilla-La Mancha (UCLM)- Escuela de Arquitectura de Toledo (eaT)- España

Lema: ELEGANTE E INNOVADOR

Registration Number: 053

Author: Andrés Suzzarini Flores

University: Universidad de Sevilla- Escuela Técnica Superior de Arquitectura de Sevilla- España

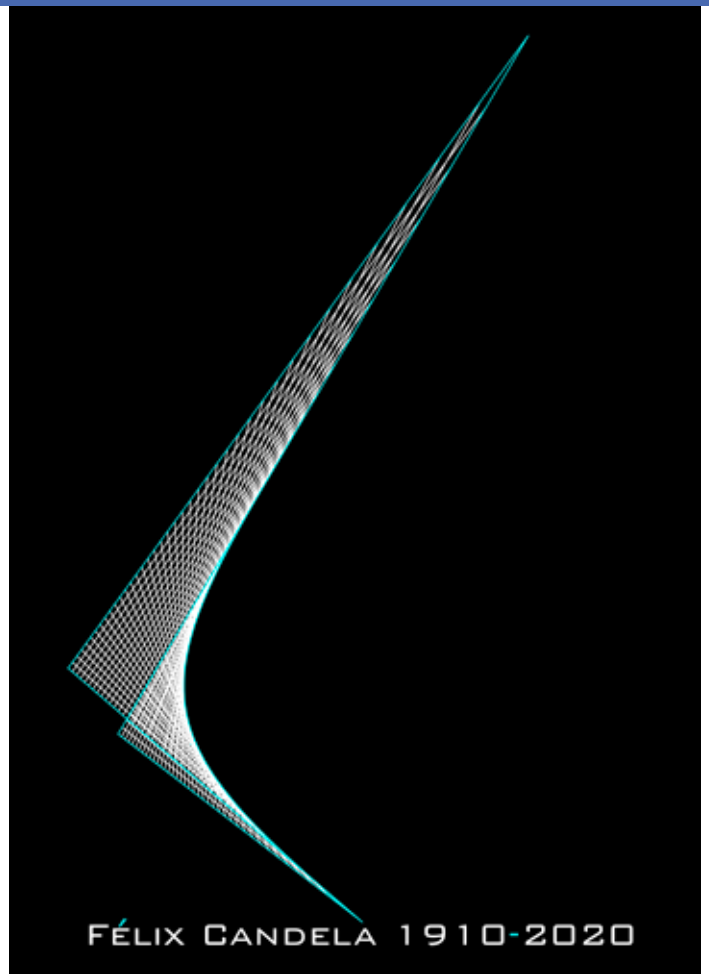
POSTERS - PARTICIPANTS
SPAIN

Lema: ONDA

Registration Number: 068

Authors: Maite Cirac Albiac, Ana García Cañas

University: Universidad de Zaragoza- Escuela de Ingeniería y Arquitectura- España

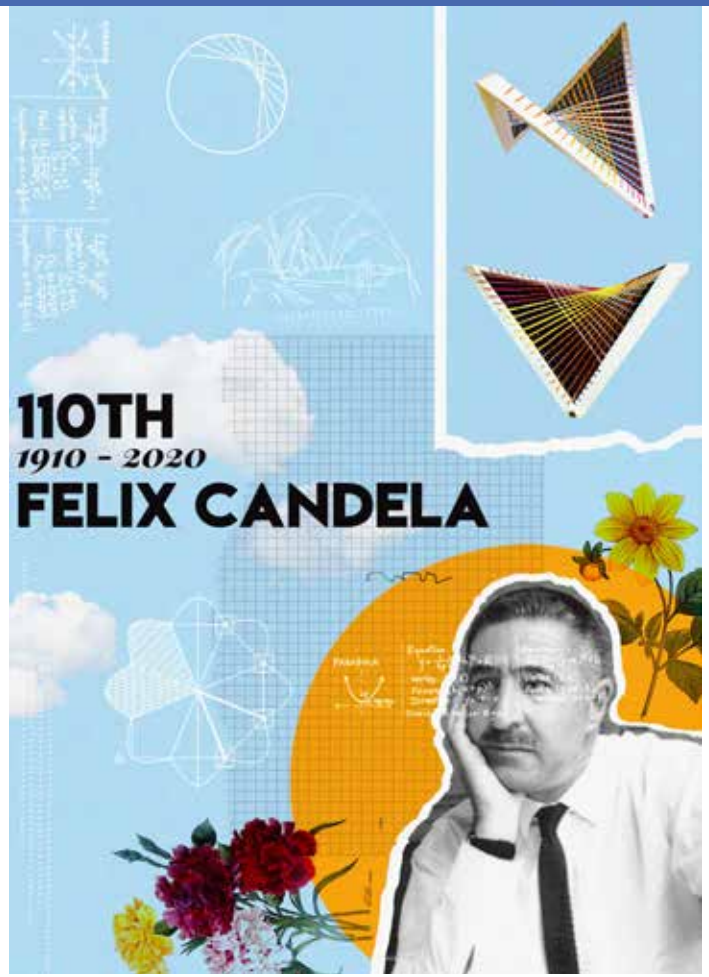


Lema: SWAT

Registration Number: 193

Author: Nerwosh Amin

University: Universidad Europea de Madrid- España



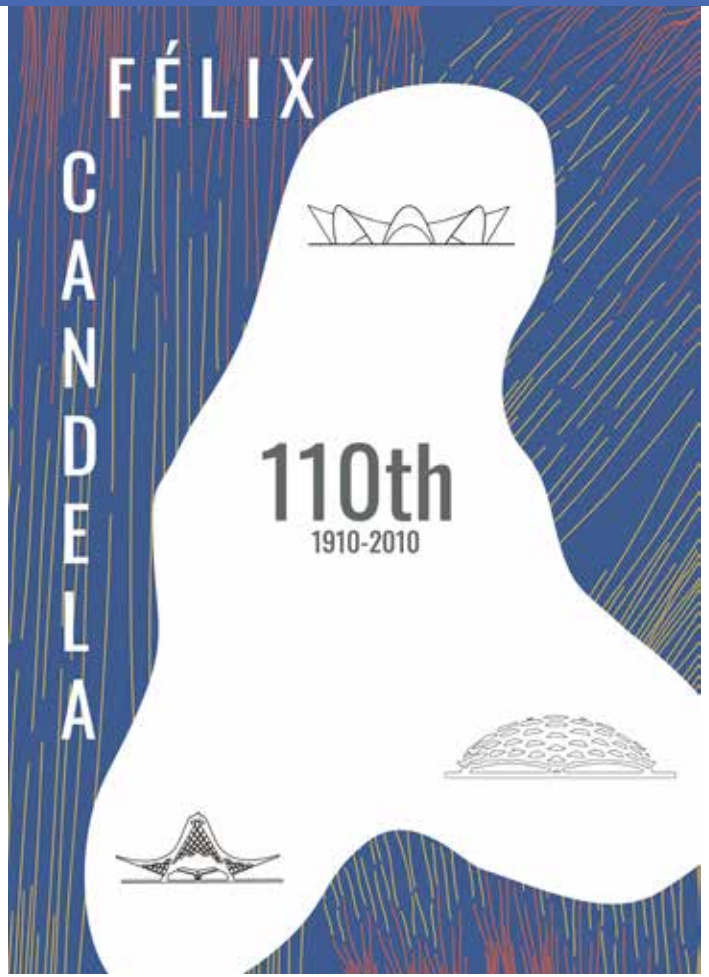
Lema: ARTE ESTRUCTURADO

Registration Number: 213

Authors: Beatriz Isabel, Castaño García Valdecasas

University: Universidad Europea de Madrid- España

POSTERS - PARTICIPANTS
SPAIN

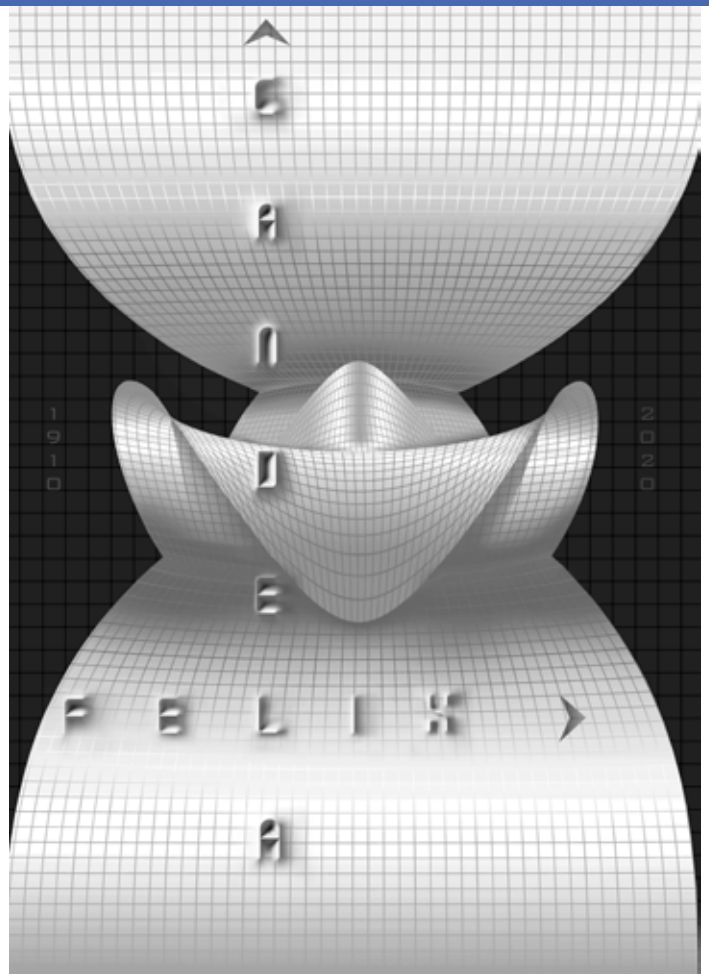


Lema: INTERGALACTISTRUCTURES

Registration Number: 219

Author: Aura Cardona Ramón

University: Universidad Europea de Madrid- España

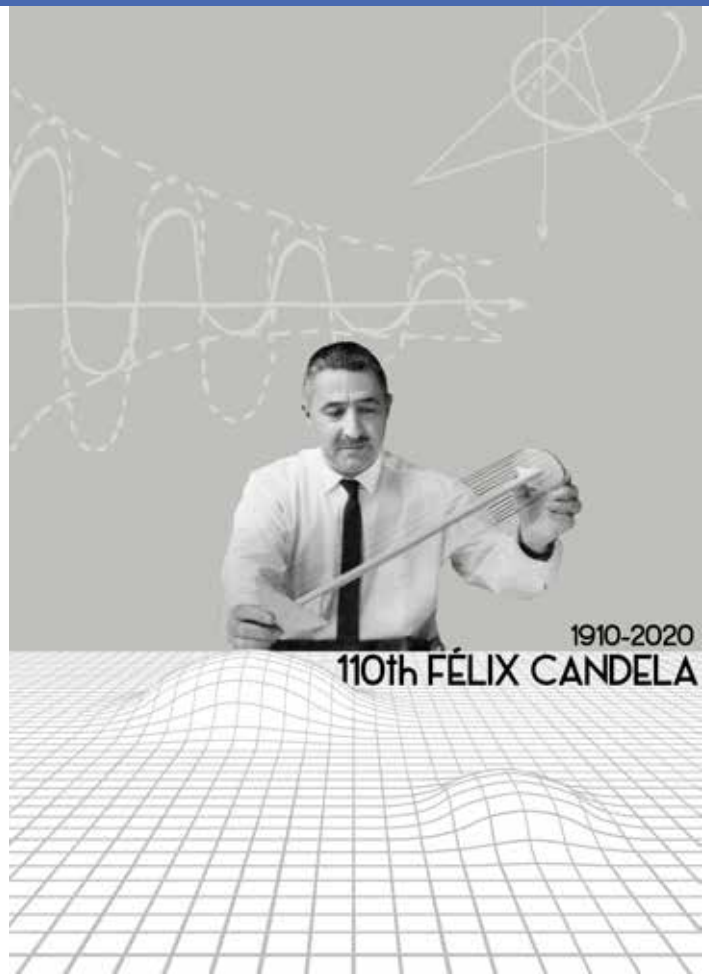


Lema: XYAXIS

Registration Number: 221

Author: Anastasiia Kudinova

University: Universidad Europea de Madrid- España



Lema: VISIONARIO

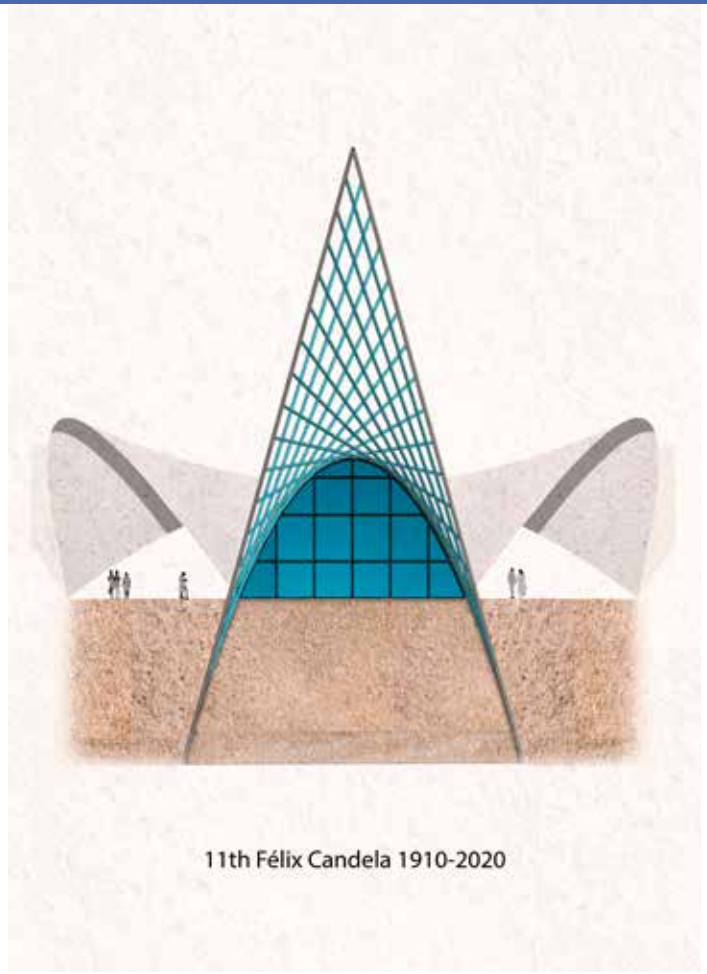
Registration Number: 048

Authors: Eric Moya Soler, Miquel Pérez Coronas

University: Universidad Politécnica de Cataluña- Escola Tècnica Superior d'Arquitectura de Barcelona (ETSAB-UPC)- España

POSTERS - PARTICIPANTS

SPAIN

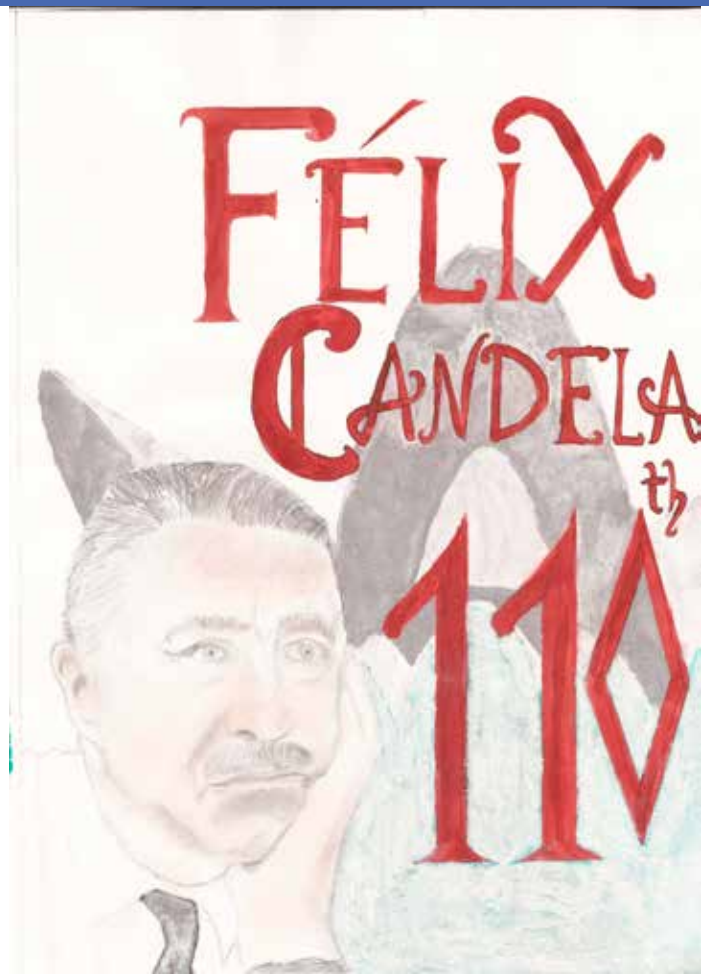


Lema: ESFUERZO

Registration Number: 239

Author: Marc Pajuelo Toledo

University: Universidad Politécnica de Cataluña- Escuela Técnica Superior de Arquitectura del Vallès- España

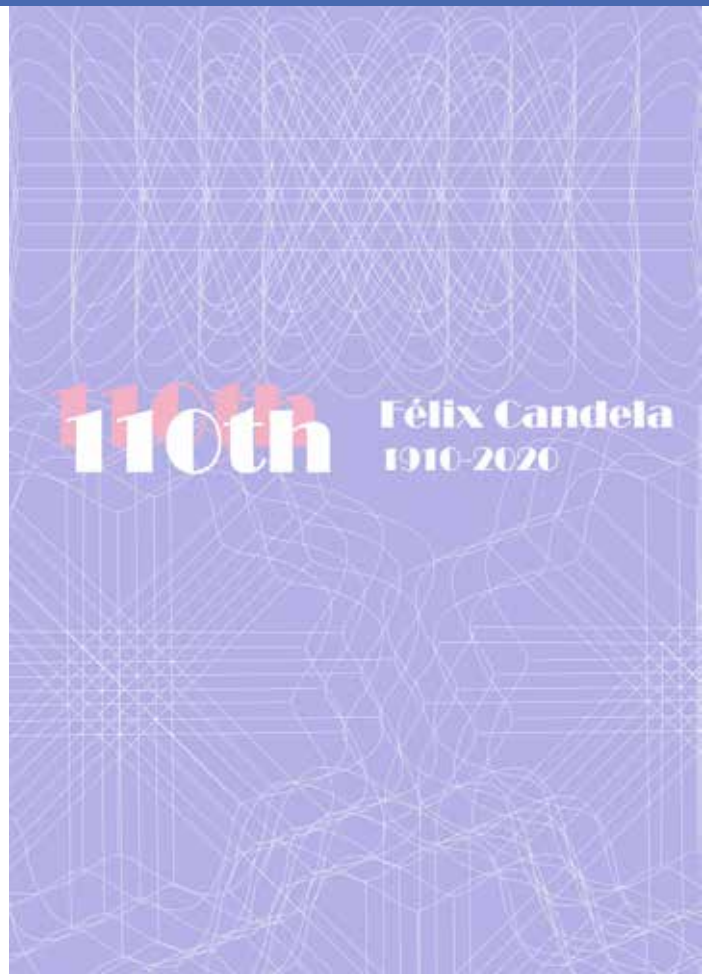


Lema: CANDILGAMUSINO

Registration Number: 066

Author: Fernando G. González Poole

University: Universidad Politécnica de Madrid- E. T. S. de Ingenieros de Caminos, Canales y Puertos- España



Lema: VIDRIERAS

Registration Number: 001

Author: Ana Cristina De la Cruz Ruiz

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

POSTERS - PARTICIPANTS

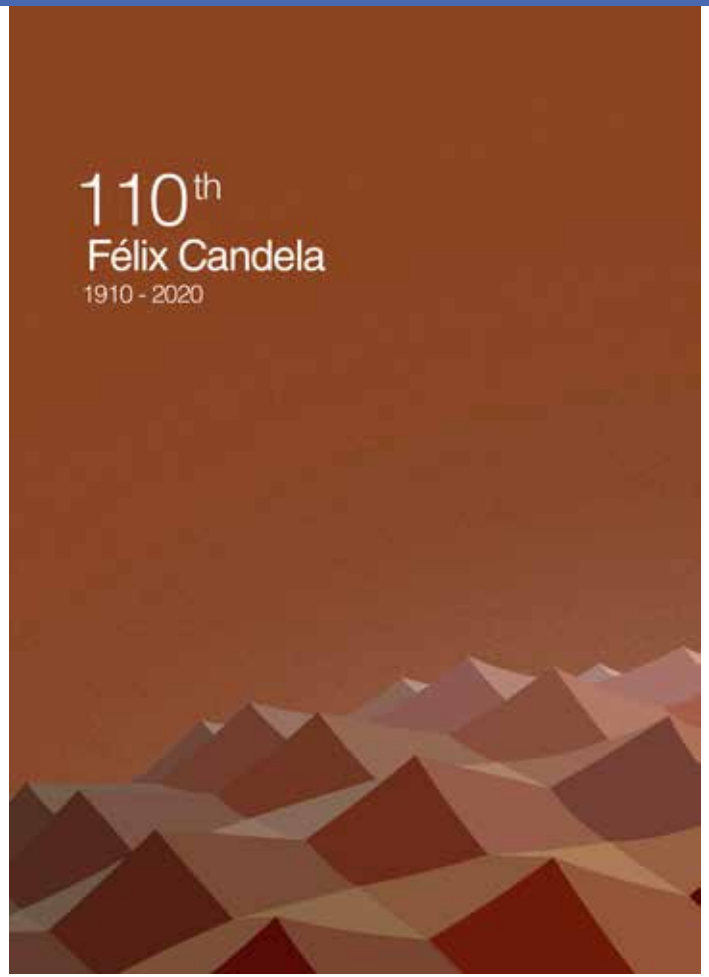
SPAIN

Lema: FORMALISMO

Registration Number: 016

Author: Jesús Sobaler Rodríguez

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

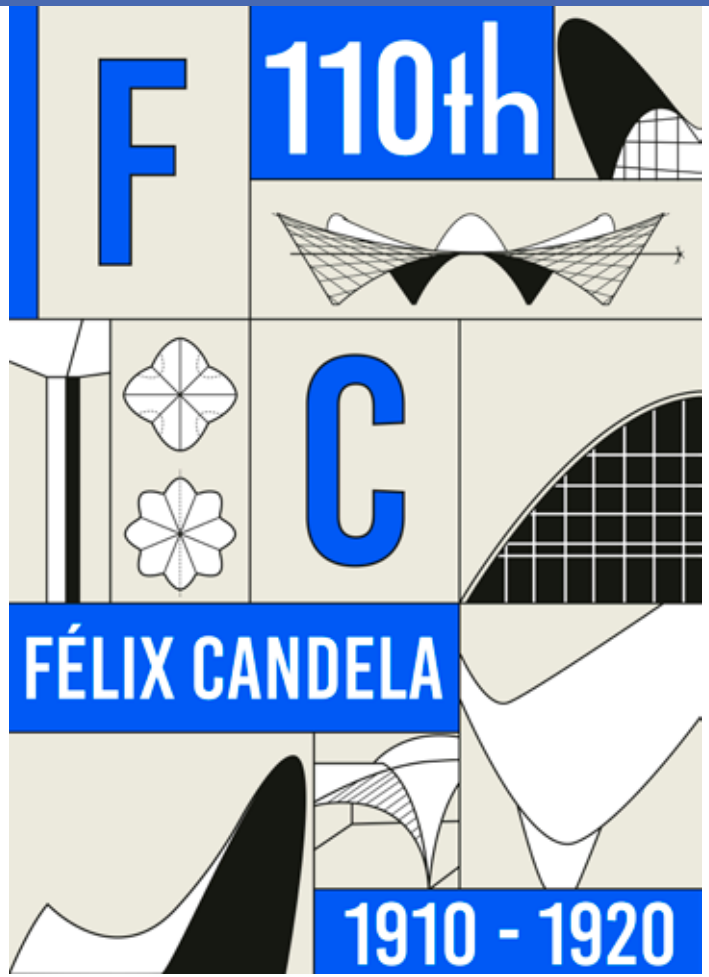


Lema: LLUVIA SOLEADA

Registration Number: 017

Authors: Pablo Cano Serrano, Juan Luis Vela Miranda

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: MOSAICO

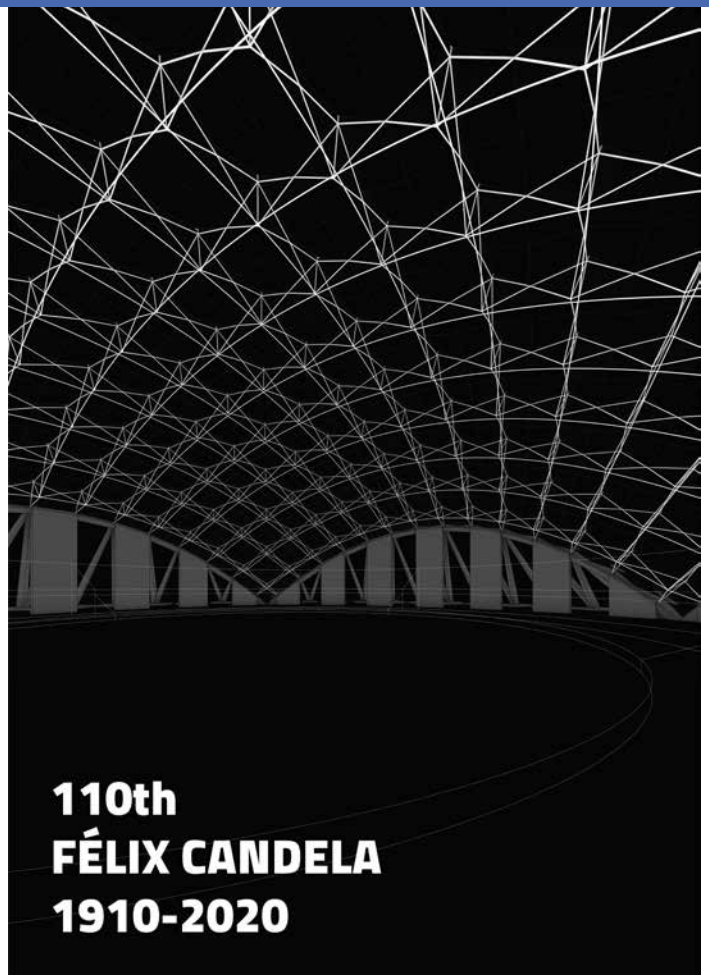
Registration Number: 040

Author: Ximena Ríos-Zertuche Benito

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

POSTERS - PARTICIPANTS

SPAIN

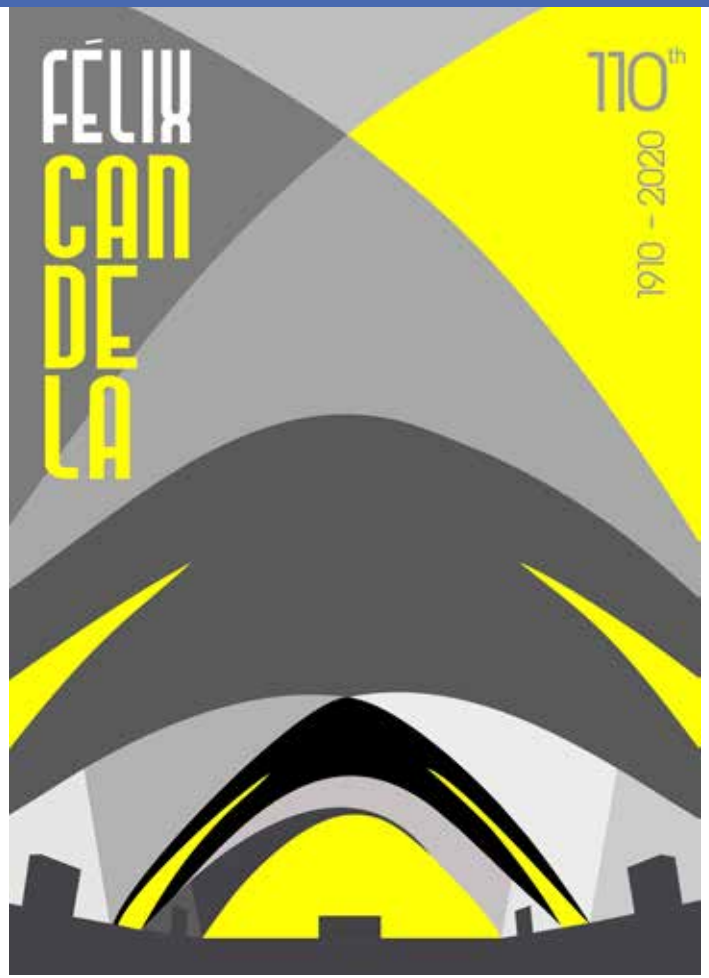


Lema: QUILOMBO

Registration Number: 042

Author s: NicolásMartín Díaz, Alberto Ferrero, Daniel Martínez

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

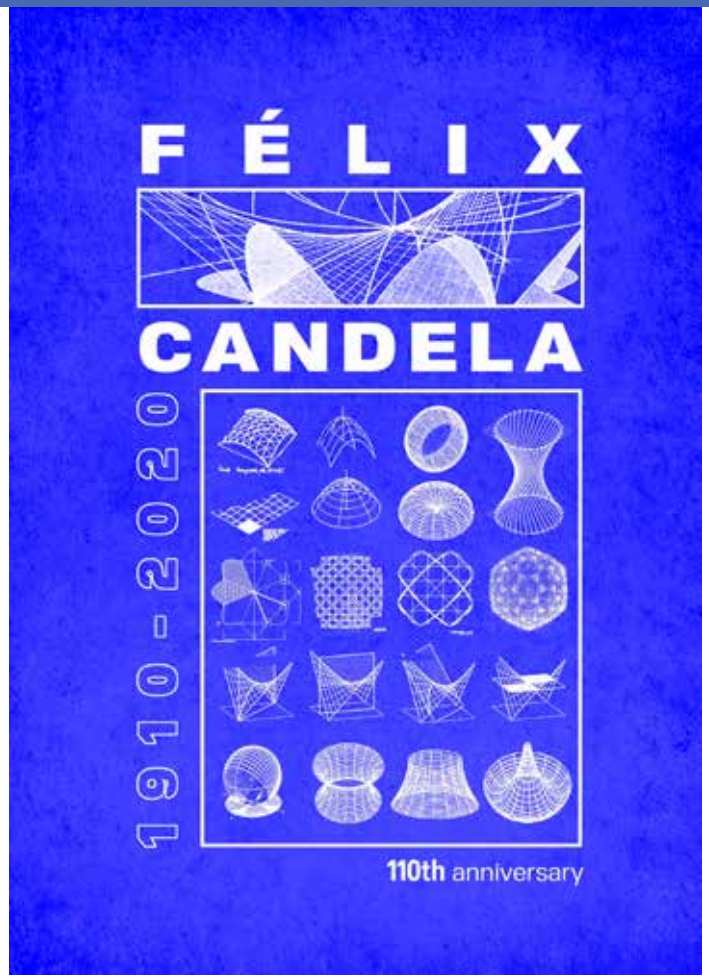


Lema: ENCOUNTER

Registration Number: 081

Author: María Iglesias Alperi

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: CALCO

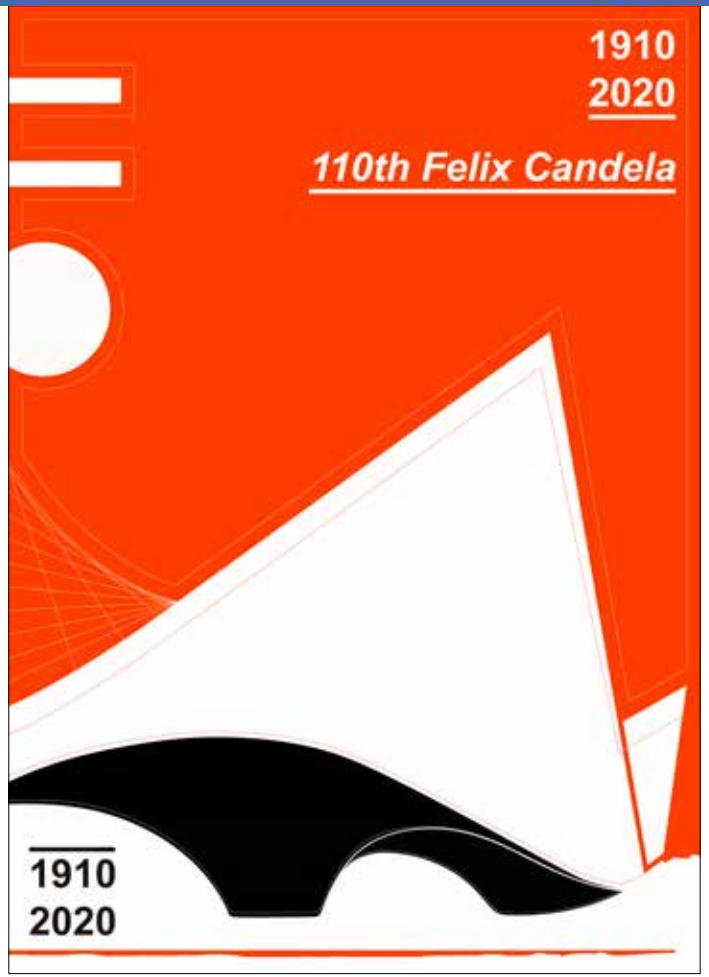
Registration Number: 092

Author: Ángel Cobo Alonso

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

POSTERS - PARTICIPANTS

SPAIN

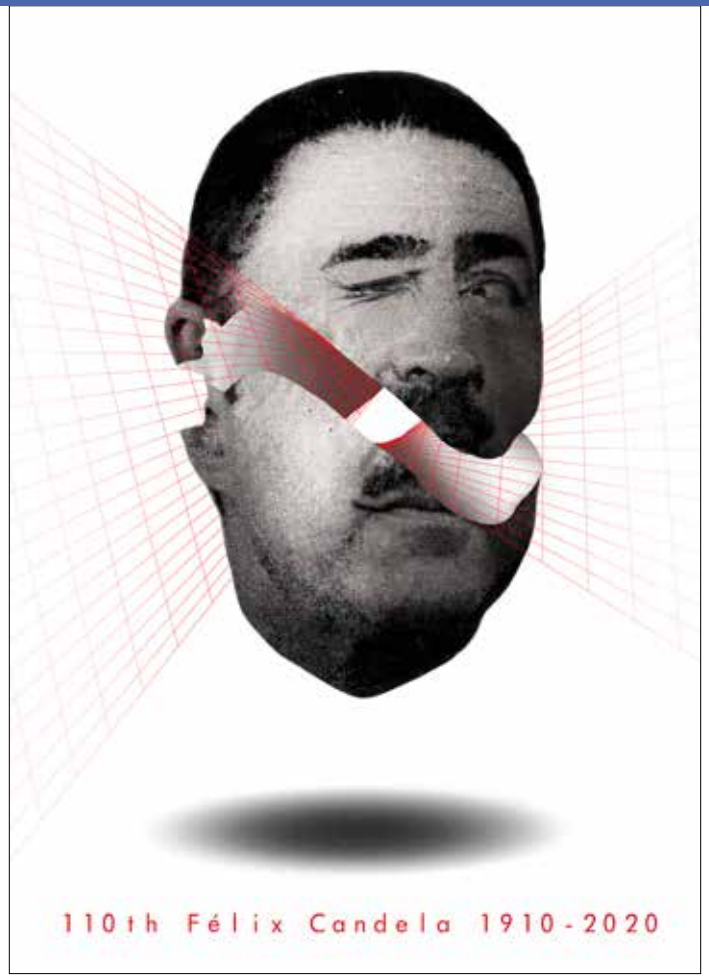


Lema: HIPER RED

Registration Number: 116

Author: Álvaro González Cerezo

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

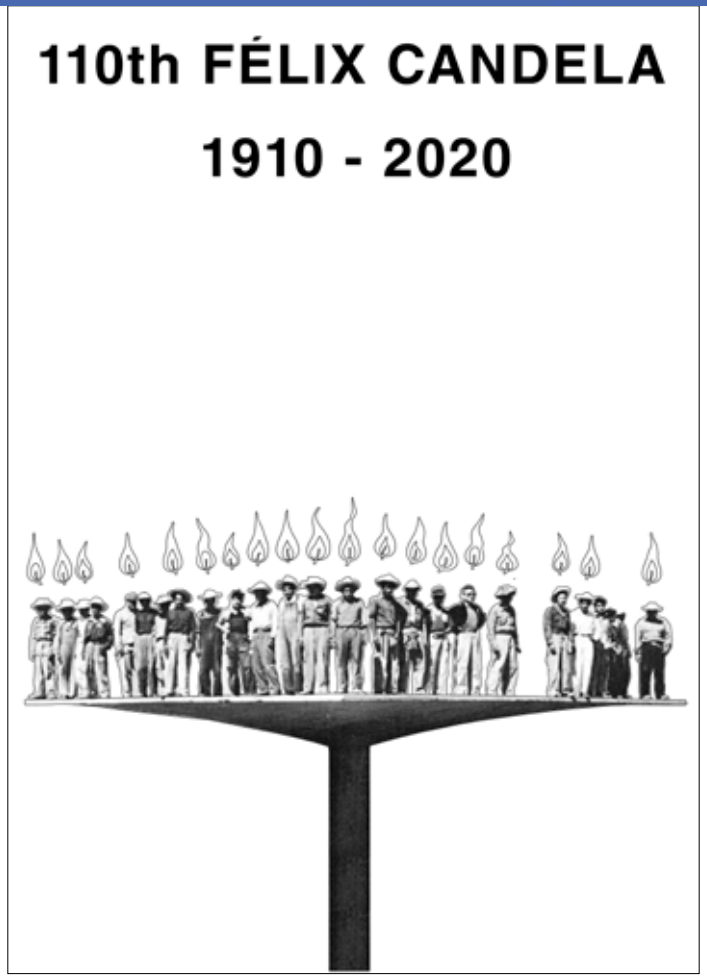


Lema: ÉL SABE

Registration Number: 117

Author: Ignacio Vences Rodríguez

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: FELICIDADES PELIX

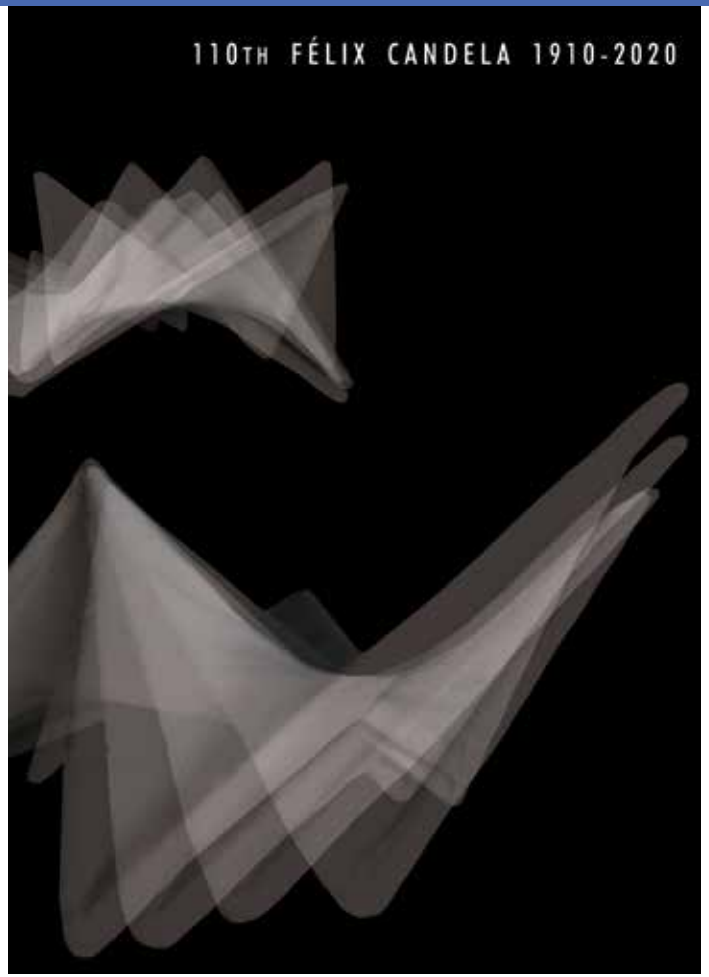
Registration Number: 124

Author: César Fuertes Llorens

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

POSTERS - PARTICIPANTS

SPAIN

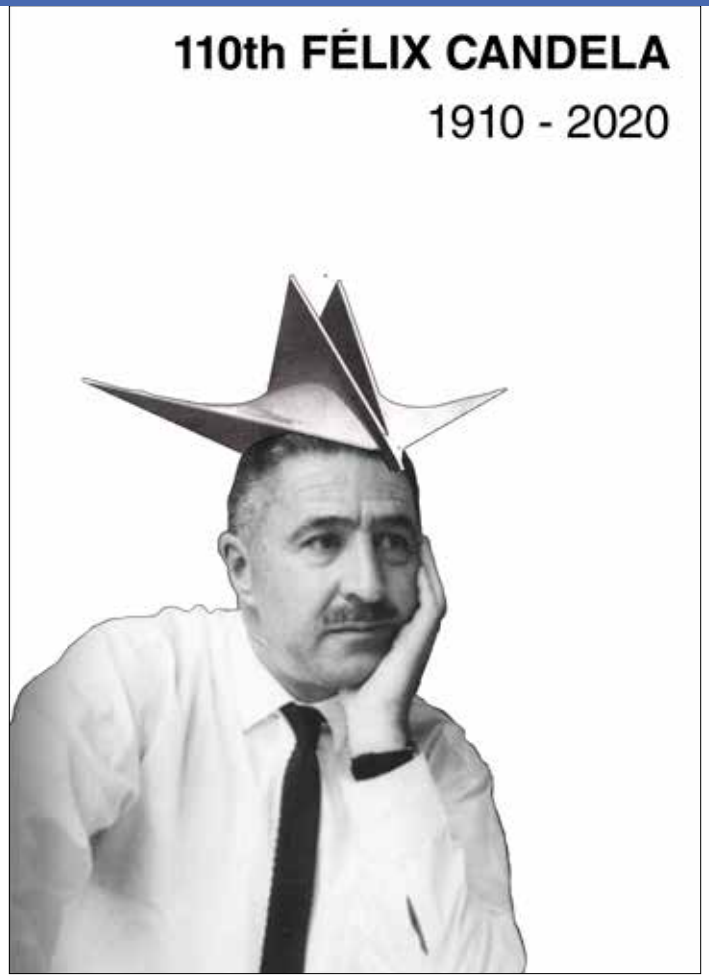


Lema: LIGEREZA

Registration Number: 184

Author: Teresa Cabrera Arzoz

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: OH MI CAPITAN

Registration Number: 208

Author: Ana Moure Rosende

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

Lema: REFLEJO NOCTURNO

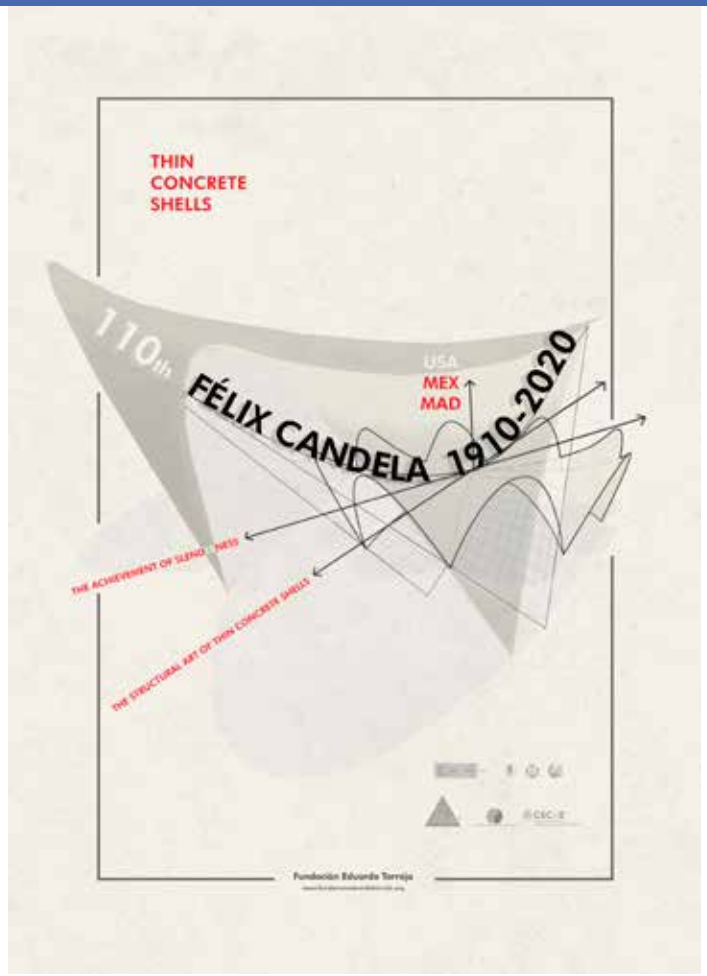
Registration Number: 222

Author: Ignacio Leceta Molina

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

POSTERS - PARTICIPANTS

SPAIN

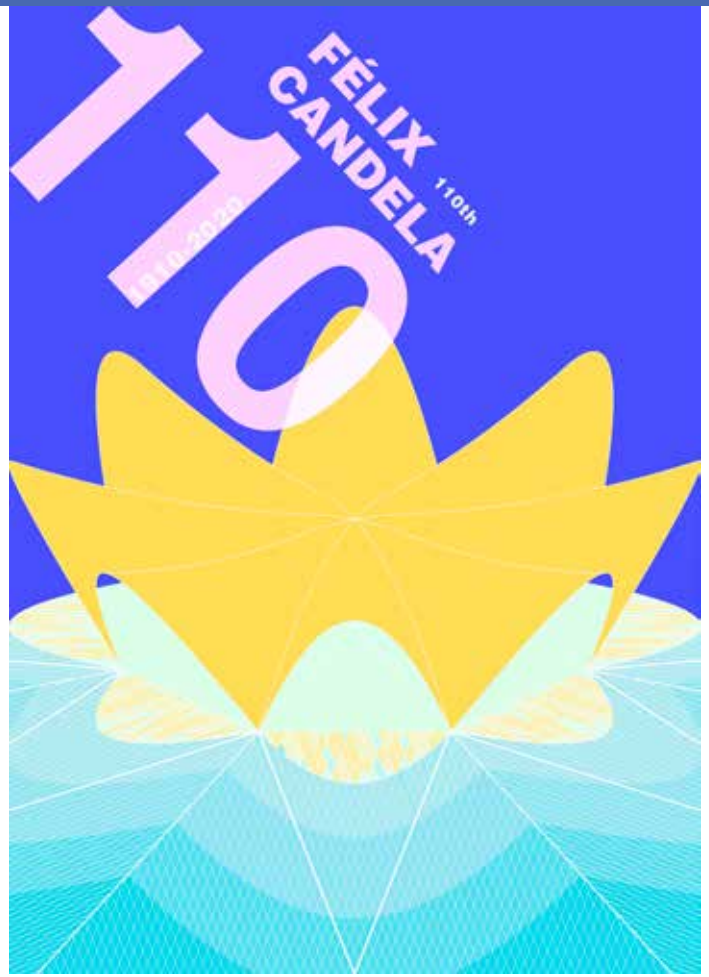


Lema: ETHERIC

Registration Number:228

Author: JORGE ESCOLANO FERNÁNDEZ

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

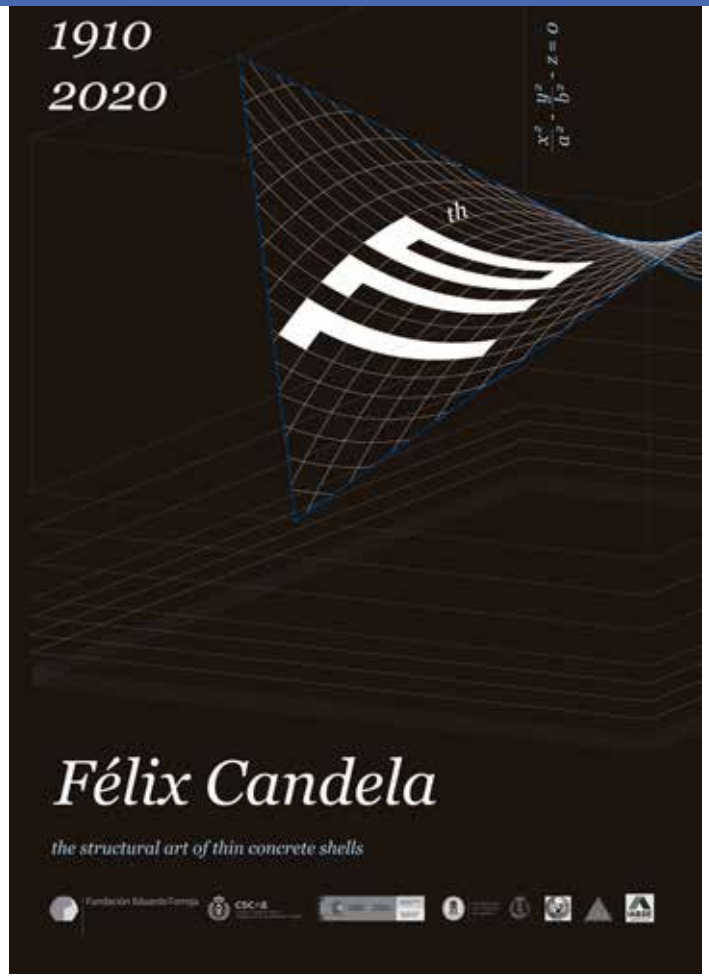


Lema: NATURALEZA REFLEJADA

Registration Number: 245

Author: Marta García Sánchez-Infante

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: INSPIRACIÓN

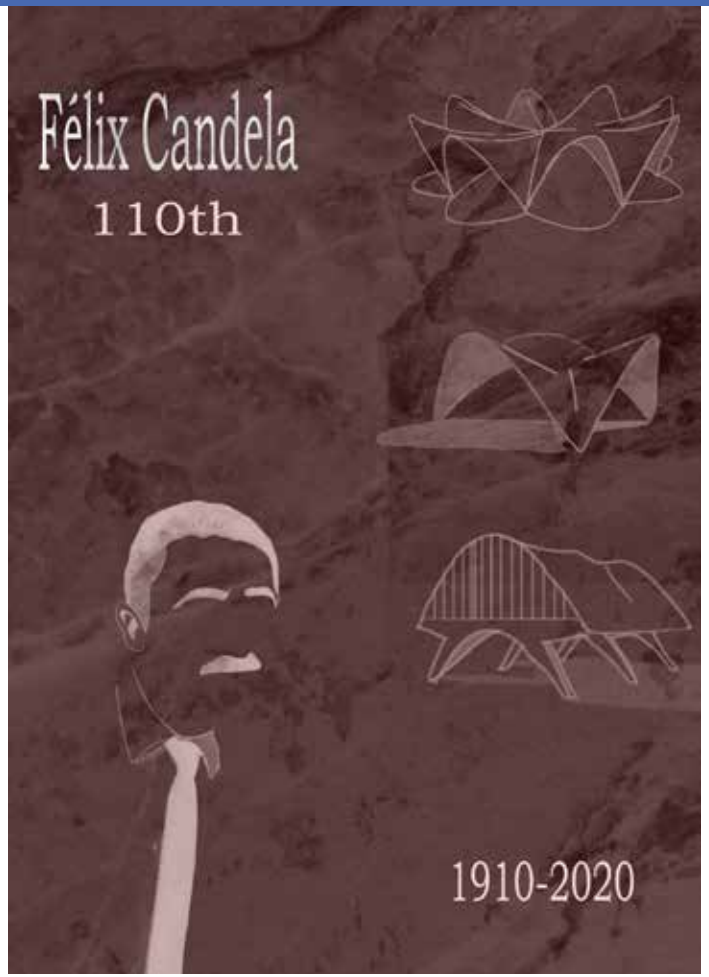
Registration Number: 247

Author: Carolina Balda Oddo

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

POSTERS - PARTICIPANTS

SPAIN

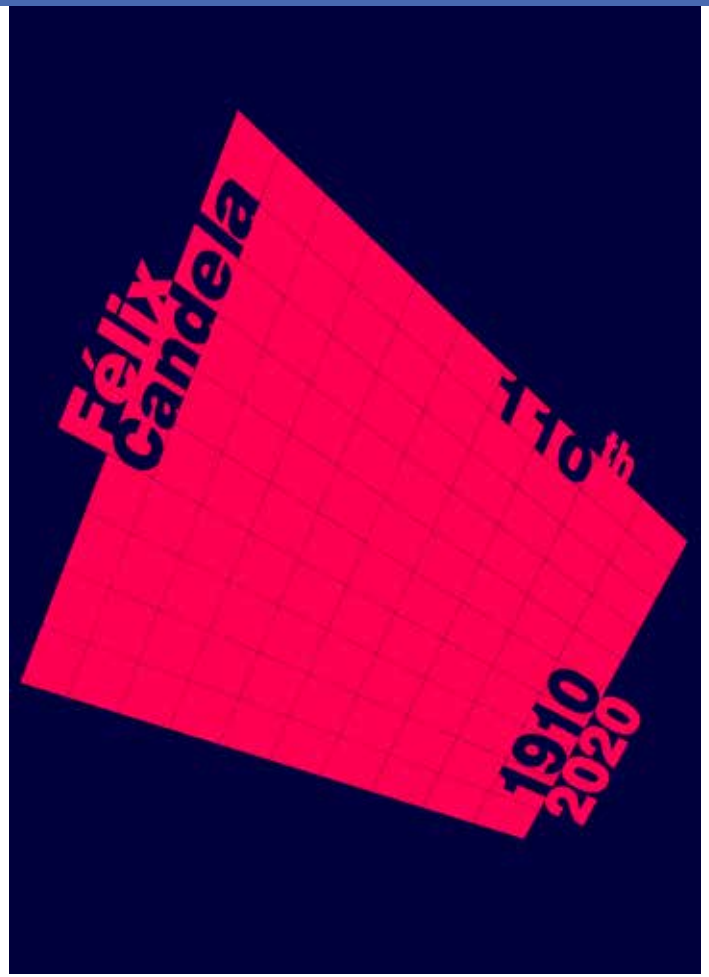


Lema: INGRESO

Registration Number: 024

Author: Alicia Nuria Correcher Parra

University: Universidad Politécnica de Valencia (UPV Valencia)- Escuela Técnica Superior de Arquitectura- España

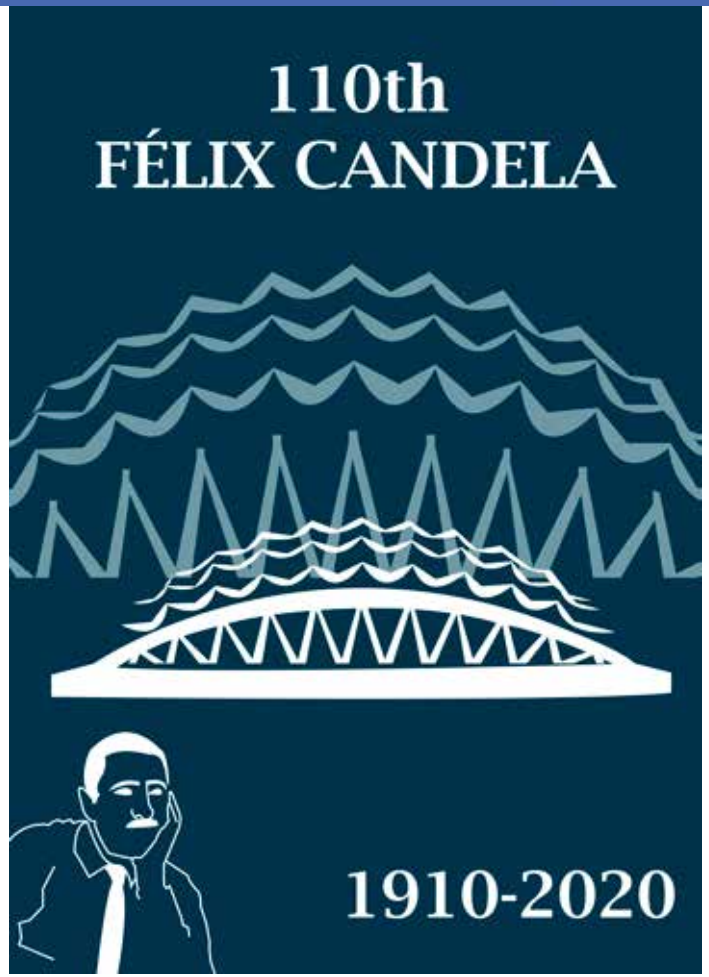


Lema: PARABOLOIDE

Registration Number: 062

Author: Josep Eixerés Ros

University: Universidad Politécnica de Valencia (UPV Valencia)- Escuela Técnica Superior de Arquitectura- España



Lema: ABRIL

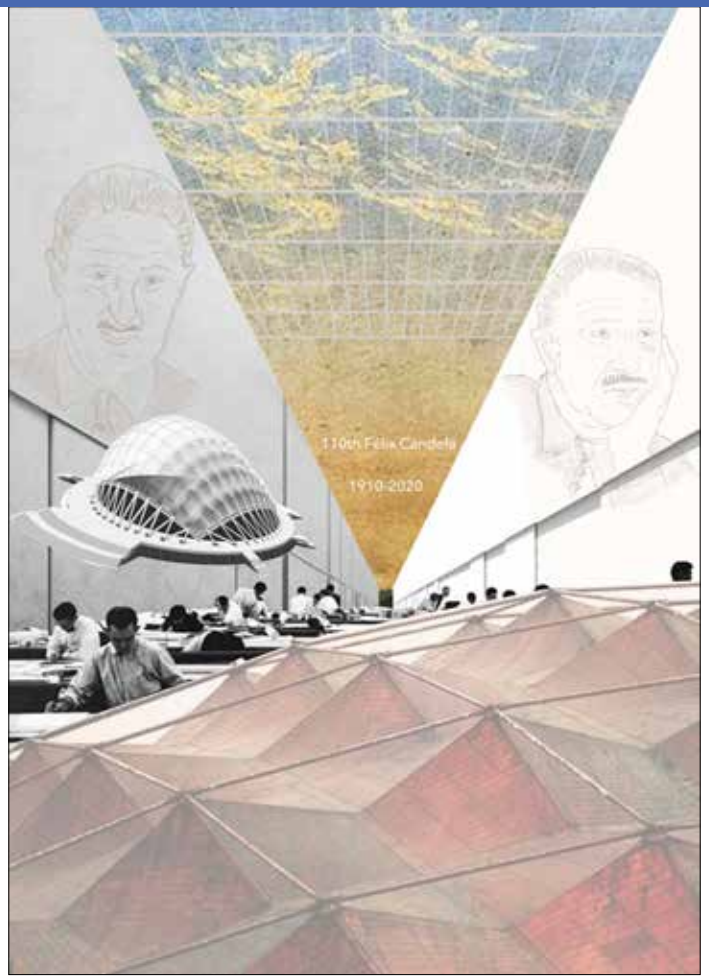
Registration Number: 152

Author: Julia Palao Barceló

University: Universidad Politécnica de Valencia (UPV Valencia)- Escuela Técnica Superior de Arquitectura- España

POSTERS - PARTICIPANTS

SPAIN

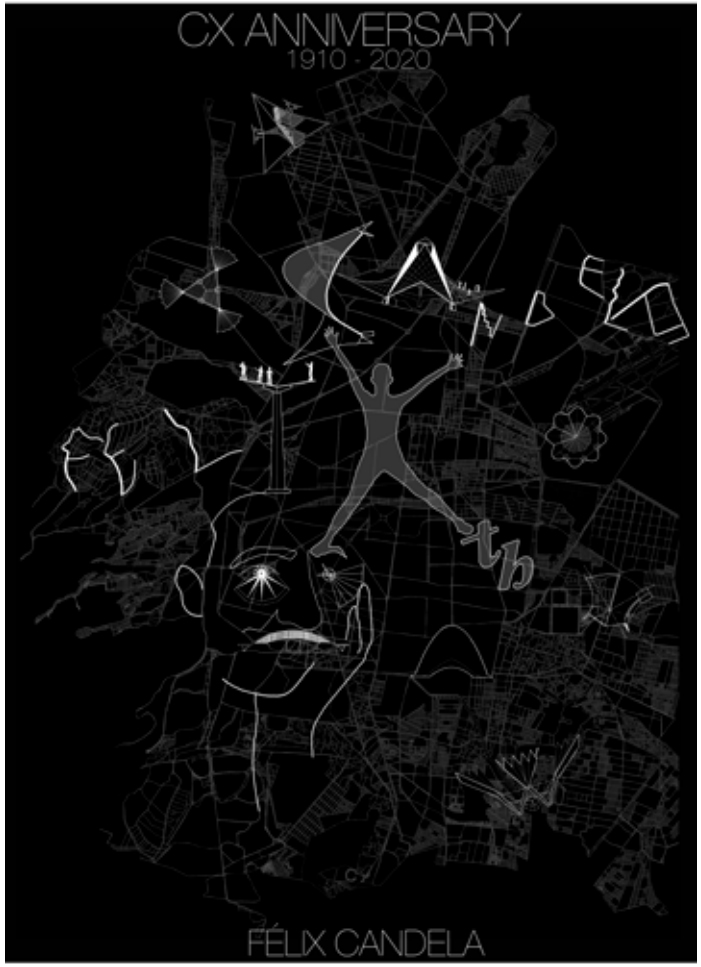


Lema: ENSOÑACIÓN

Registration Number: 098

Author: Carlos Baselga Rallo

University: Universidad San Jorge- España



Lema: CAPITÁN

Registration Number: 142

Author: Marine Lorne y Sánchez

University: Universidad San Pablo CEU, Madrid- Escuela Superior de Arquitectura- España

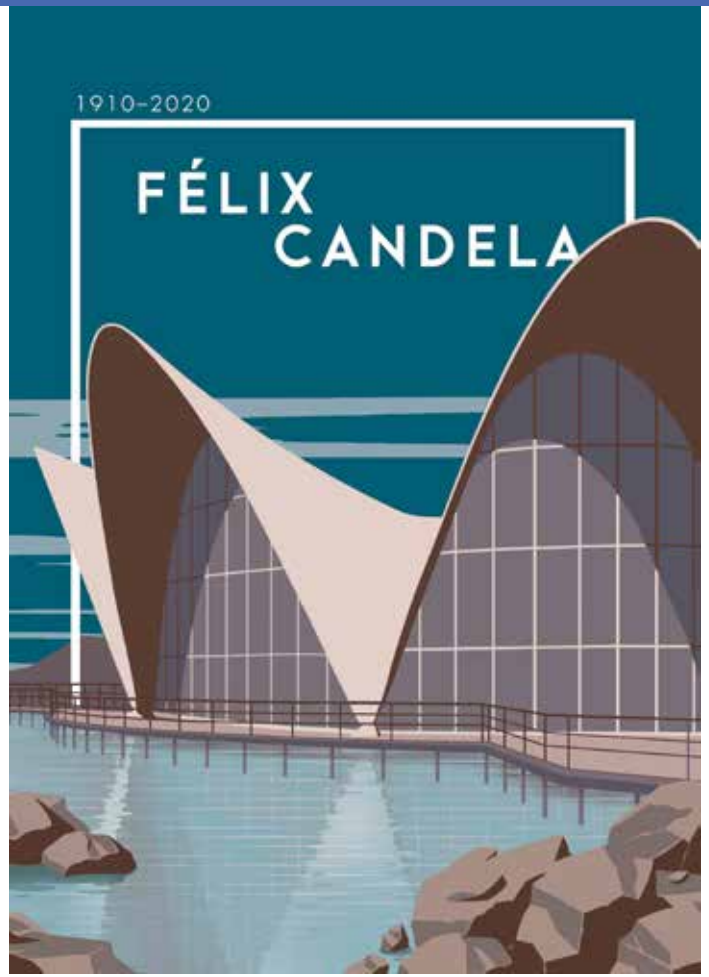
POSTERS - PARTICIPANTS
RUSSIA

Lema: SAMSARA

Registration Number: 049

Authors: Anastasia Kozel,
Maria Baykova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

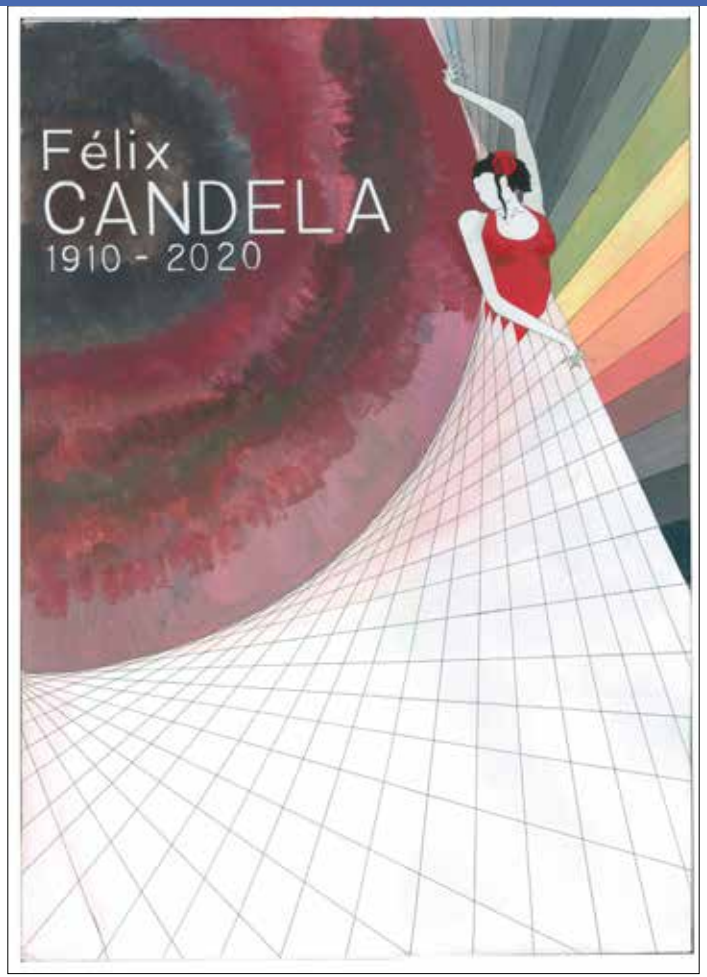


Lema: THREE SHADES

Registration Number: 082

Author: Viktoria Piskunova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: BEAUTY OF DANCE

Registration Number: 094

Author: Grigorii Briukhov

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

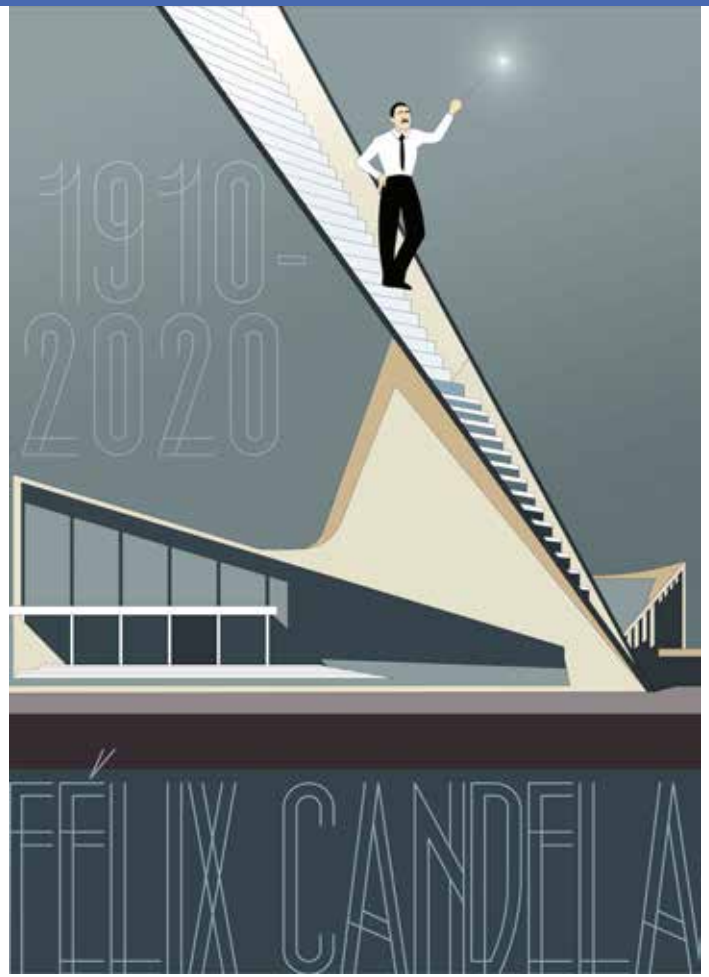
POSTERS - PARTICIPANTS
RUSSIA

Lema: LOOKING UP

Registration Number: 103

Author: Sergey Lebedev

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

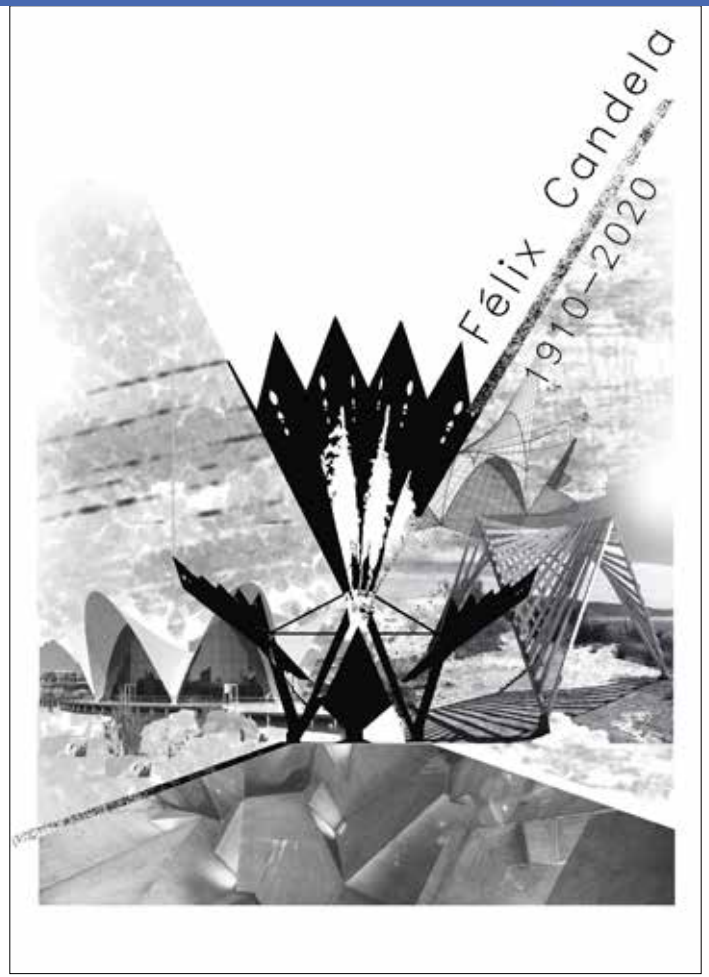


Lema: LIGHTENING STARS+SCHEME

Registration Number: 108

Authors: Natalia Teslina, Daria Cheblakova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



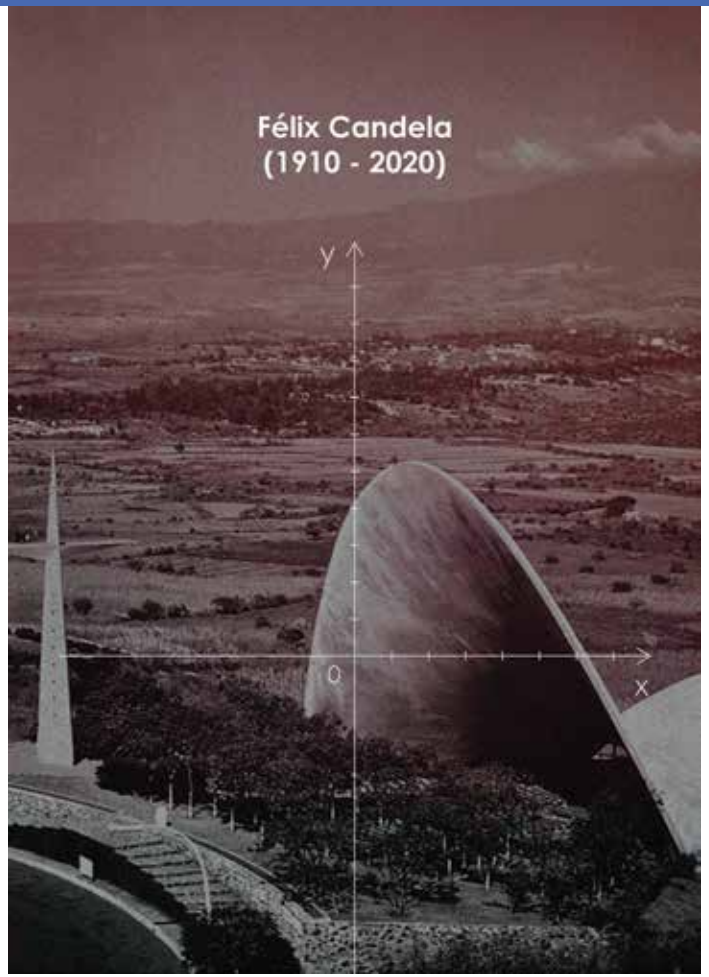
Lema: ARCHITECTURE

Registration Number: 110

Author: Maria Igorevna Kiseleva

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

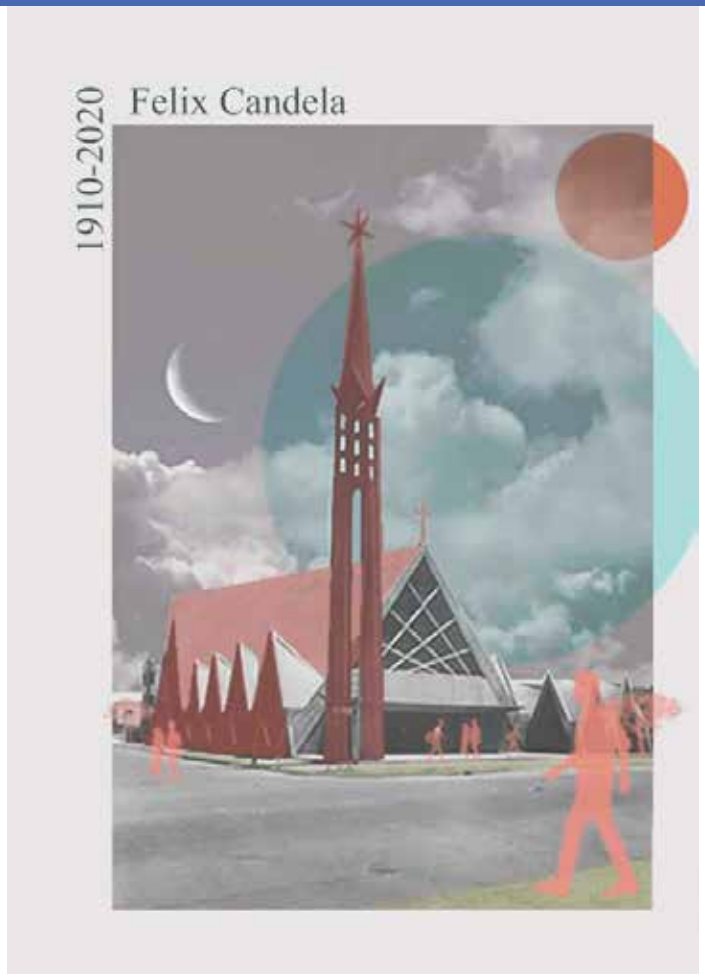


Lema: FUNCTION

Registration Number: 118

Author: Mirzakeyeva Bayan

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

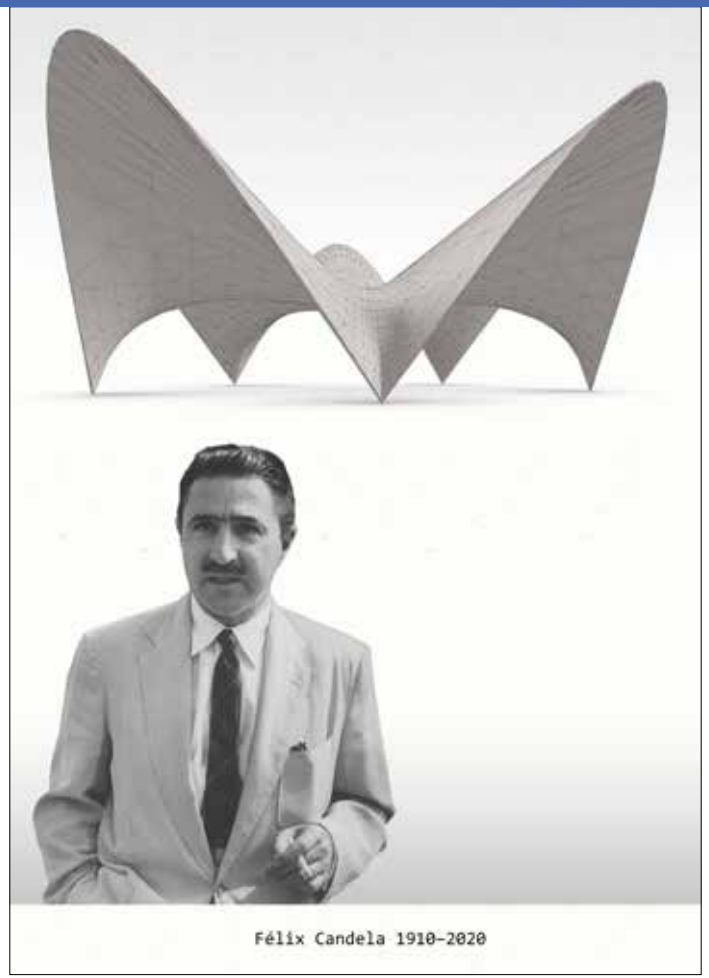


Lema: IMAGINATION

Registration Number: 120

Author: Elizabeth Valnuk

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



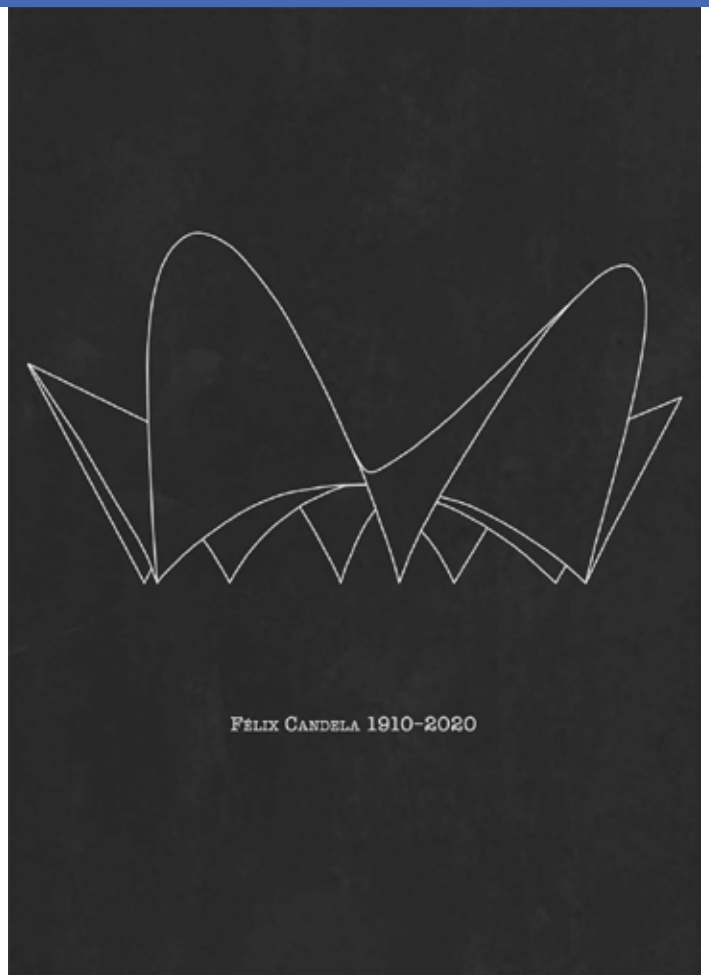
Lema: THE GREAT ARCHITECT

Registration Number: 122

Author: Daniil Shaposhnikov

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

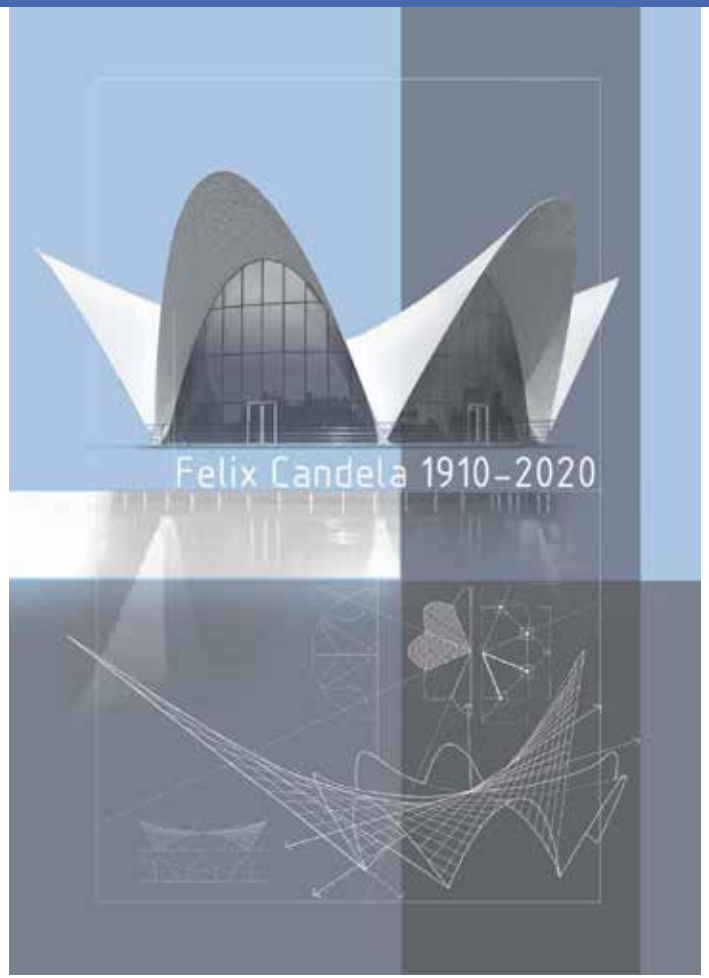


Lema: MEMORY

Registration Number: 123

Author: Danil Kharin

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

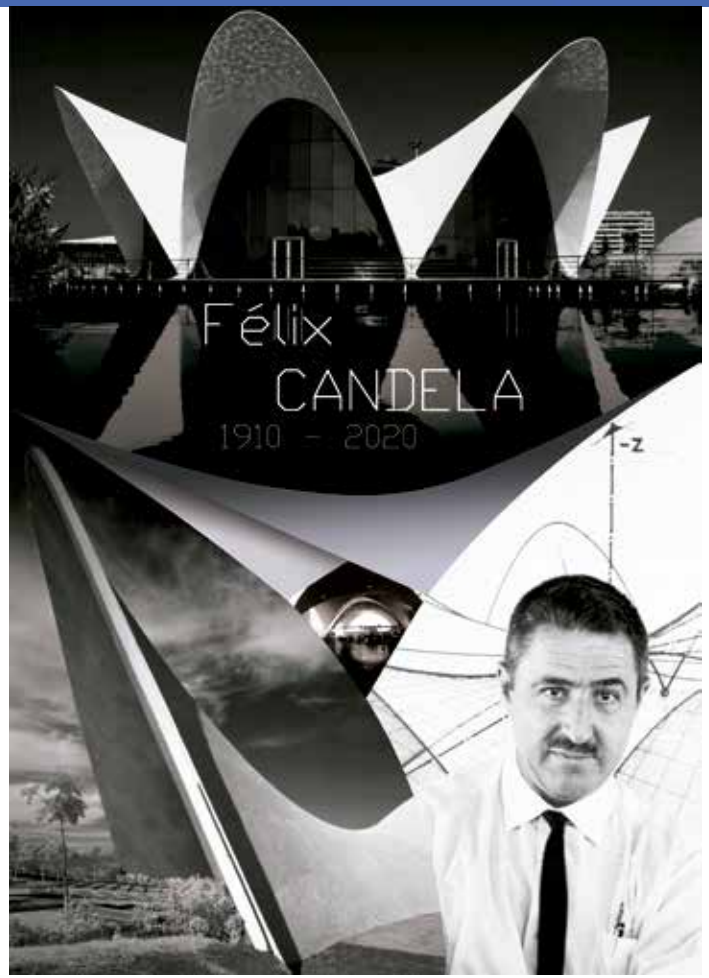


Lema: HIDDEN PART

Registration Number: 127

Author: Victoria Dmitrievna Provorova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: FINAL CURVE

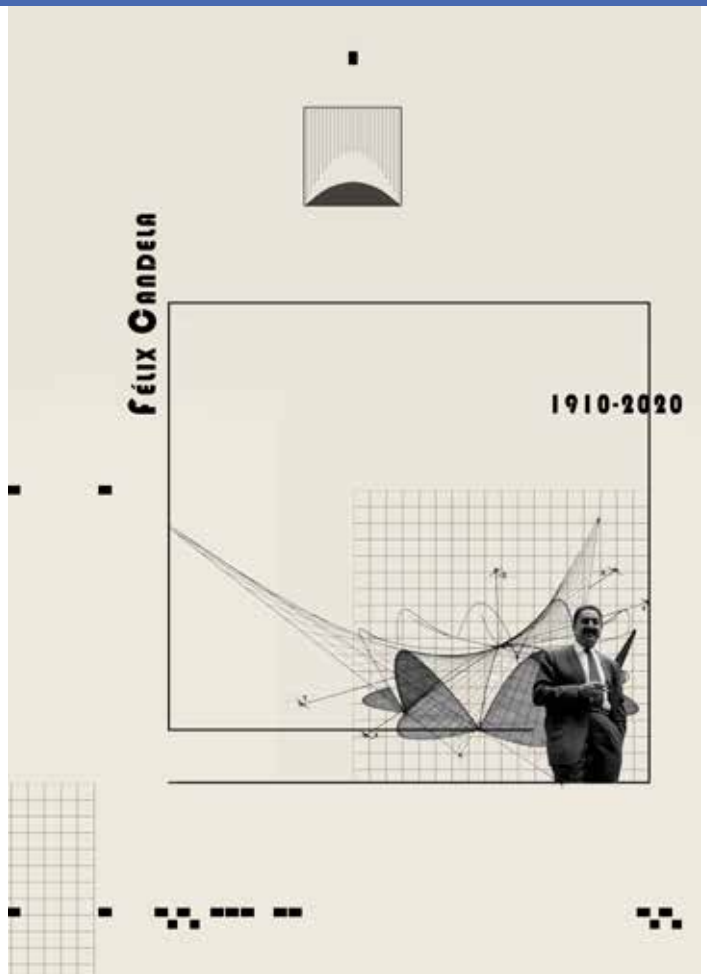
Registration Number: 129

Author: Omar Dadouche

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS

RUSSIA

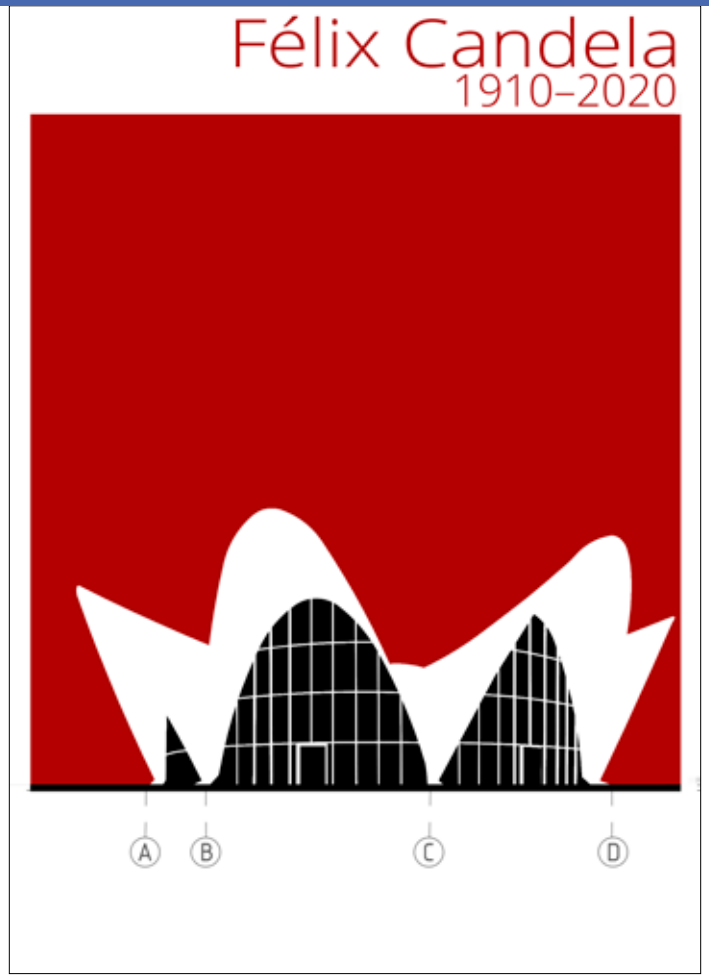


Lema: HARMONY SYMMETRY

Registration Number: 136

Author: Kristina Kaziimir

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

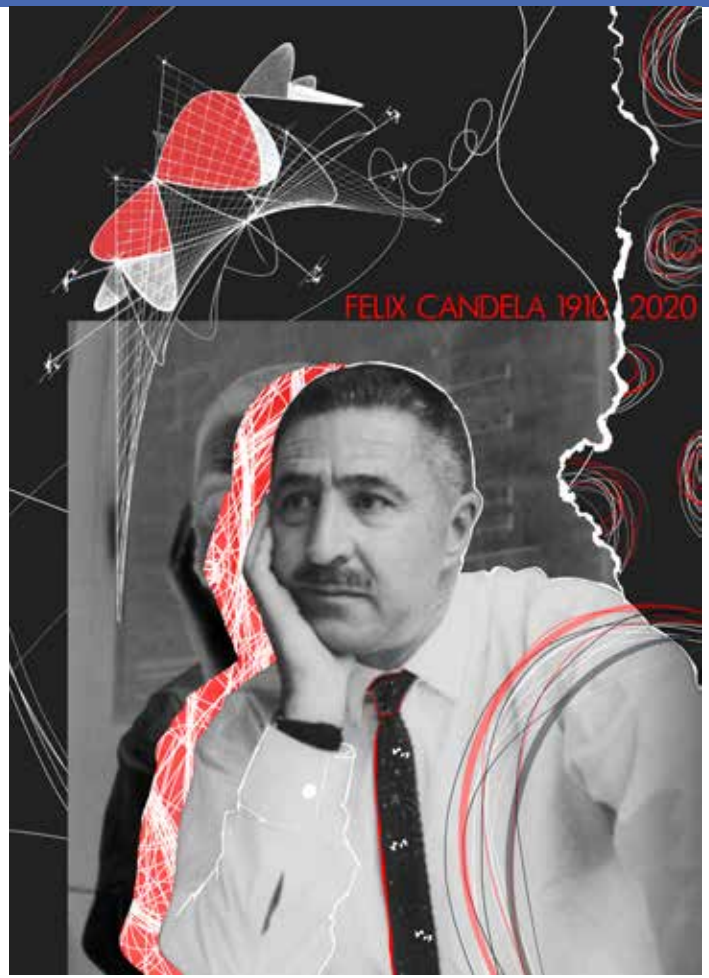


Lema: ARCH_DISAINN+DISKAM

Registration Number: 138

Author: Elena Chernova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: CONNECTING LINES

Registration Number: 139

Author: Victoria Pupentsova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

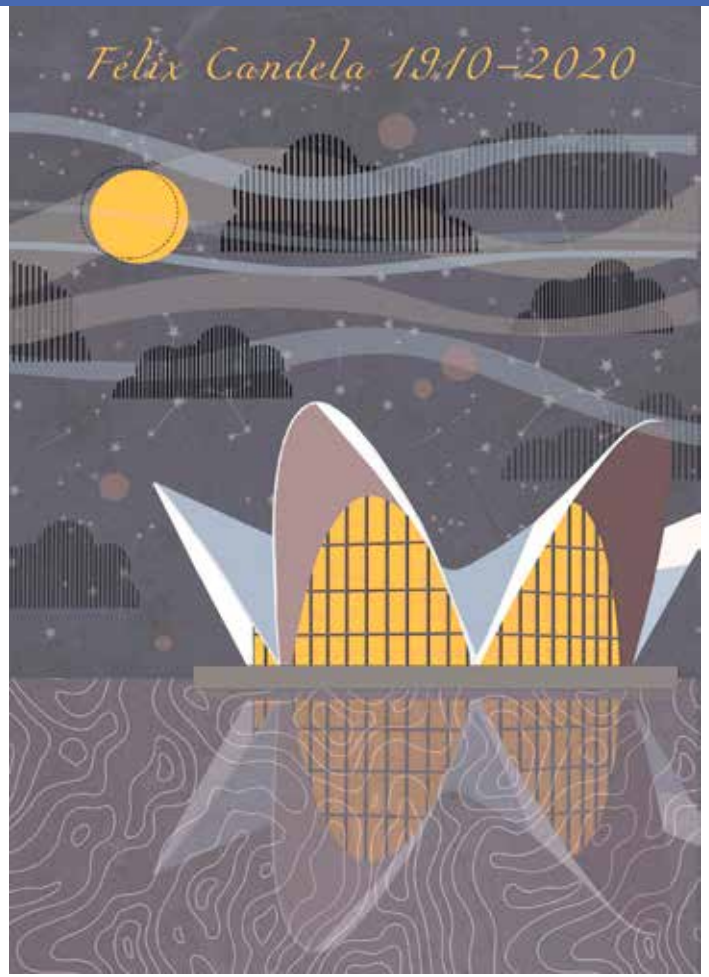
POSTERS - PARTICIPANTS
RUSSIA

Lema: ABSTRACTION

Registration Number: 140

Author: Asmik Sardaryan

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: MOONANDWATER

Registration Number: 141

Author: Yana Sinelnik

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

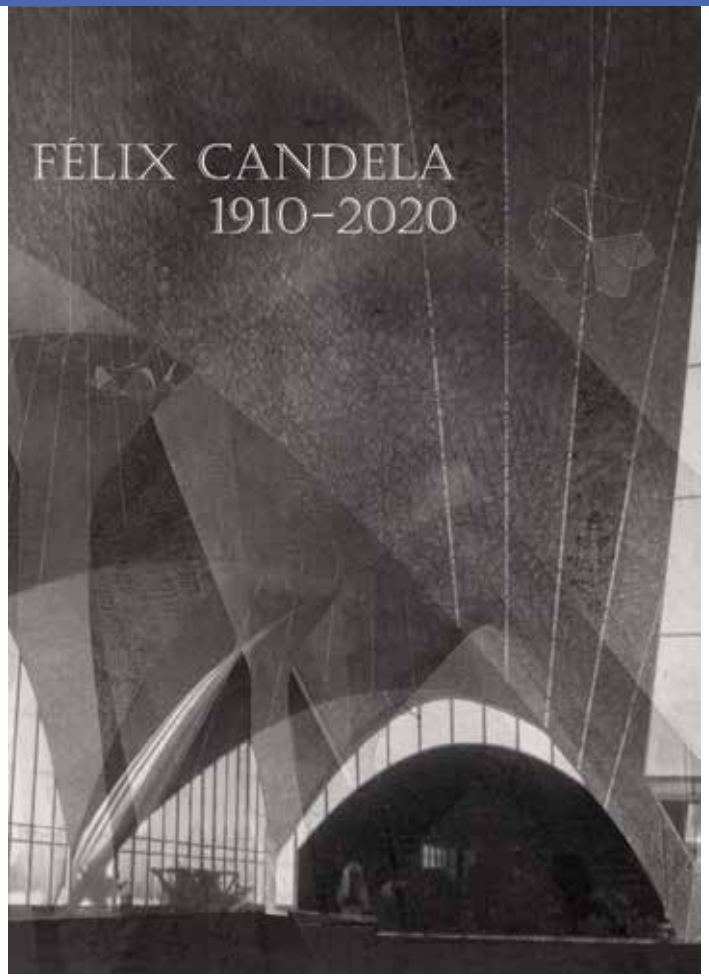
Lema: INSPIRATION

Registration Number: 144

Author: Ekaterina Rushinets

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA



Lema: BACARSKYDI

Registration Number: 145

Author: Arina Panchenko

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

Lema: SERENDIPITY

Registration Number: 146

Author: Anastasia Karandina

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

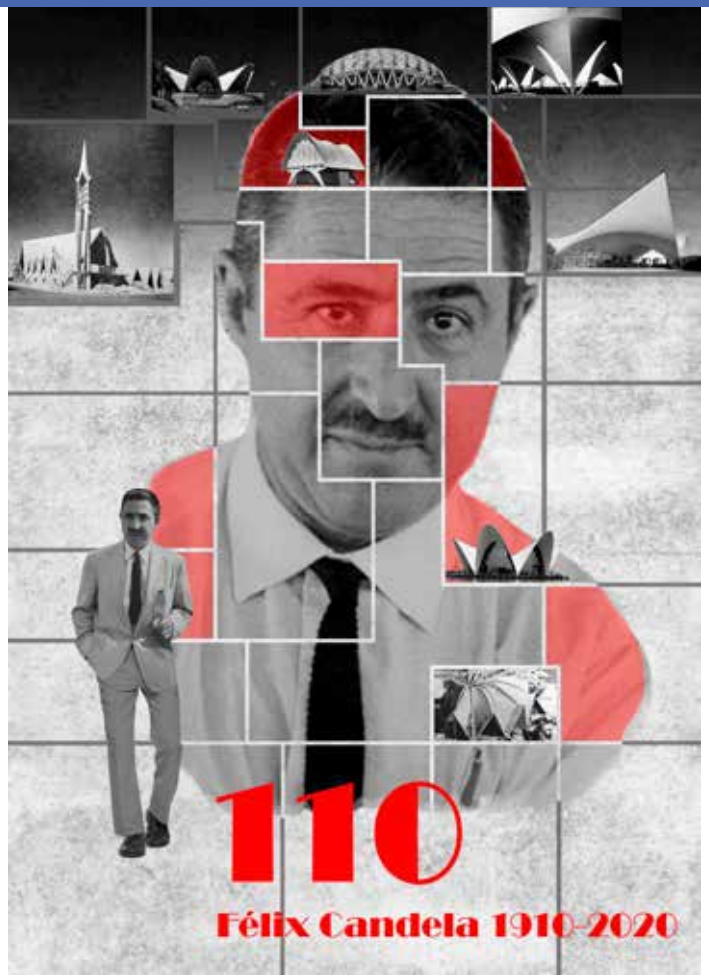
Lema: LEGADO

Registration Number: 147

Author: Anastasiia Kupriianova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

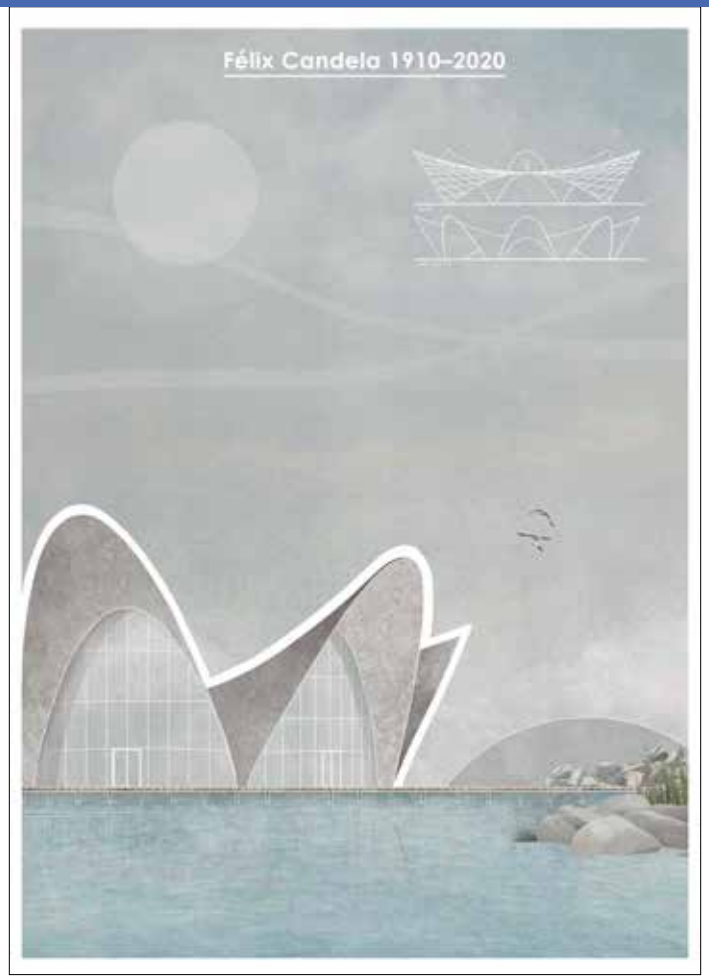


Lema: ENGINEERING ARCHITECTURE

Registration Number: 151

Author: Anna Krivorotova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

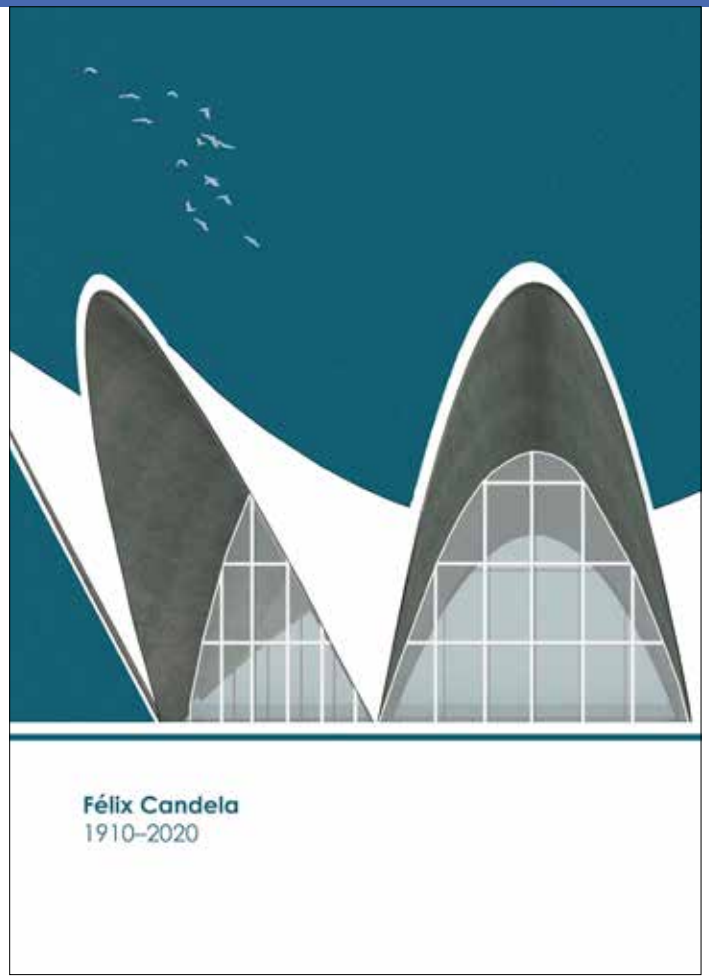


Lema: MORN

Registration Number:158

Author: Valentina Osokina

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



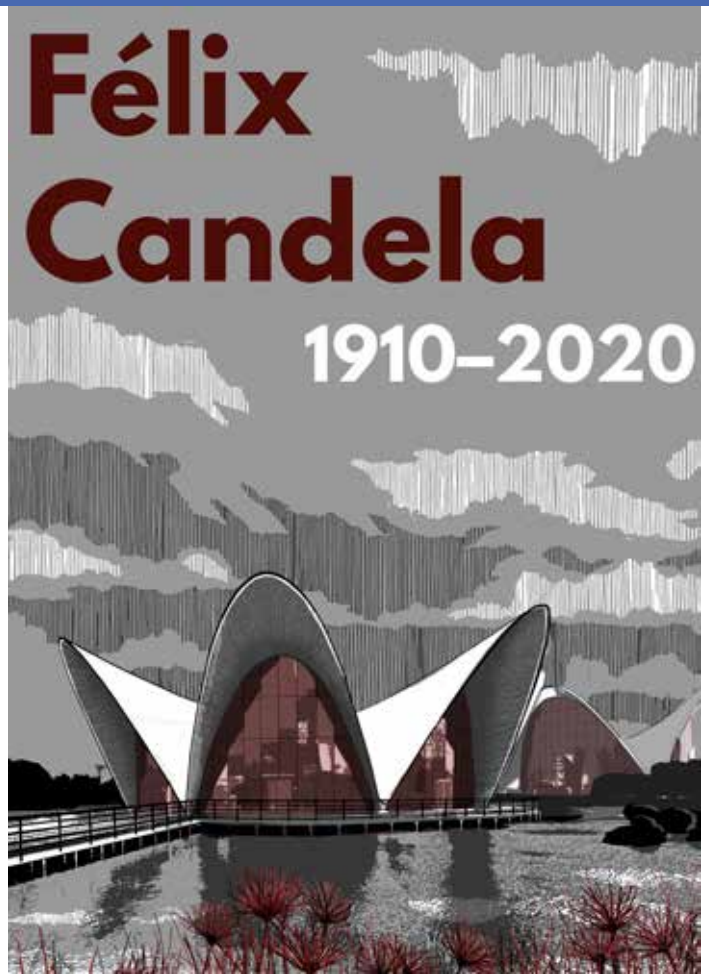
Lema: FLIGHT

Registration Number: 159

Author: Alena Alekseevna Nikiforova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

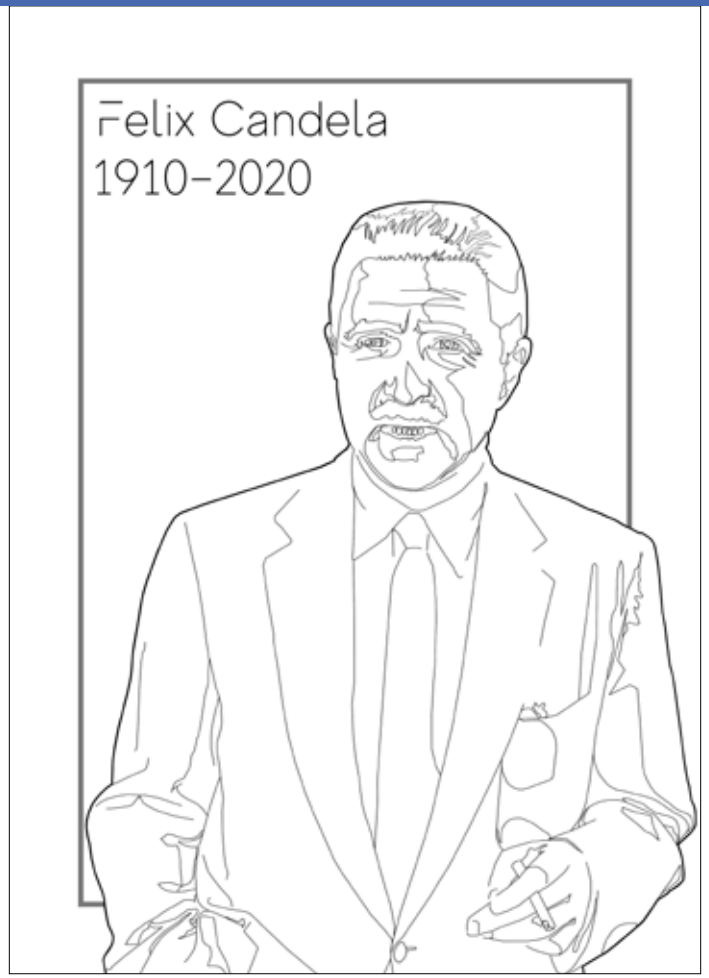


Lema: ETERNITY

Registration Number: 160

Author: Mariya Kolobowa

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

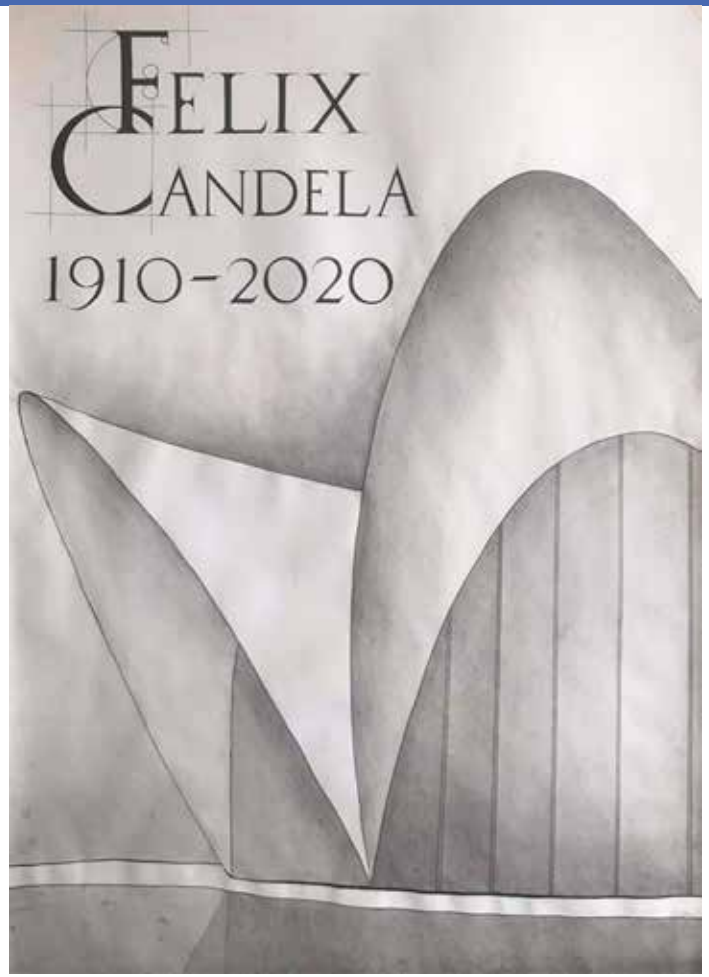


Lema: LINE

Registration Number: 162

Author: Inessa Anatolevna Bagmet

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



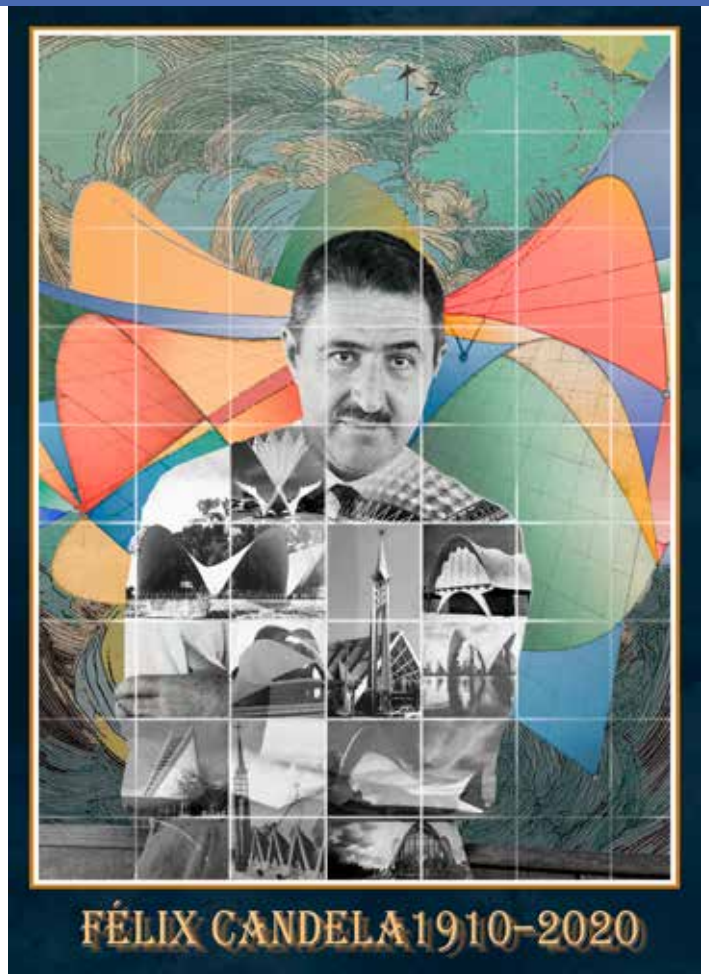
Lema: INK DRAWING

Registration Number:163

Author: Urvan Nionela

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA



Lema: INMORTAL ART

Registration Number: 164

Authors: Ofelia Tovmasyan, Voronina Ekaterina

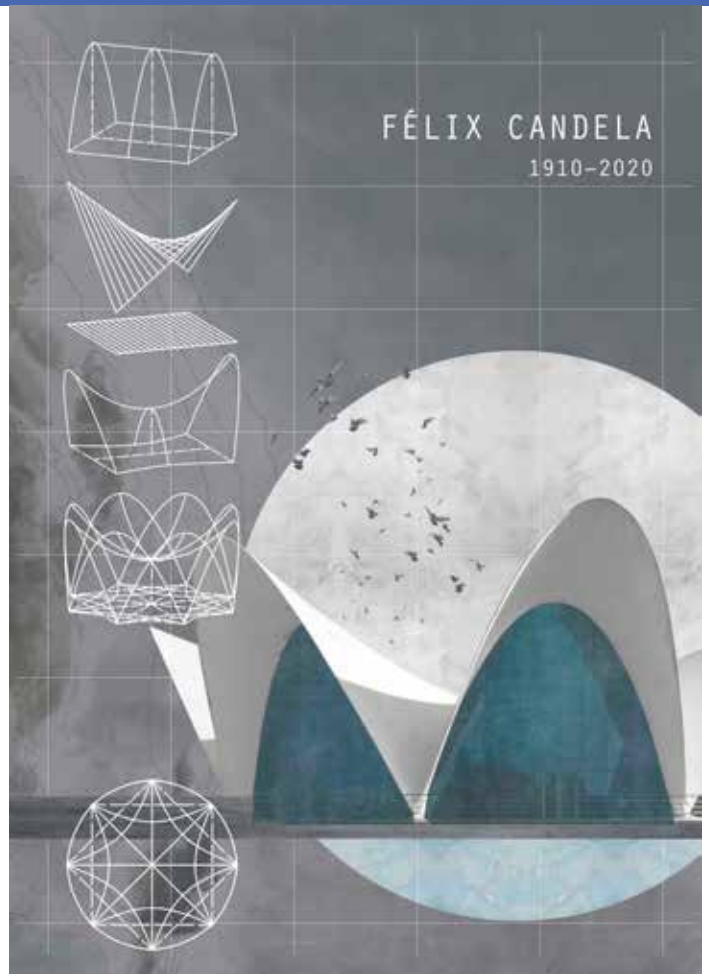
University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

Lema: EL AIRE

Registration Number: 165

Author: Ilia Krachkovskii

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: ARCHIMATHS

Registration Number: 166

Author: Anzhelika Bazhenova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

Lema: CONTINUITY

Registration Number: 169

Author: Andrew Zima

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

Lema: SUNSET

Registration Number: 170

Author: ARINA PYATTOEVA

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

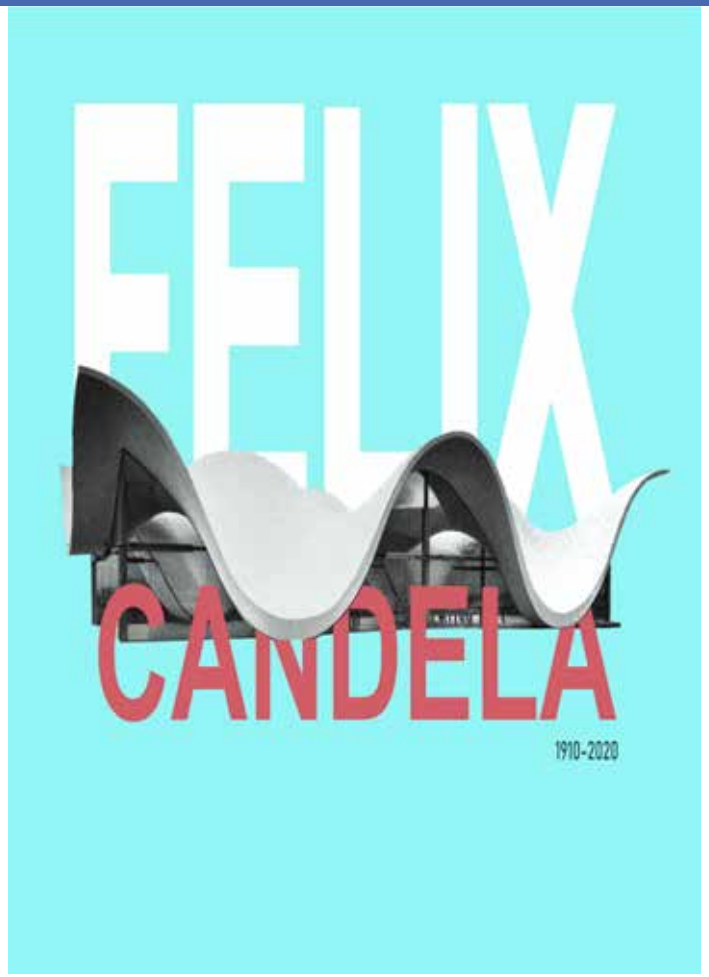
Lema: FLY

Registration Number: 191

Author: Daniil Vasiliev

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

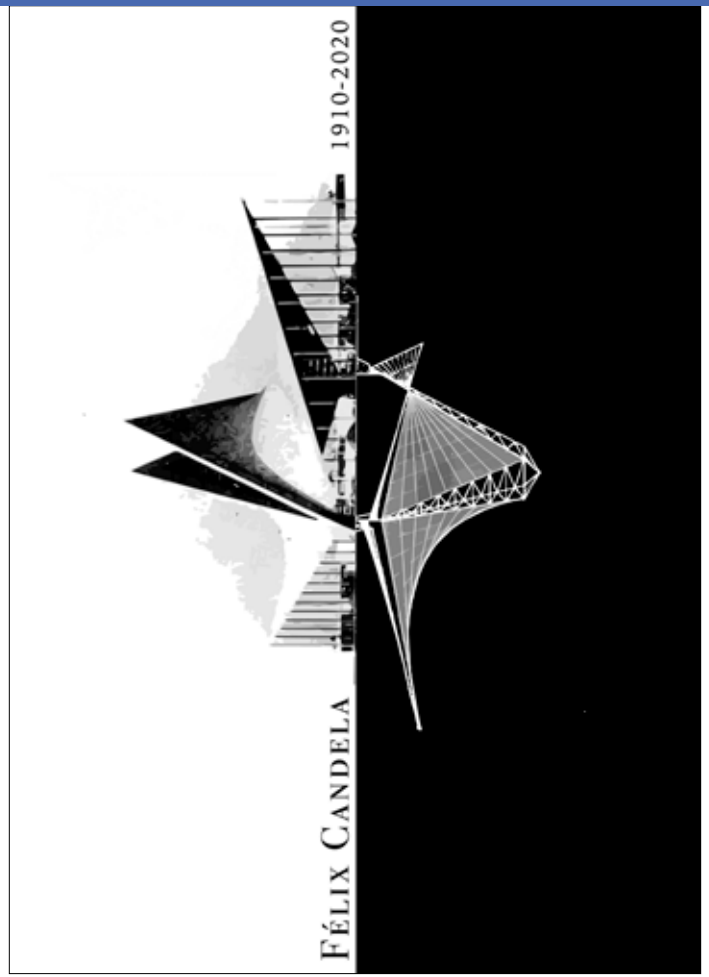


Lema: THROUGH TIME

Registration Number: 194

Author: Polina Tokareva

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

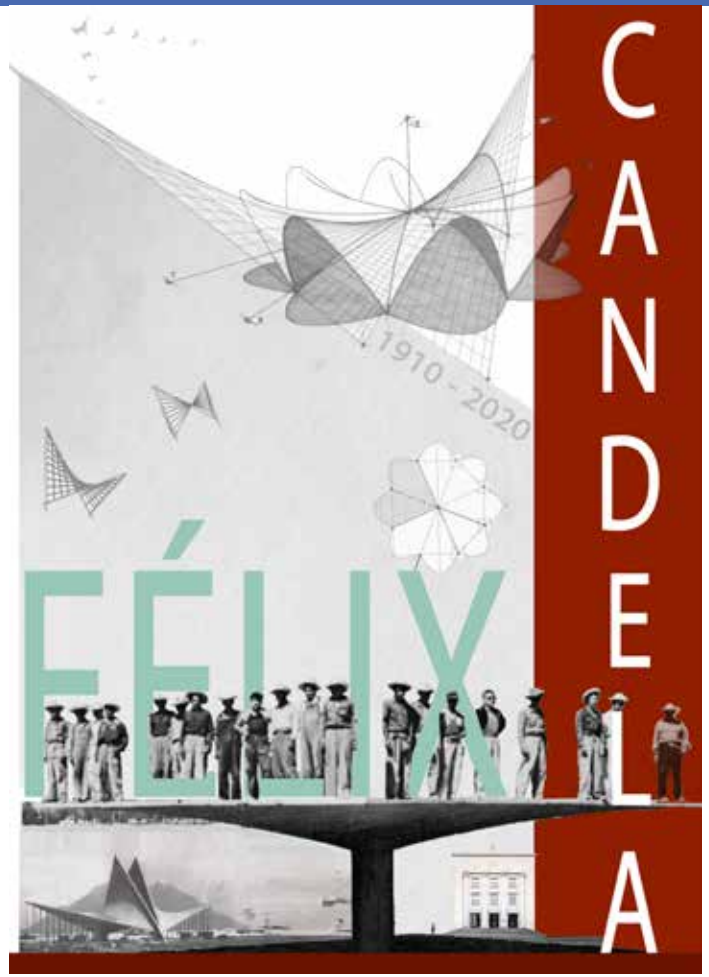


Lema: OFF WHITE

Registration Number: 198

Author: Antonina Andreevna Mazepa

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: REVIVE THE IDEA

Registration Number: 202

Author: Alexandra Soloveva

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

Lema: LIGHT

Registration Number: 204

Author: Arina Suvorova

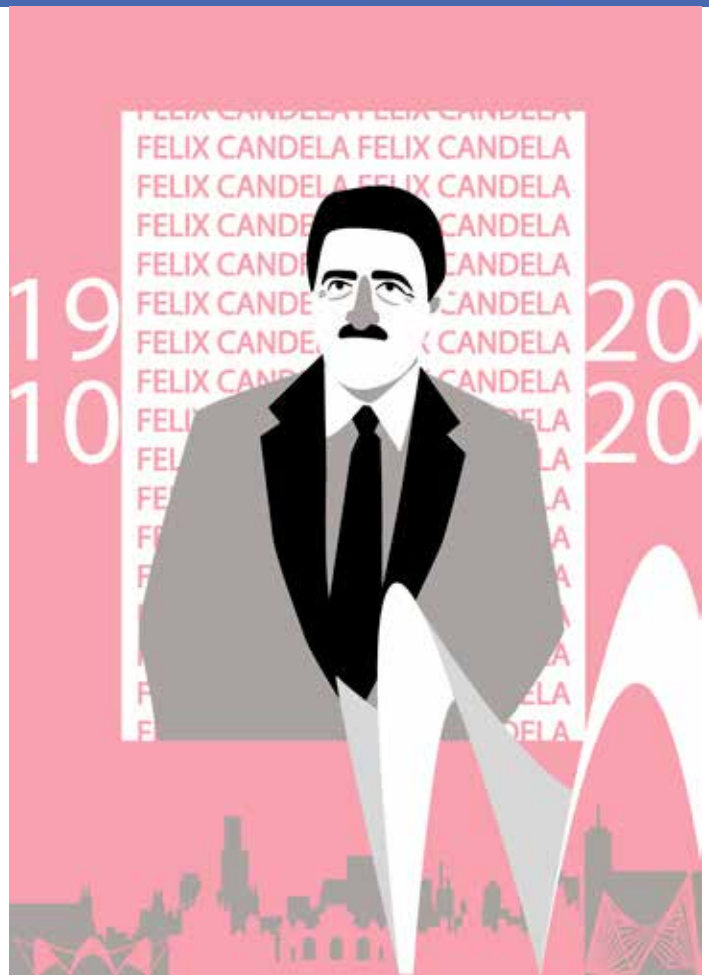
University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

Lema: FUTURE CONCRETE

Registration Number: 207

Author: Shvedova Uliana Viacheslavovna

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



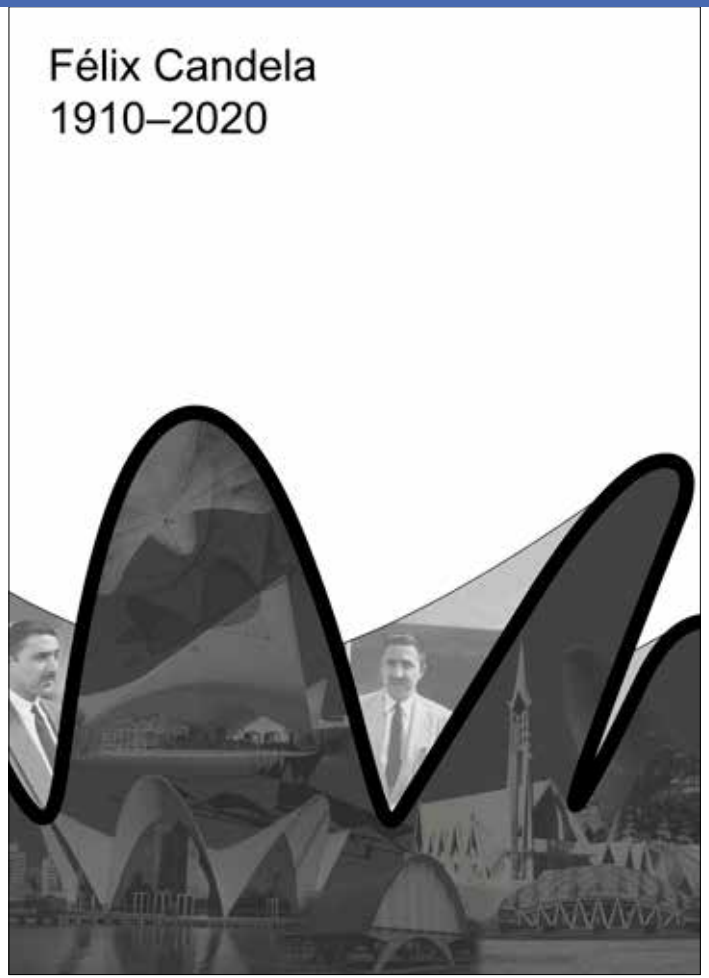
Lema: AXIS

Registration Number: 223

Author: Anna Goldobina

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS
RUSSIA

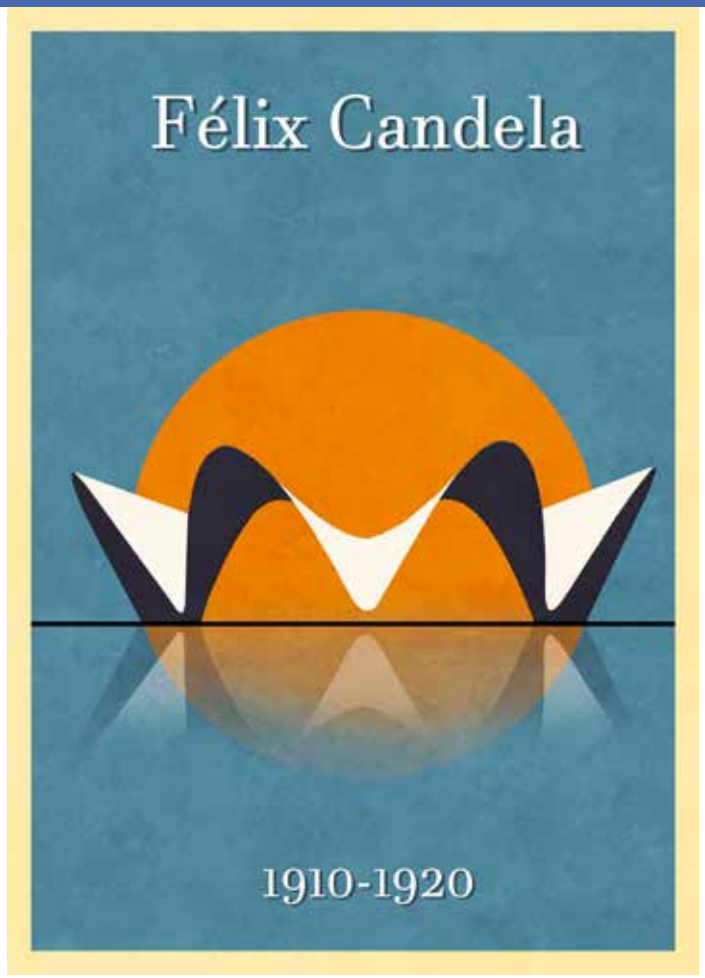


Lema: VALUE

Registration Number: 225

Author: Alena Andreevna Zhigalova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

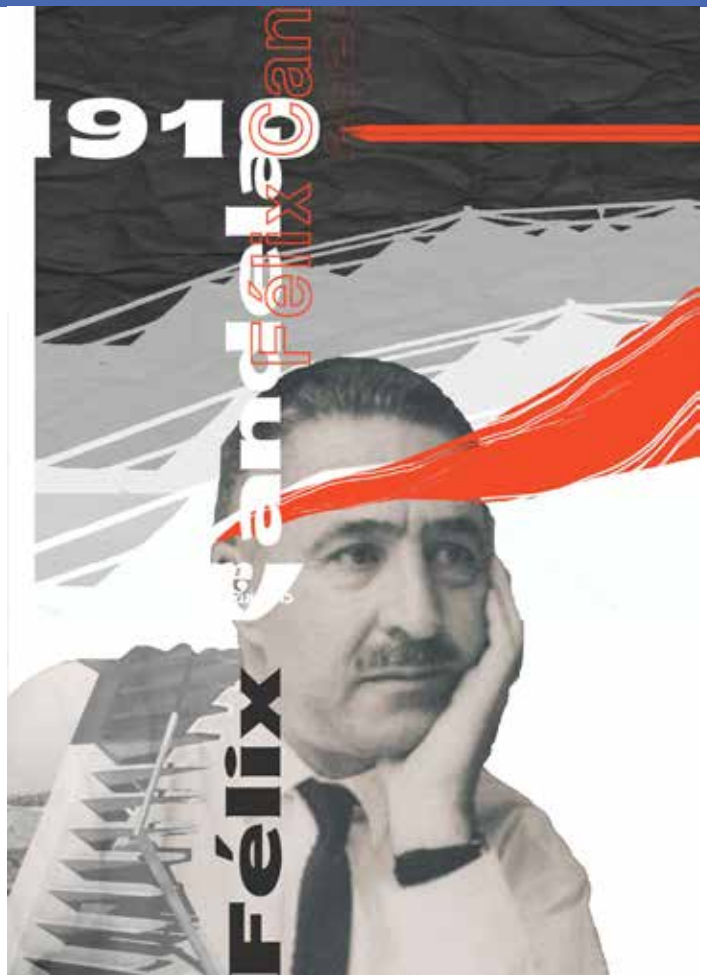


Lema: SUNRISE

Registration Number: 227

Author: Aleksandra Aleksandrovna Shishova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: AETHEREALITY

Registration Number: 236

Author: Maria Soboleva

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

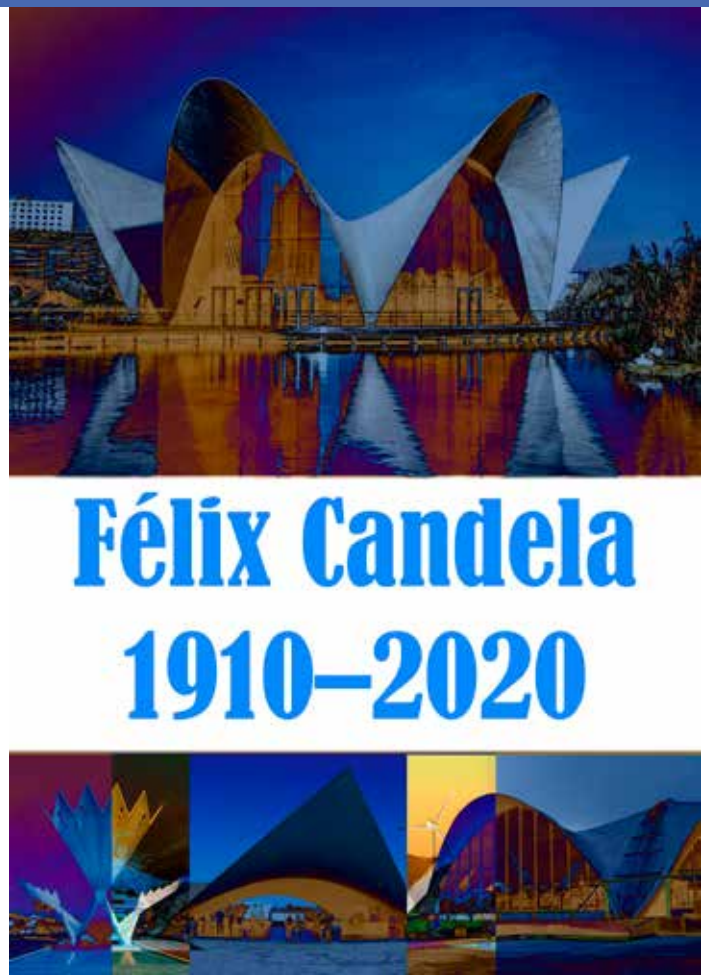
POSTERS - PARTICIPANTS
RUSSIA

Lema: TOBY

Registration Number: 246

Author: Nguyen Diu Thanh Truc

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

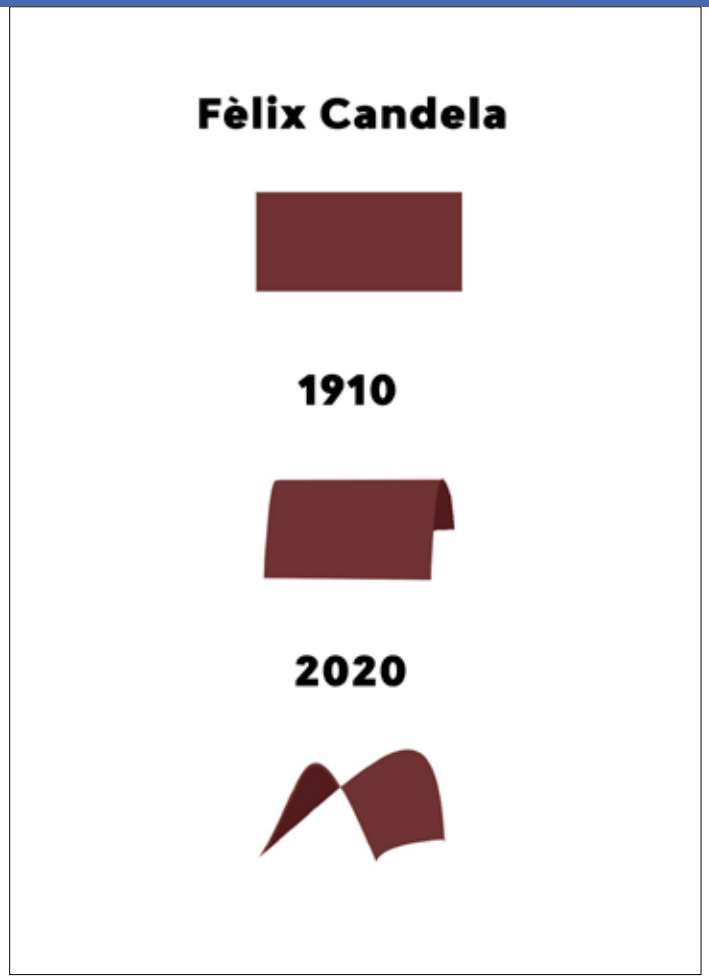


Lema: MOLPA

Registration Number: 248

Author: Diana Vladimirovna Polyashova

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA



Lema: POSTER

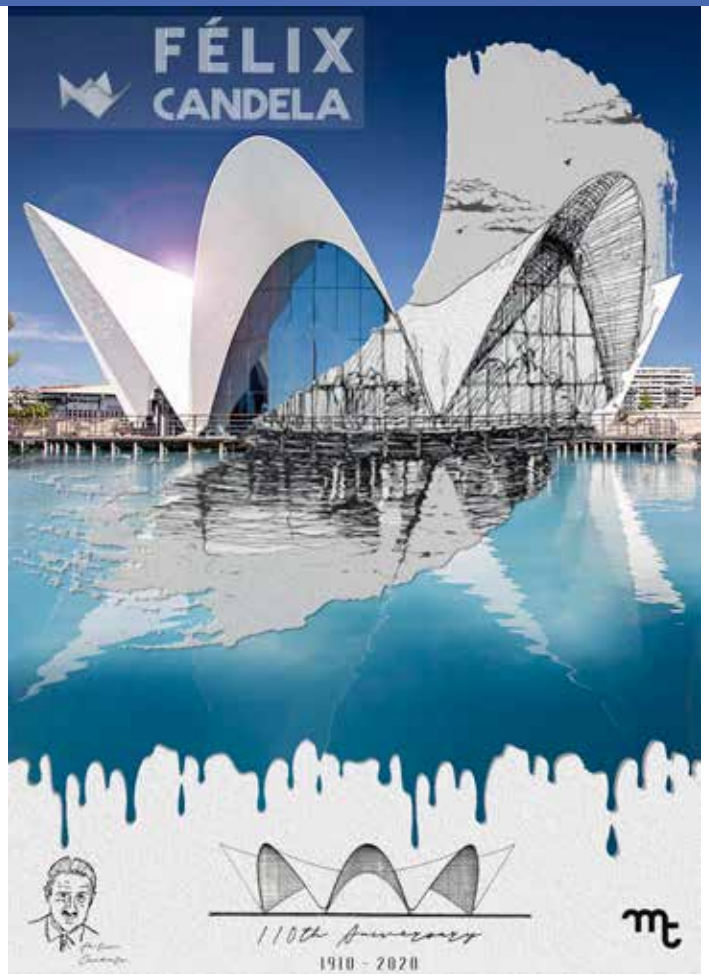
Registration Number: 253

Author: Serzina Karolina Ivanovna

University: Saint Petersburg State University of Architecture and Civil Engineering. SPbGASU. RUSSIA

POSTERS - PARTICIPANTS

MEXICO



Lema: TINTES DE INGENIO

Registration Number: 006

Author: Mario Testelli Flores

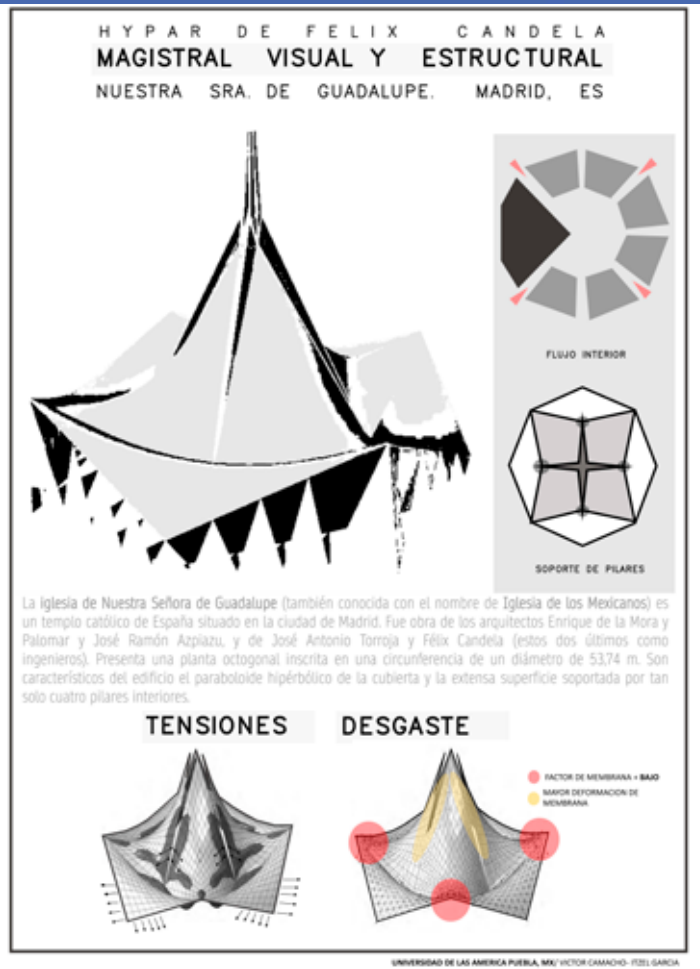
University: Universidad Iberoamericana Campus México- México

Lema: SILLA CÓSMICA

Registration Number: 011

Authors: Fernando Beulo Valdes, Alejandro Beulo Valdés

University: Universidad de las Américas Puebla (UDLAP)- México



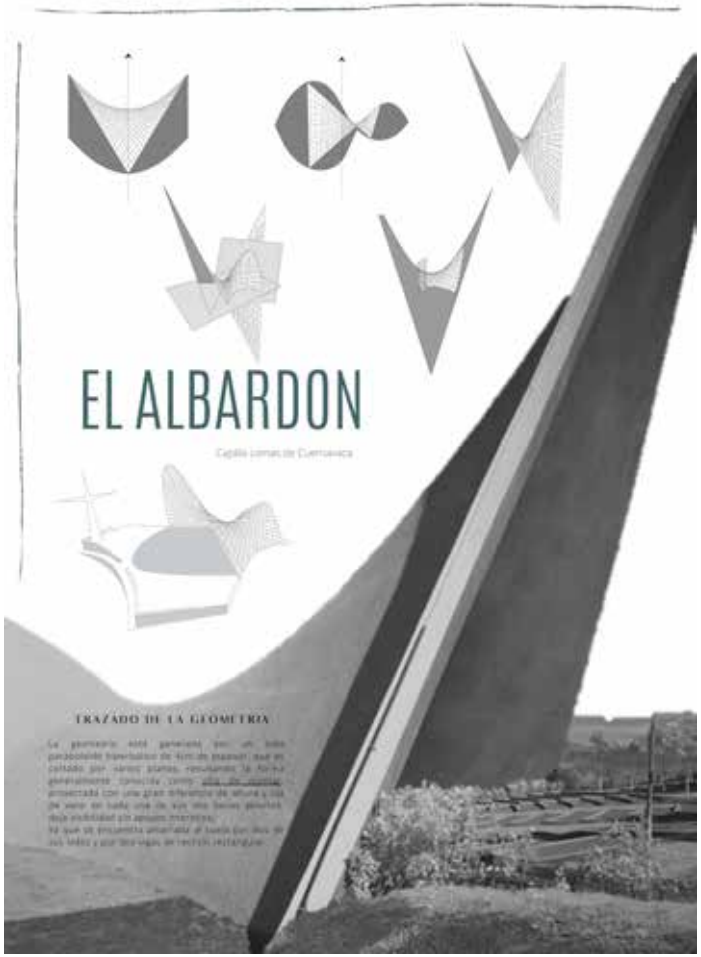
Lema: MAGISTRAL VISUAL Y ESTRUCTURAL

Registration Number: 018

Authors: Victor Andrés Camacho, Itzel Esahí García Morales

University: Universidad de las Américas Puebla (UDLAP)- México

POSTERS - PARTICIPANTS
MEXICO

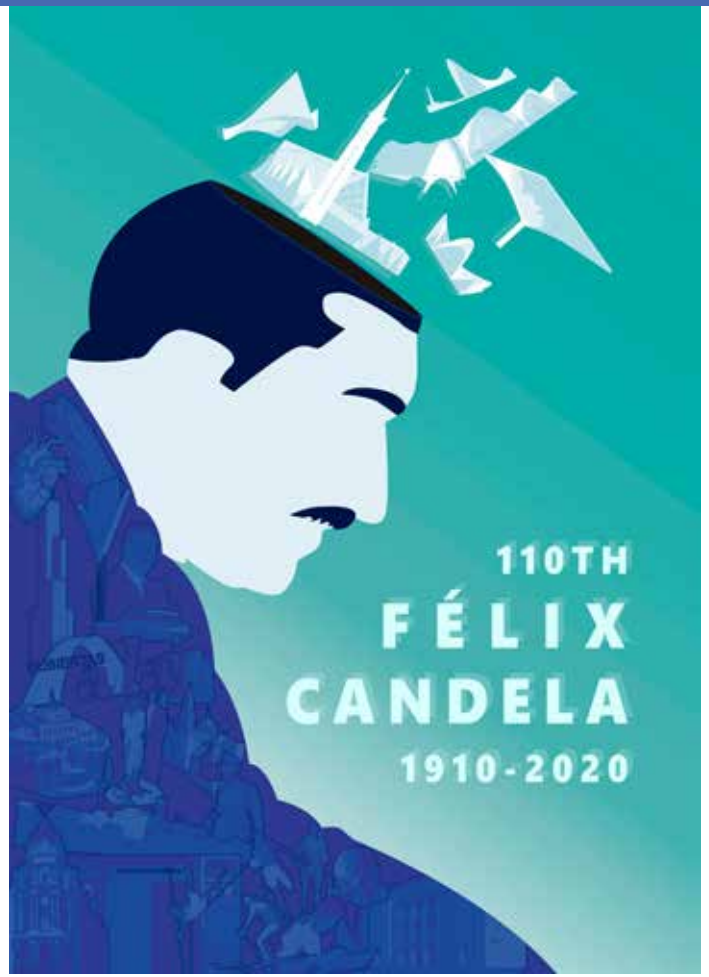


Lema: EL ALBARDÓN

Registration Number: 021

Authors: Rodrigo Montero, Maria Fernanda Loredo

University: Universidad de las Américas Puebla (UDLAP)- México

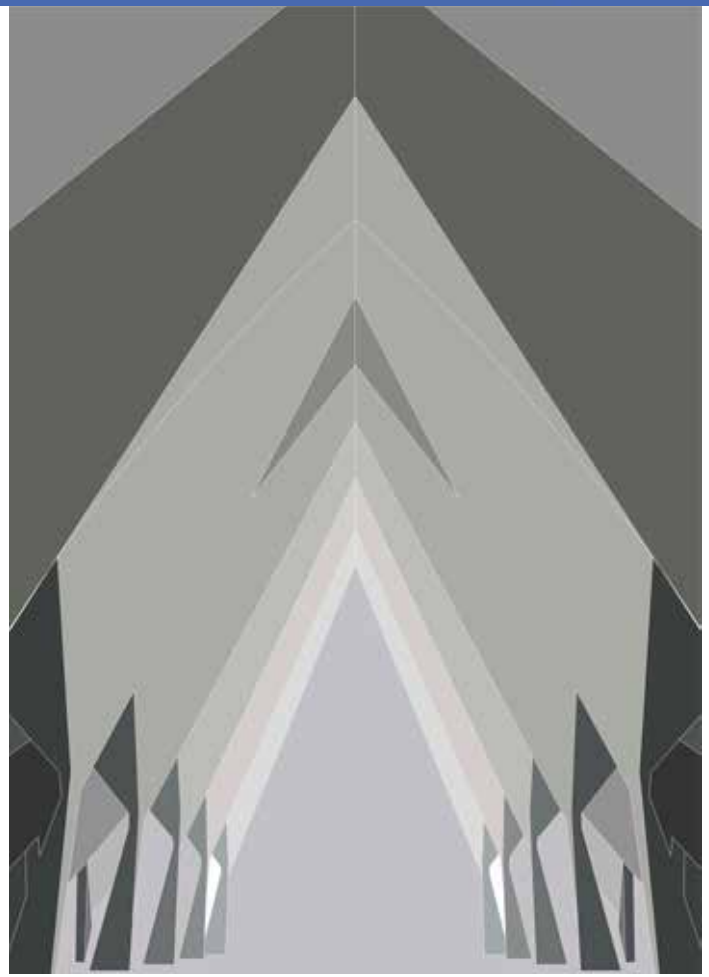


Lema: PIEZAS

Registration Number: 070

Author: Victoria Elizabeth Chávez Mora

University: Universidad del Valle de México (UVM, Campus Chihuahua)- México



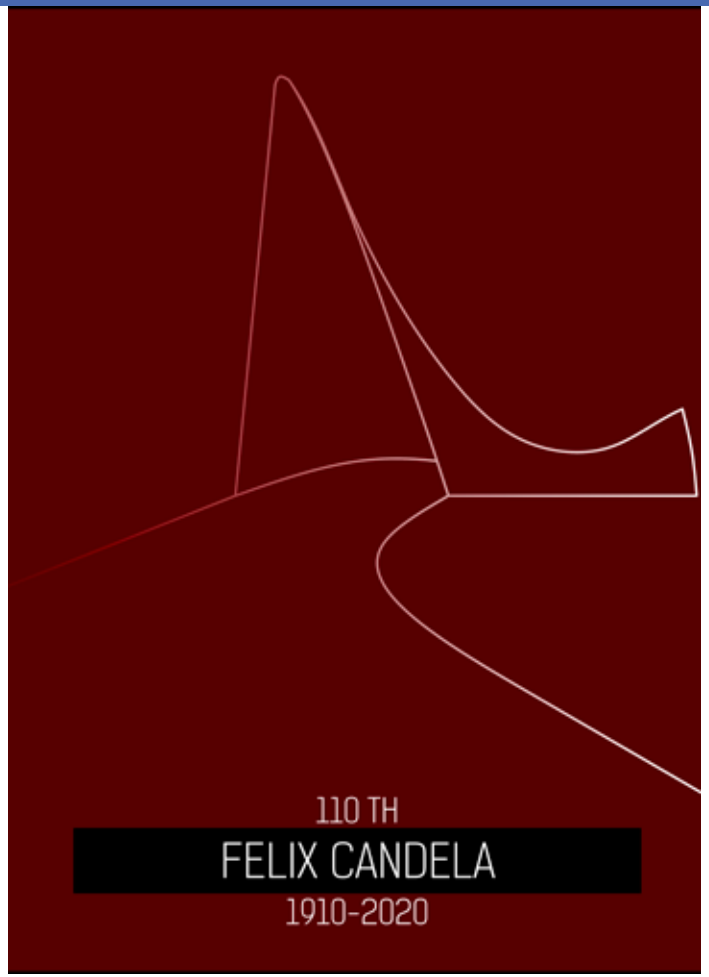
Lema: INNOVACIÓN GEOMÉTRICA

Registration Number: 096

Authors: Eric Alejandro García Piedras, Ariel Villa Lozada

University: Universidad Autónoma Metropolitana – Azcapotzalco – México

POSTERS - PARTICIPANTS
MEXICO

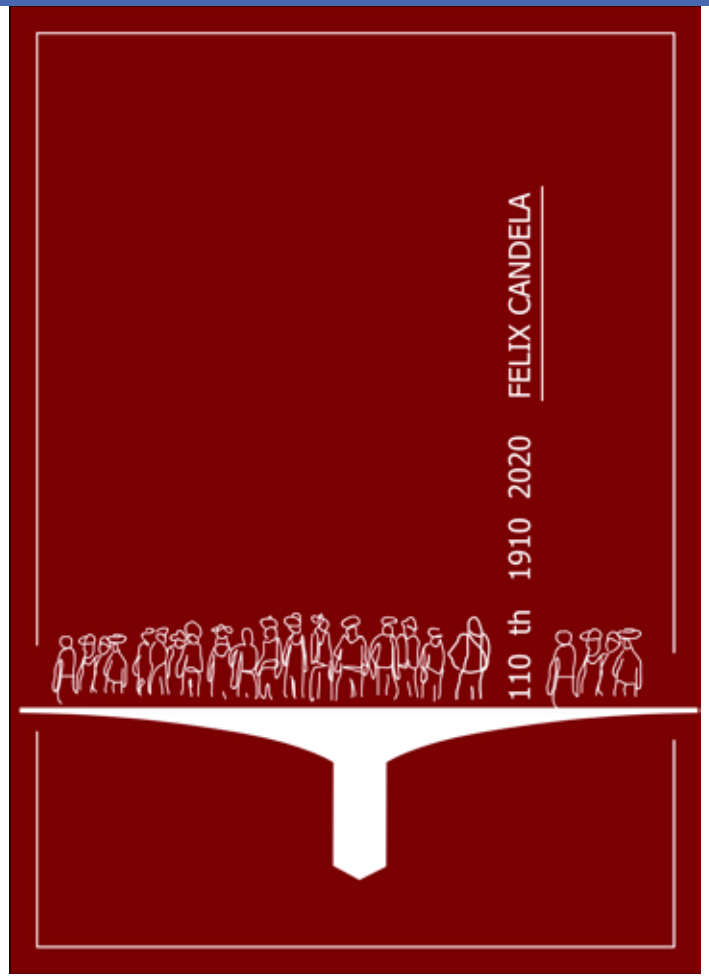


Lema: PARABLE

Registration Number: 195

Author: Jorge Vásquez Espinosa

University: Universidad Autónoma “Benito Juárez” de Oaxaca, Facultad de Arquitectura de la UABJO – México



Lema: CURVILINEA

Registration Number: 196

Author: José Francisco González Martínez

University: Universidad Autónoma “Benito Juárez” de Oaxaca, Facultad de Arquitectura de la UABJO – México

Lema: DESENLACE

Registration Number: 200

Authors: Karen Itzel, Contreras López

University: Universidad Autónoma “Benito Juárez” de Oaxaca, Facultad de Arquitectura de la UABJO – México

POSTERS - PARTICIPANTS
MEXICO

Lema: REVOLUCIÓN

Registration Number: 217

Author: José Eduardo Rangel Camacho

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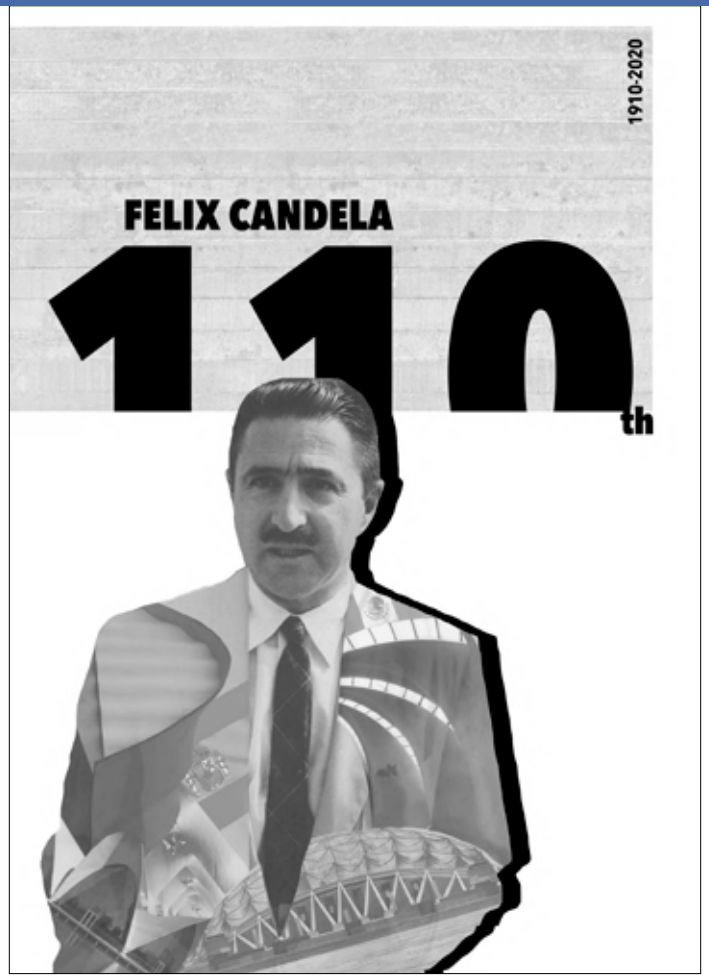
POSTERS - PARTICIPANTS
ARGENTINA

Lema: POLIS

Registration Number: 027

Author: Santiago Francia

University: Universidad Nacional de Rosario - Facultad de Arquitectura, Planeamiento y Diseño- Rosario, Santa Fe

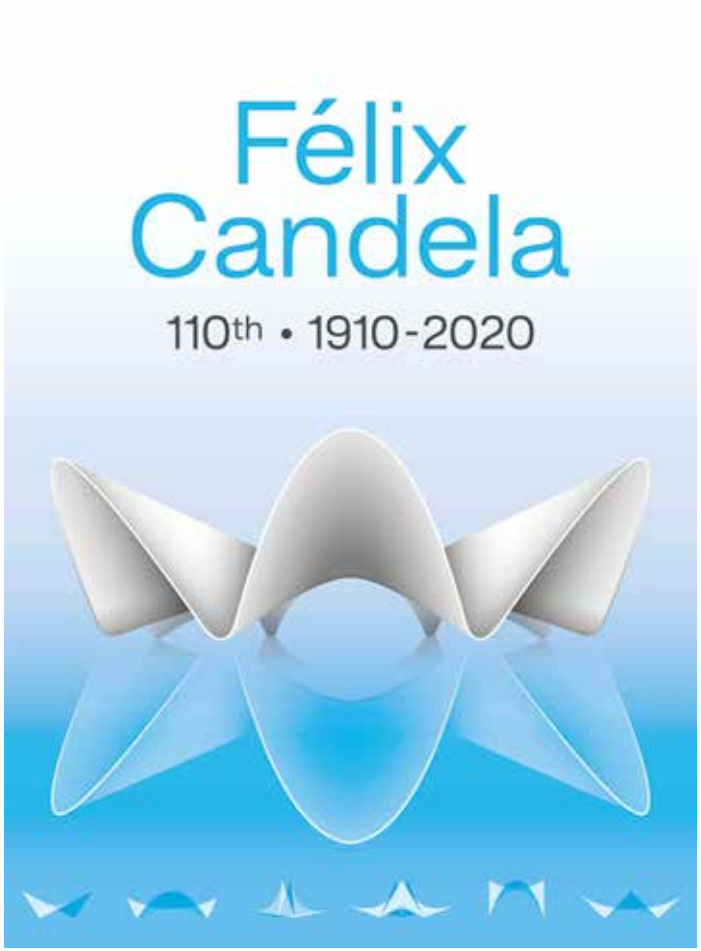


Lema: CONCRETO

Registration Number: 032

Author: Denise Dirienzo, Eugenia Domingo, Martina Lombardich

University: Universidad Nacional de Rosario - Facultad de Arquitectura, Planeamiento y Diseño - Rosario, Santa Fe



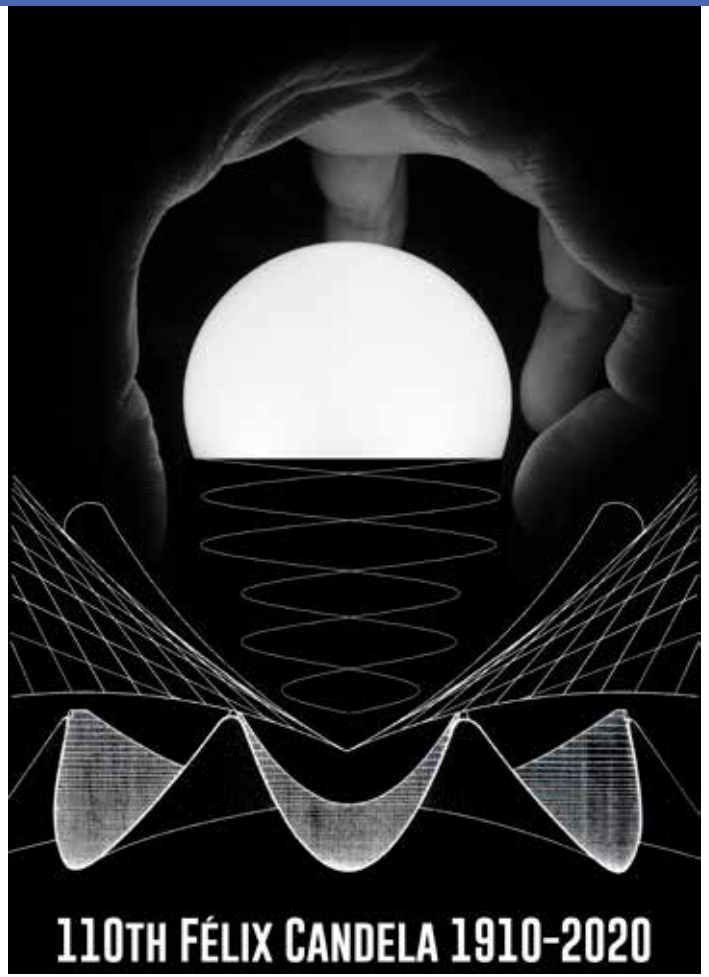
Lema: MAZINGER-Z

Registration Number: 041

Author: Germán Guillermo Rimancus

University: Universidad Nacional de La Plata- Facultad de Arquitectura y Urbanismo- Argentina

POSTERS - PARTICIPANTS
ARGENTINA



Lema: UMBRALUZ

Registration Number: 051

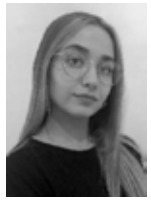
Author: Gastón Humberto Zacarías

University: Universidad Católica de Santa Fe. (U.C.S.F). Ciudad de Santa Fe – Argentina

Lema: HUELLA HISTÓRICA

Registration Number: 060

Authors: María Victoria Falivene
María Belén Hillar



University: Universidad Católica de Santa Fe. (U.C.S.F). Ciudad de Santa Fe – Argentina

Lema: SEBERA

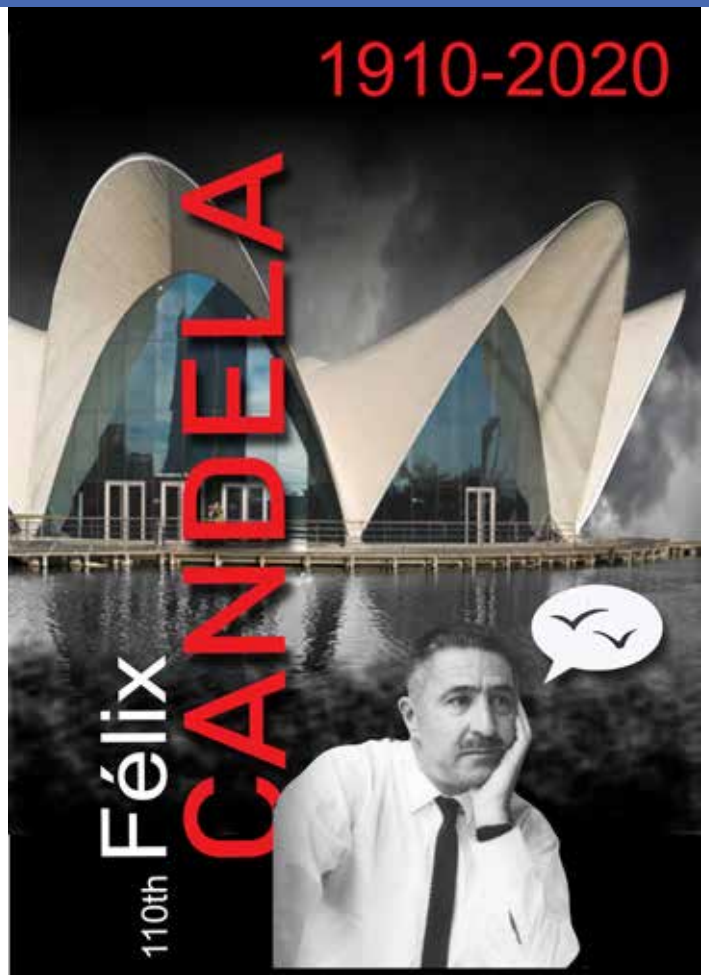
Registration Number: 063

Authors: Pilar Otero,
Lucio Mastrogiacomo

University: Universidad Nacional de Rosario - Facultad de Arquitectura, Planeamiento y Diseño- Rosario, Santa Fe

POSTERS - PARTICIPANTS

ARGENTINA

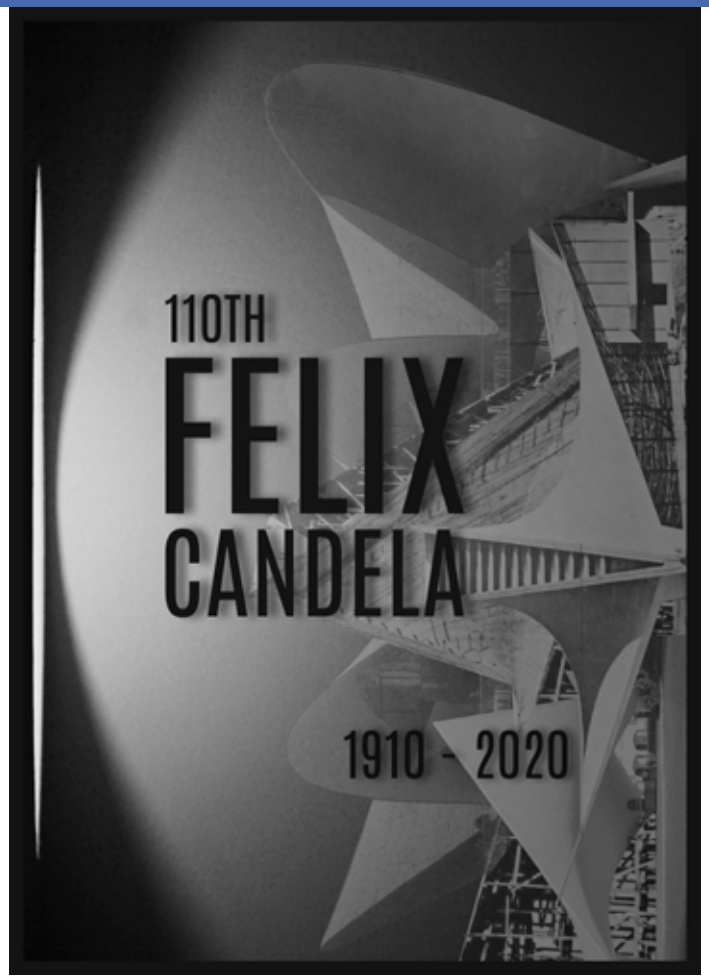


Lema: TECTÓNICO

Registration Number: 069

Author: Fernando Martínez Santillán

University: Universidad Nacional de Tucumán- Facultad de Arquitectura y Urbanismo – Argentina

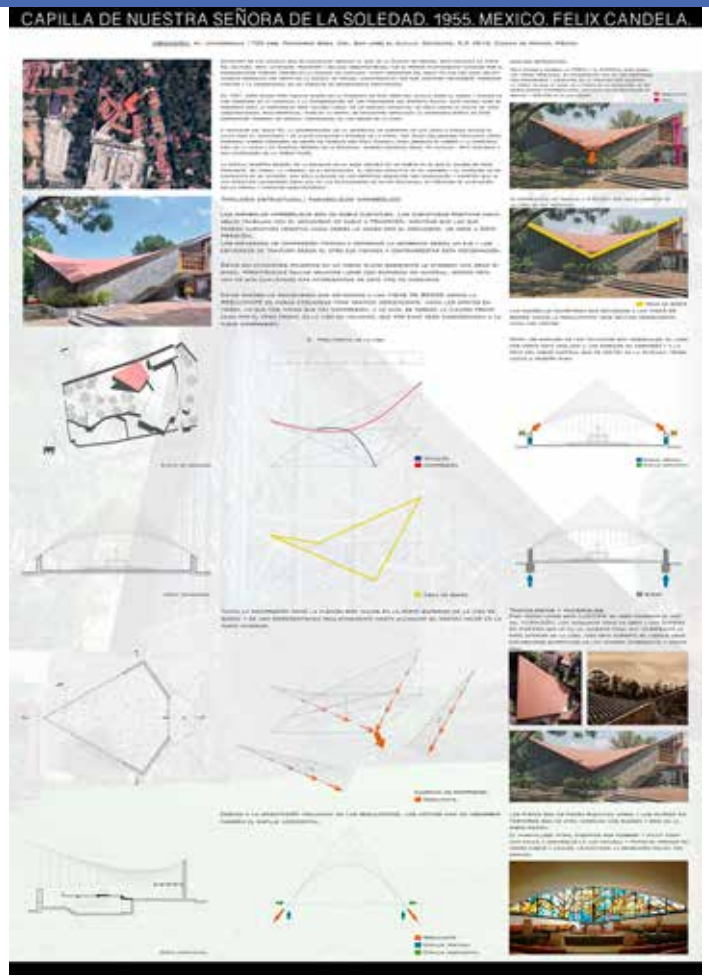


Lema: POMELOROSADO

Registration Number: 071

Author: Lucas Santiago, Juan Martín, Alana Ojalvo

University: Universidad Nacional del Litoral, Santa Fe- Argentina



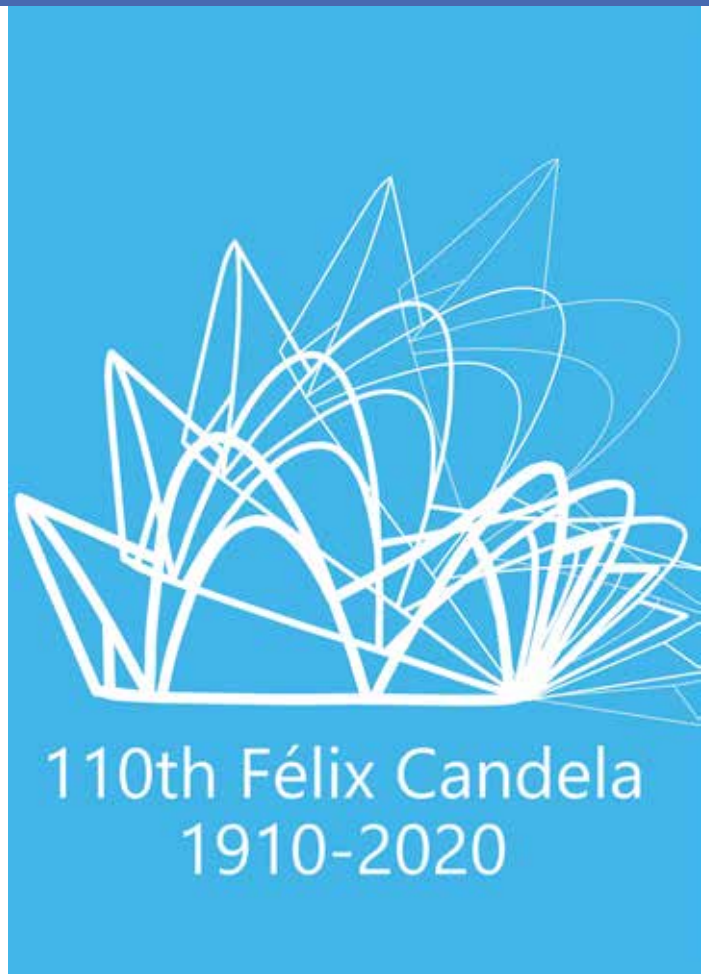
Lema: RENACER!

Registration Number: 087

Authors: Naiara Tais, Natali Solanille

University: Universidad Nacional de Rosario - Facultad de Arquitectura, Planeamiento y Diseño- Rosario, Santa Fe

POSTERS - PARTICIPANTS
PUERTO RICO

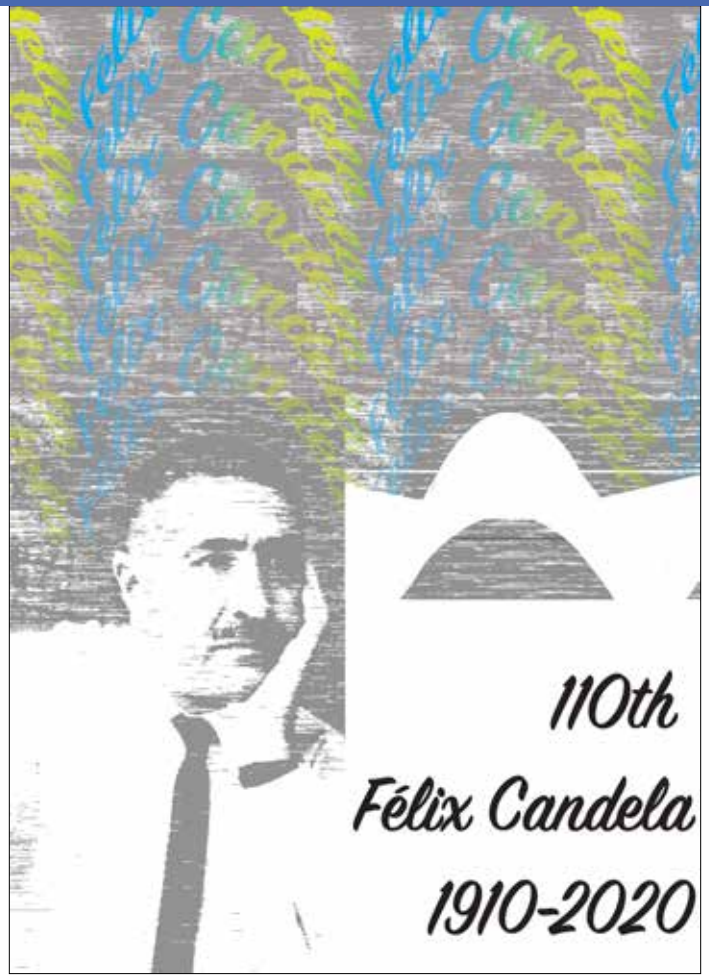


Lema: LUZ APACIBLE

Registration Number: 057

Author: Kinayshamar Cuadrado Andino

University: Universidad Politécnica de Puerto Rico



Lema: TRASCENDENCIA INIMAGINABLE

Registration Number: 059

Author: Kelly Ann Pérez Rodríguez

University: Universidad Politécnica de Puerto Rico

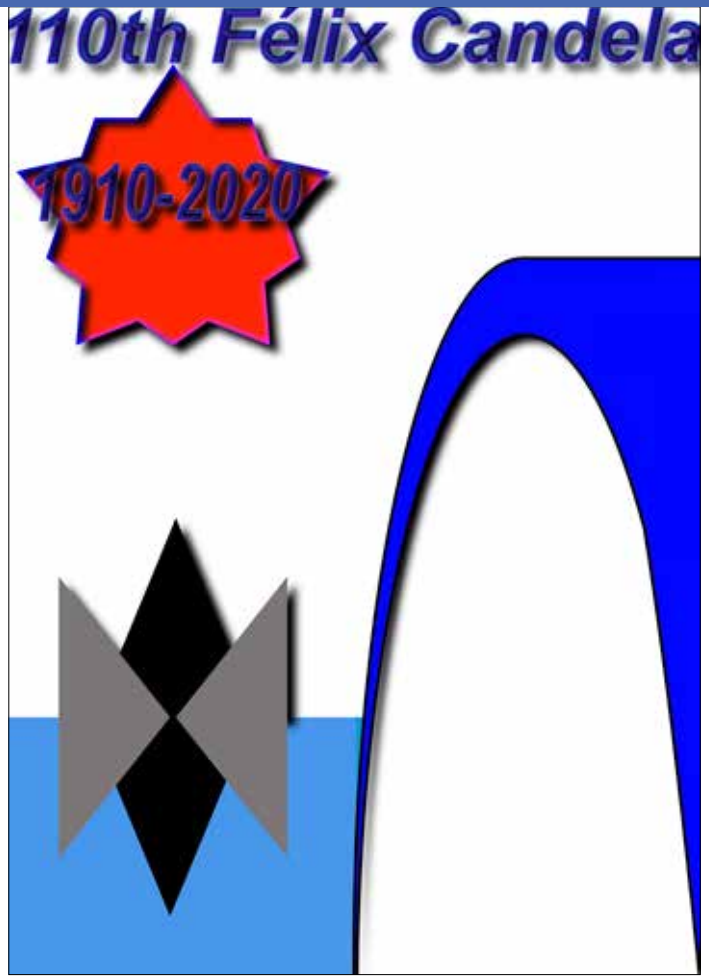
Lema: NAVE ASIMETRICA

Registration Number: 064

Author: Marjorie L. Pérez Rodríguez

University: Universidad Politécnica de Puerto Rico

POSTERS - PARTICIPANTS
PUERTO RICO



Lema: PERFECTO IMPERPECTO

Registration Number: 089

Author: Dominic Jr. Morales González

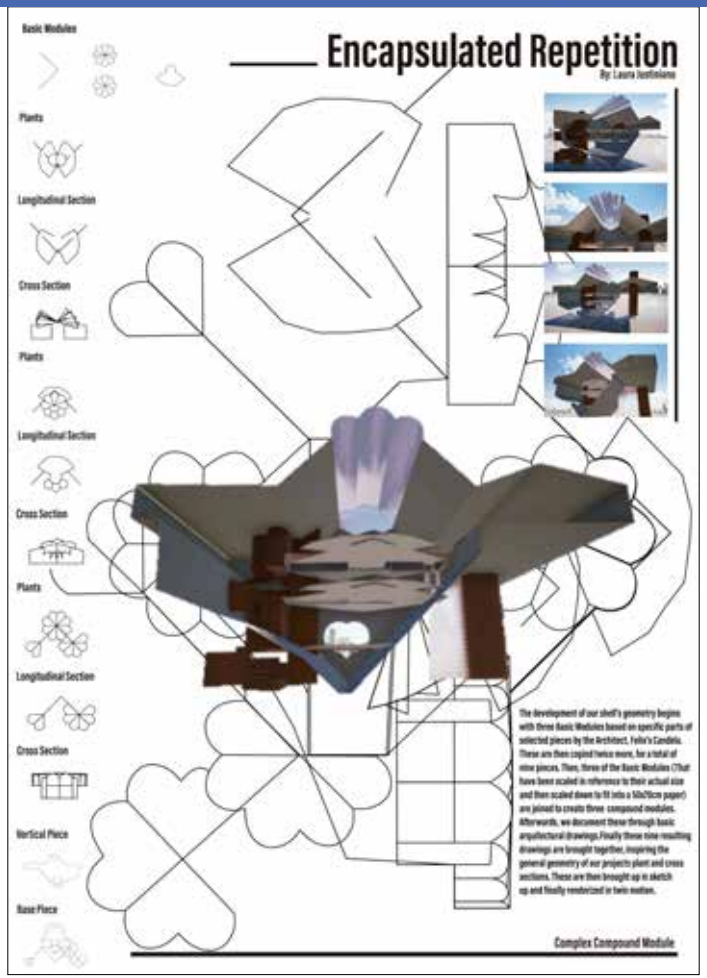
University: Universidad Politécnica de Puerto Rico

Lema: ABSTRACCIÓN NATURAL

Registration Number: 091

Author: Carla G. Villarrubia Sánchez

University: Universidad Politécnica de Puerto Rico



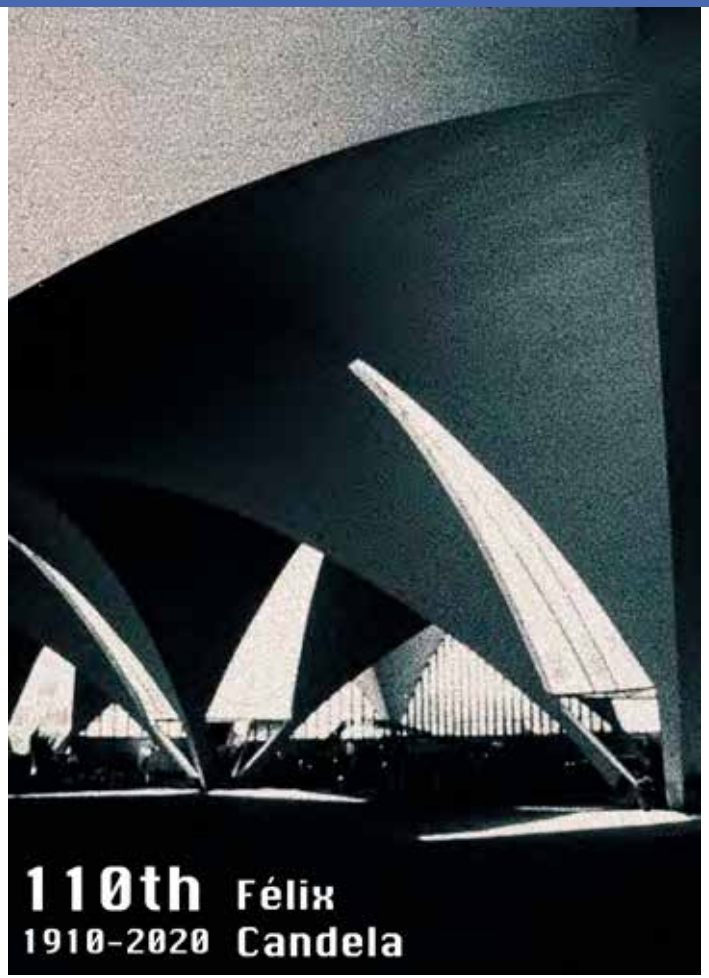
Lema: ENCAPSULATED REPETITION

Registration Number: 131

Author: Laura Justiniano

University: Universidad Politécnica de Puerto Rico

POSTERS - PARTICIPANTS
PUERTO RICO



Lema: CICLOPEO

Registration Number: 153

Author: Edwin Armando Ortiz Díaz

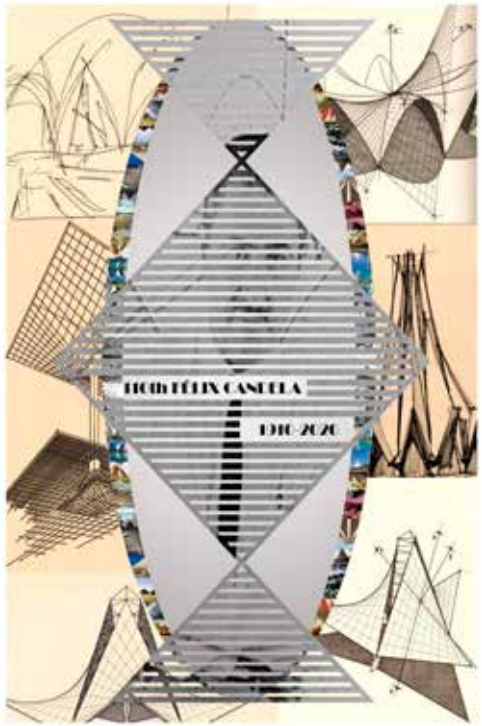
University: Universidad Politécnica de Puerto Rico

Lema: ESTETICA ESTRUCTURAL

Registration Number: 216

Author: Edgar J. Algarin Morales

University: Universidad Politécnica de Puerto Rico



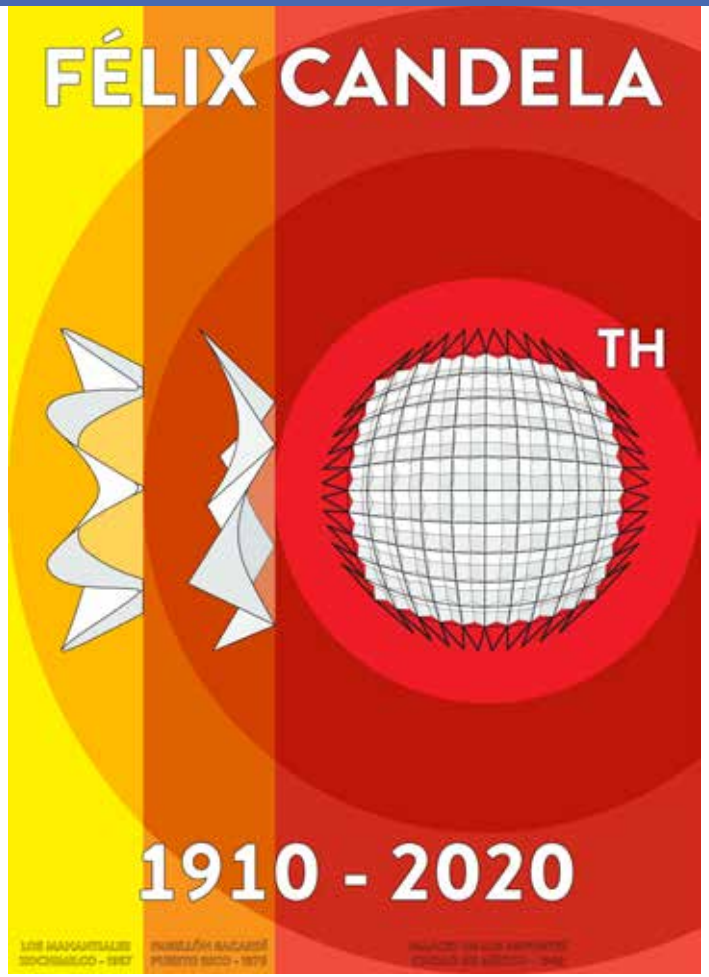
Lema: CONTORNO ÍNTIMO

Registration Number: 255

Author: Gabriel Enrique Rodríguez

University: Universidad Politécnica de Puerto Rico

POSTERS - PARTICIPANTS
ITALIA



Lema: DESDE ESPAÑA

Registration Number: 080

Author: Alessandro Azzolini

University: Politecnico di Milano – Italia

Lema: TUTTO BIEN

Registration Number: 101

Author: Camilo Scafuro

University: Università degli Studi di Roma " Tor Vergata " – Italia

POSTERS - PARTICIPANTS
COLOMBIA

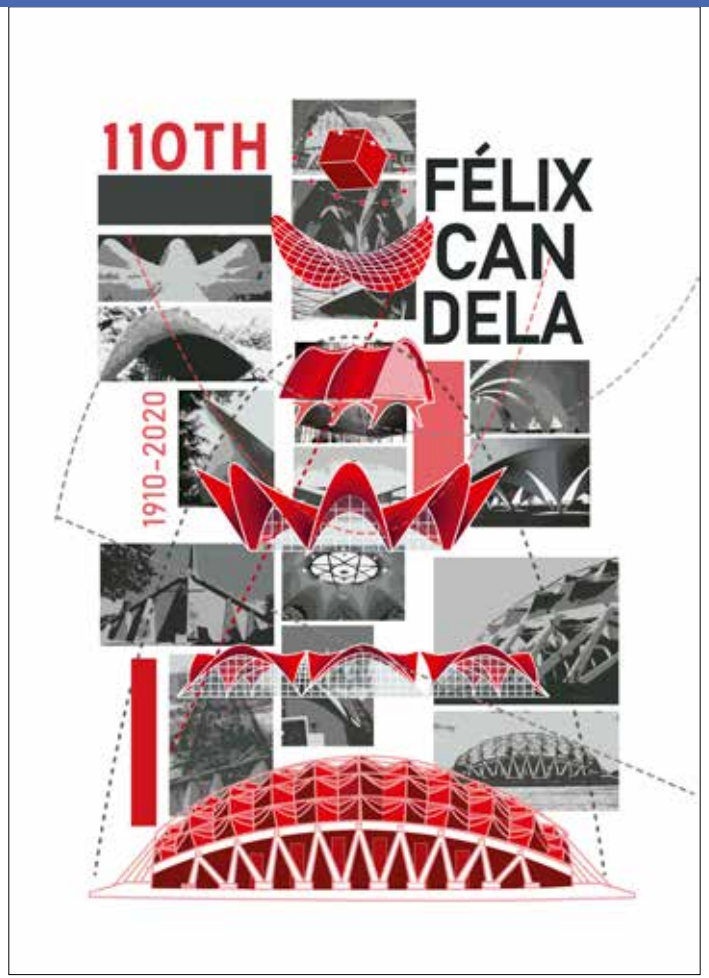
Lema: PAPERSHELLS



Registration Number: 086

Authors: Alejandro Correa,
Juan Pablo López,
Marianella Chica
University: Universidad Nacional de Colombia- Colombia

POSTERS - PARTICIPANTS
VENEZUELA



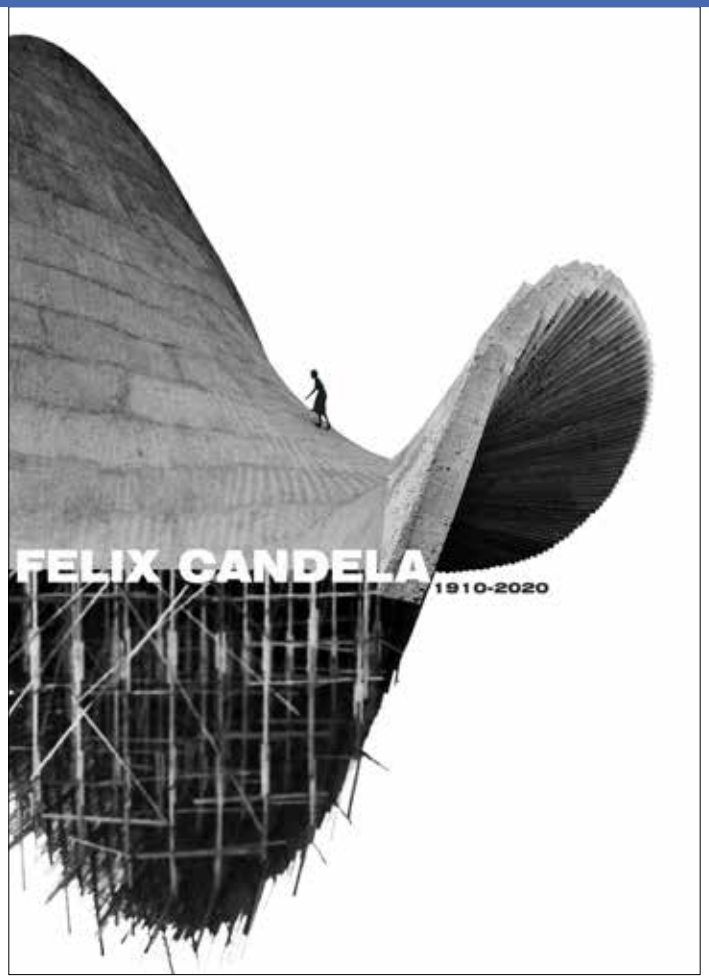
Lema: REVOLUCIÓN ESENCIAL

Registration Number: 095

Authors: Juan Diego Albornoz,
Isabella Sophia Mubayed

University: Universidad Rafael Urdaneta- Venezuela

POSTERS - PARTICIPANTS
BÉLGICA



Lema: VELA

Registration Number: 050

Authors: Victoire Soller,
Clara Astorino

University: UCL LOCI Bruxelles – Bélgica

DRAWINGS - PARTICIPANTS

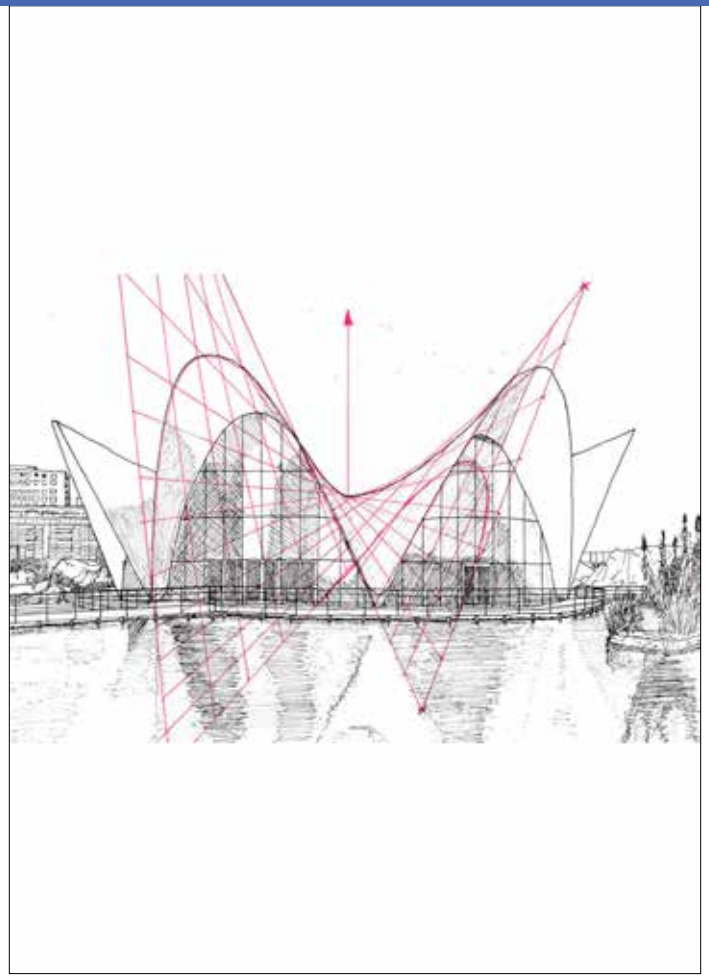
SPAIN

Lema: STAINED GLASS

Registration Number: 001

Author: Ana Cristina De la Cruz Ruiz

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

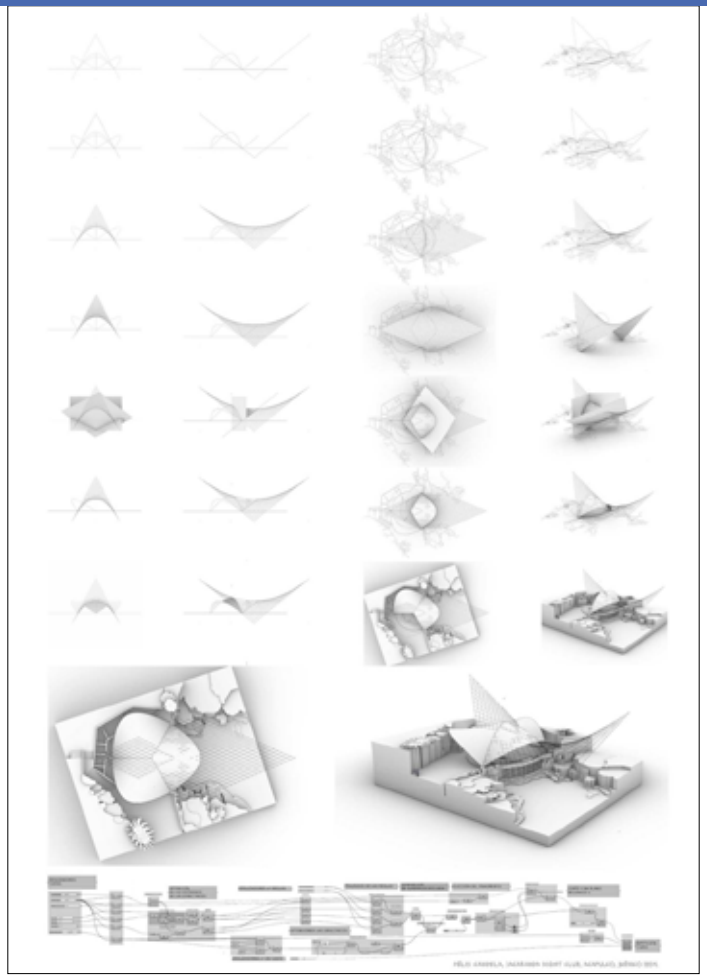


Lema: LLUVIA SOLEADA

Registration Number: 017

Authors: Pablo Cano Serrano, Juan Luis Vela Miranda

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: FRUTO ROJO

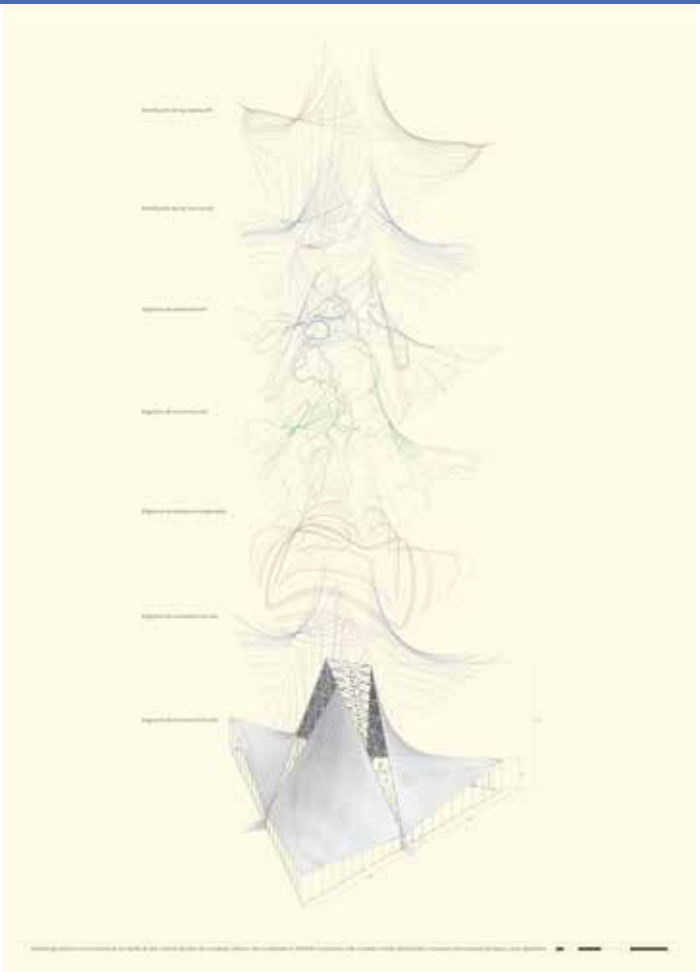
Registration Number: 035

Author: Jesús Díez Rodríguez

University: Universidad de Alcalá de Henares (UAH) – España

DRAWINGS - PARTICIPANTS

SPAIN

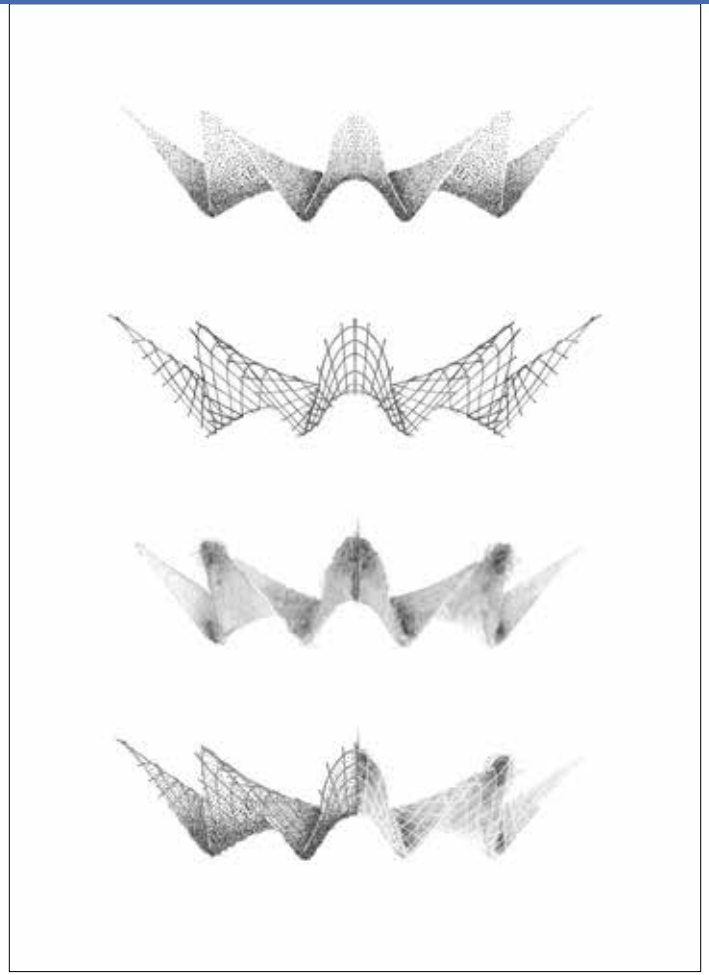


Lema: QUILOMBO

Registration Number: 042

Authors: Nicolás Martín, Alberto Ferrero, Daniel Martínez

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

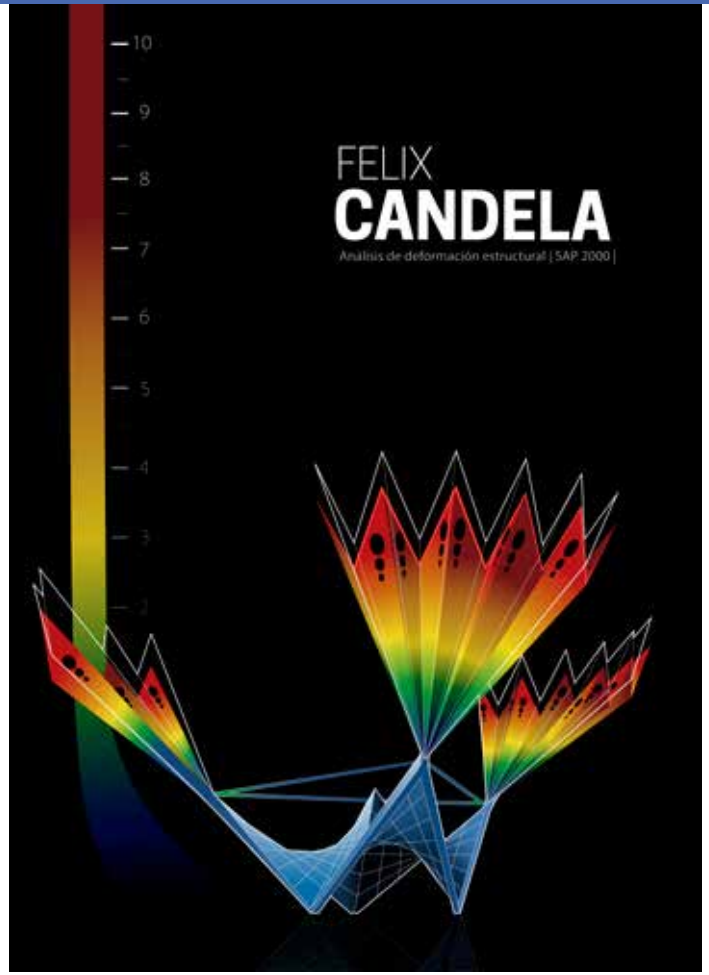


Lema: COMPLEJIDAD

Registration Number: 048

Authors: Eric Moya Soler, Miquel Pérez Coronas

University: Universidad Politécnica de Cataluña- Escola Tècnica Superior d'Arquitectura de Barcelona (ETSAB-UPC)- España



Lema: FORMA Y MOVIMIENTO

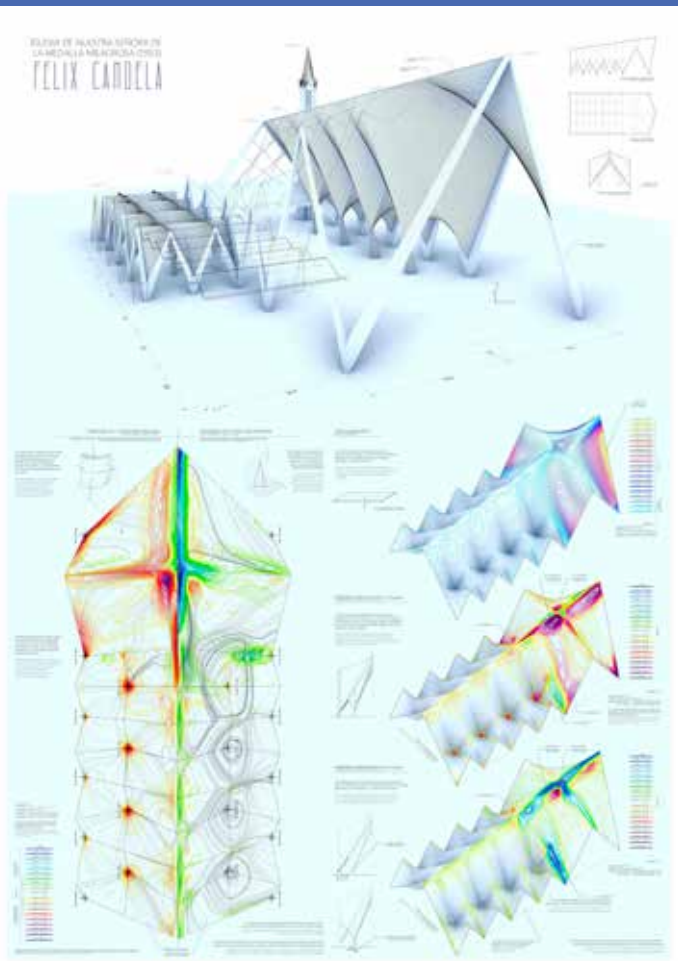
Registration Number: 053

Author: Patricia Guillén Camisón

University: Universidad de Sevilla- Escuela Técnica Superior de Arquitectura de Sevilla- España

DRAWINGS - PARTICIPANTS

SPAIN

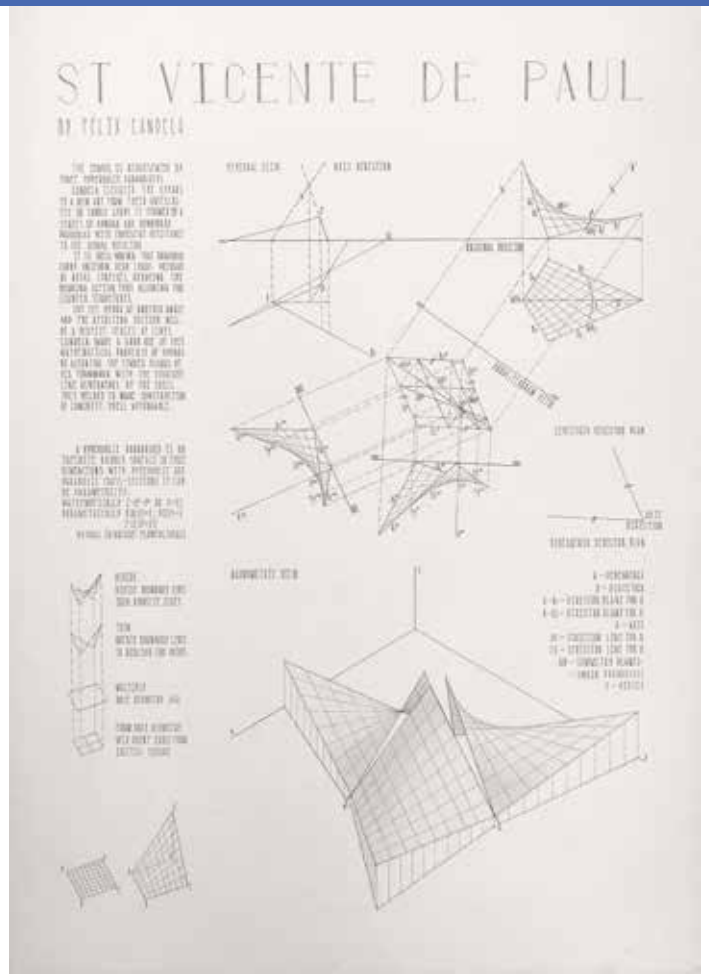


Lema: THIN EXPRESIONISM

Registration Number: 055

Author: José Manuel Parrilla López-Brea

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

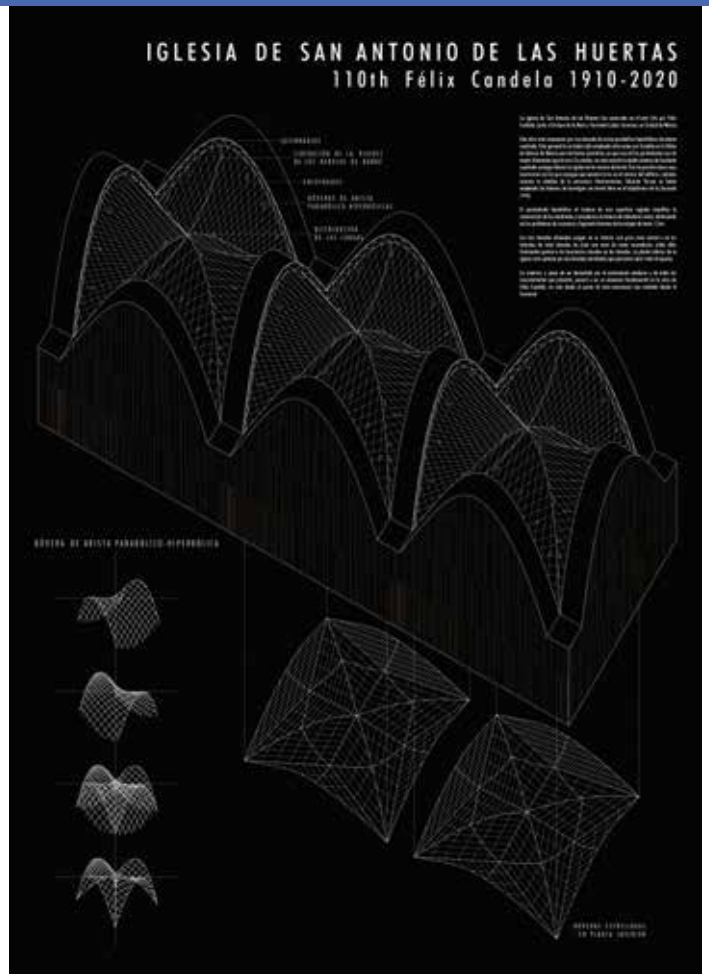


Lema: NORS

Registration Number: 072

Author: Mariia Deinega

University: La Salle Campus Barcelona – España



Lema: LIGEREZA

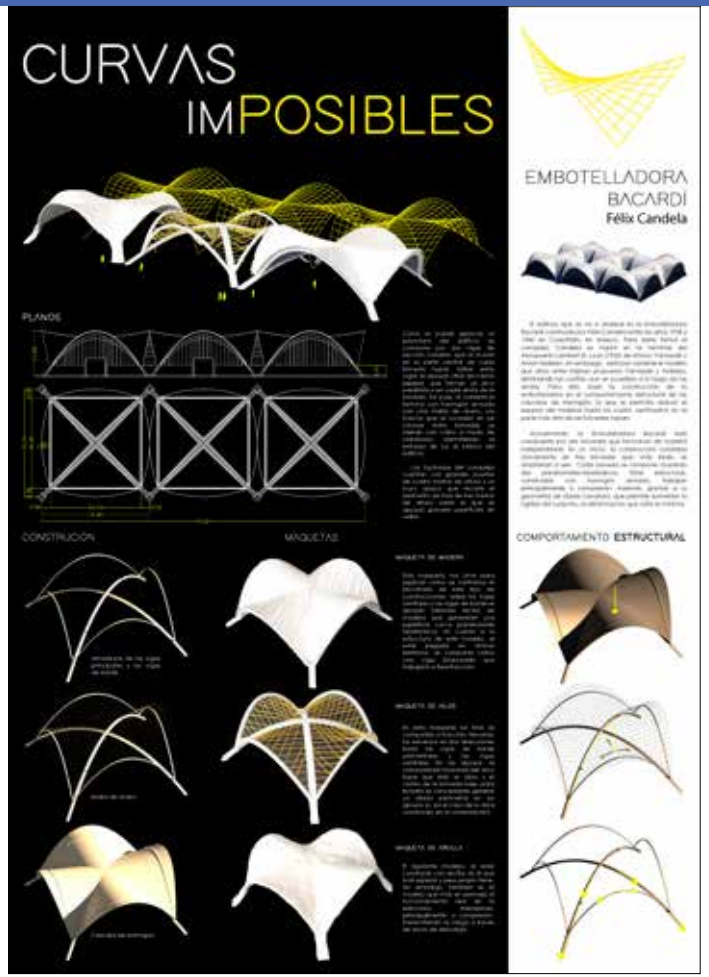
Registration Number: 184

Author: Teresa Cabrera Arzoz

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España

DRAWINGS - PARTICIPANTS

SPAIN

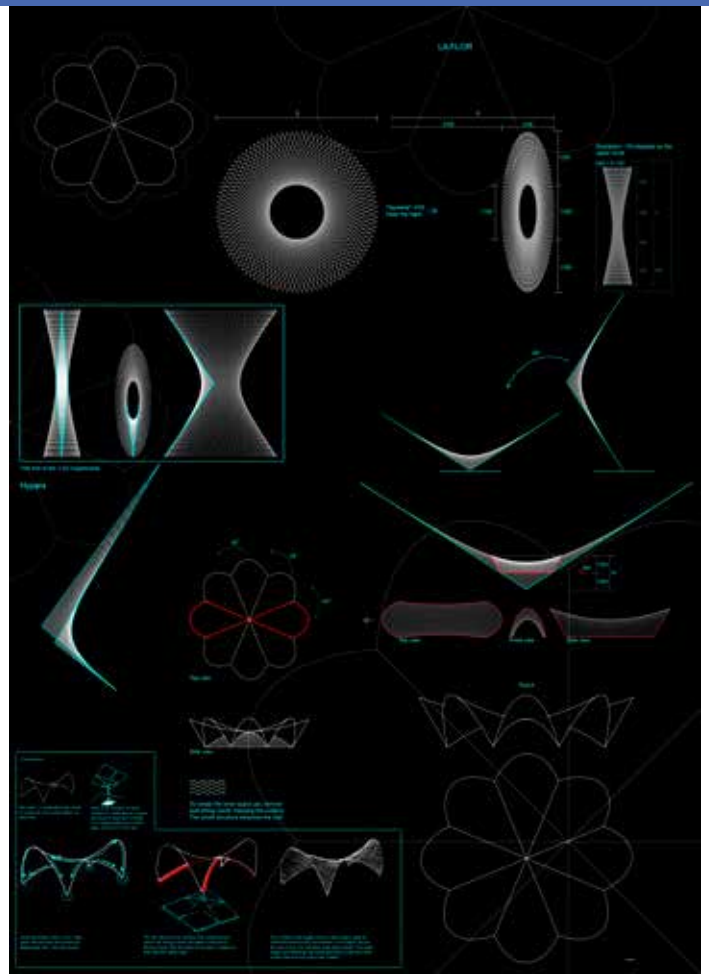


Lema: CURVAS IMPOSIBLES

Registration Number: 192

Authors: Irene Pomares Domingo, Luis Enrique Rodríguez

University: Universidad de Alicante- España

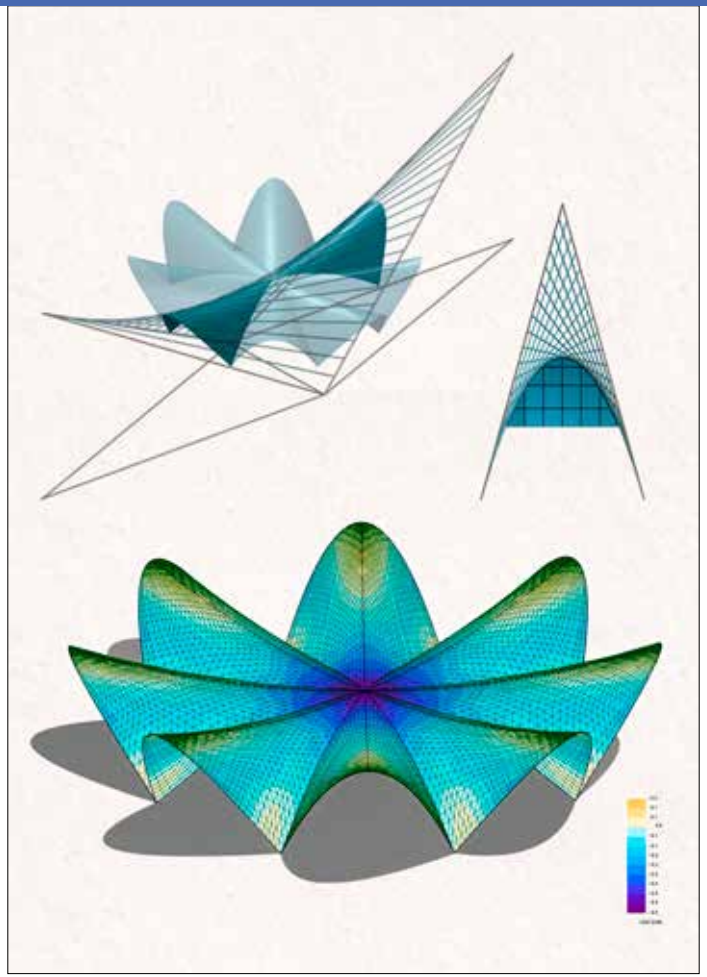


Lema: SWAT

Registration Number: 193

Author: Nerwosh Amin

University: Universidad Europea de Madrid- España



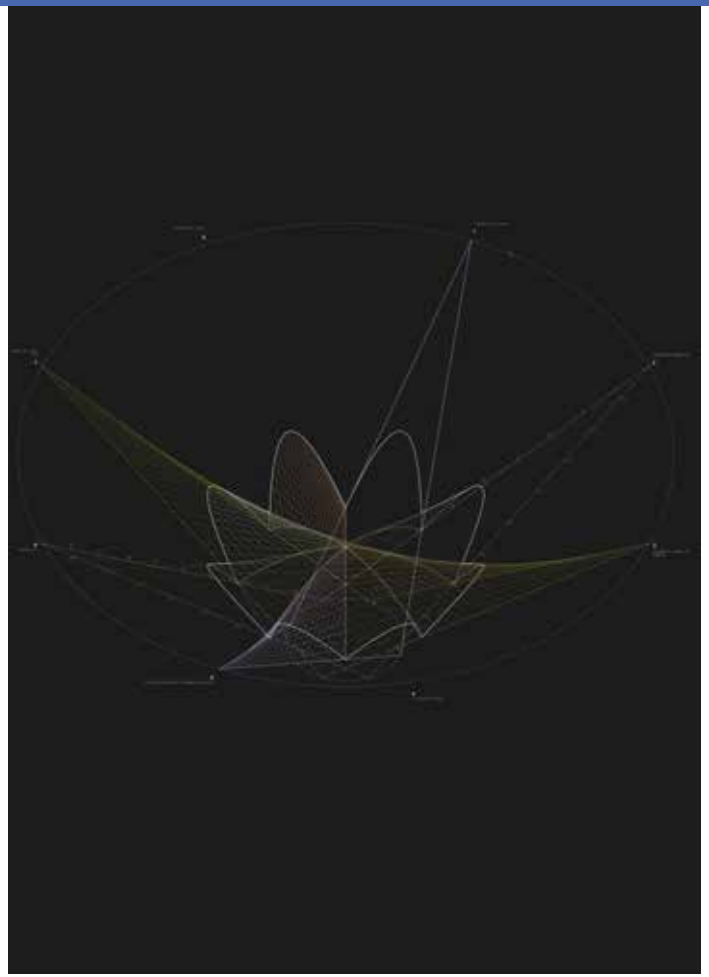
Lema: FORMAS

Registration Number: 239

Author: Marc Pajuelo Toledo

University: Universidad Politécnica de Cataluña- Escuela Técnica Superior de Arquitectura del Vallès- España

DRAWINGS - PARTICIPANTS
SPAIN

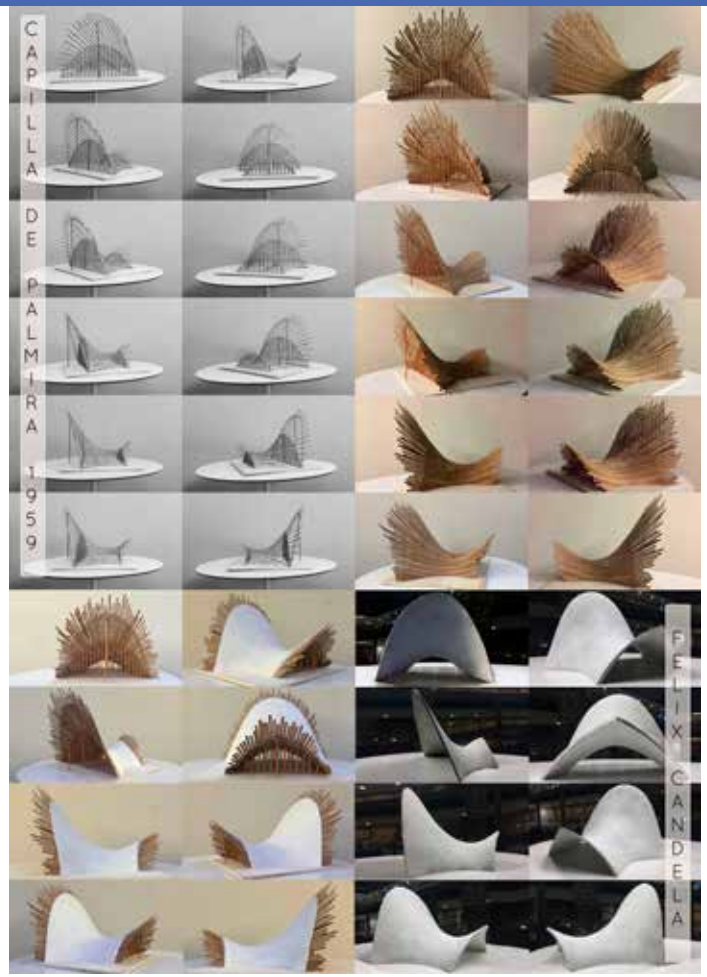


Lema: GEOMETRÍA REVOLUCIONADA

Registration Number: 245

Author: Marta García Sánchez-Infante

University: Universidad Politécnica de Madrid- Escuela Superior de Arquitectura de Madrid- España



Lema: ESTRUCTURARTE

Registration Number: 256

Authors: Wilson Alexis Oña Córdova, Mariya Gusenkova

University: Universidad de Alicante- España

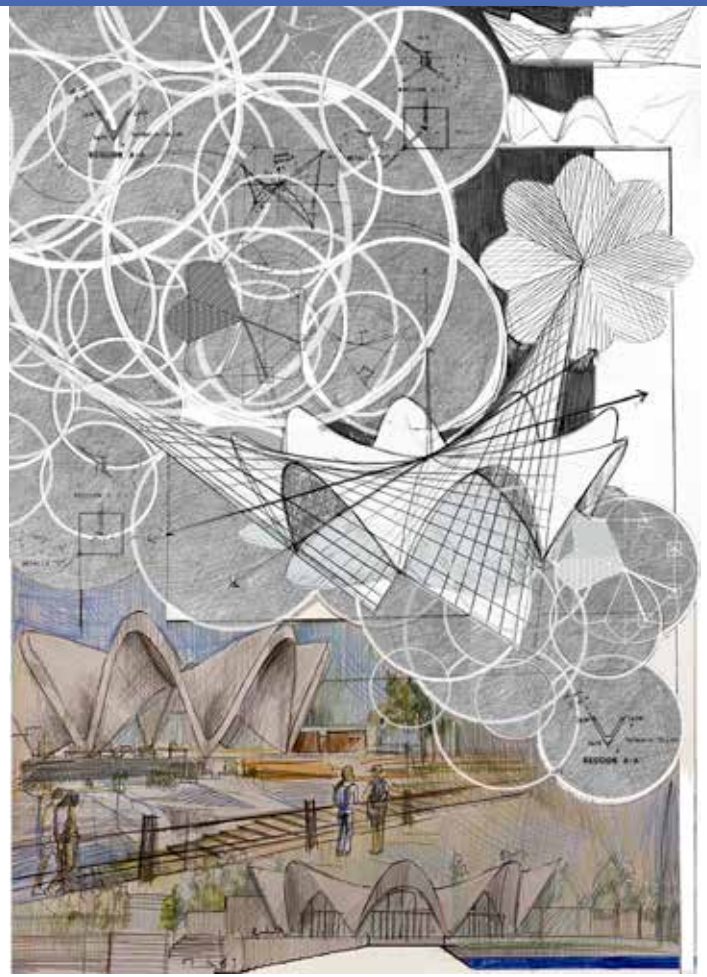
DRAWINGS - PARTICIPANTS
RUSSIA

Lema: COLORFUL SIMMTRY

Registration Number: 104

Authors: Semyonova Viktoria Ruslanovna

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia

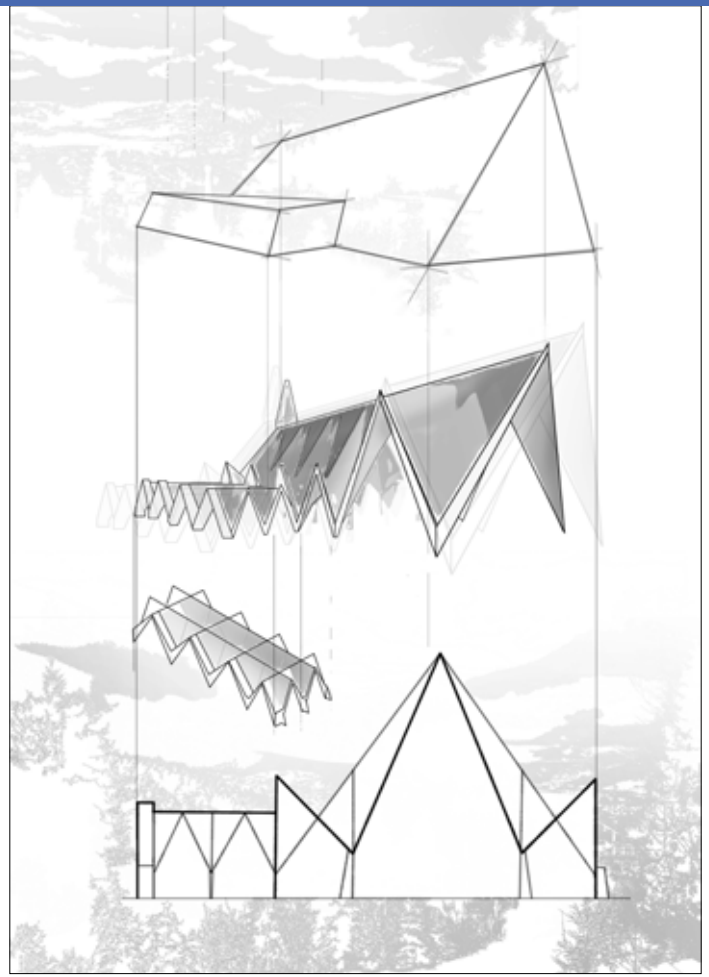


Lema: FROZEN FLOWER

Registration Number: 113

Author: Elizaveta Shevtsova

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia



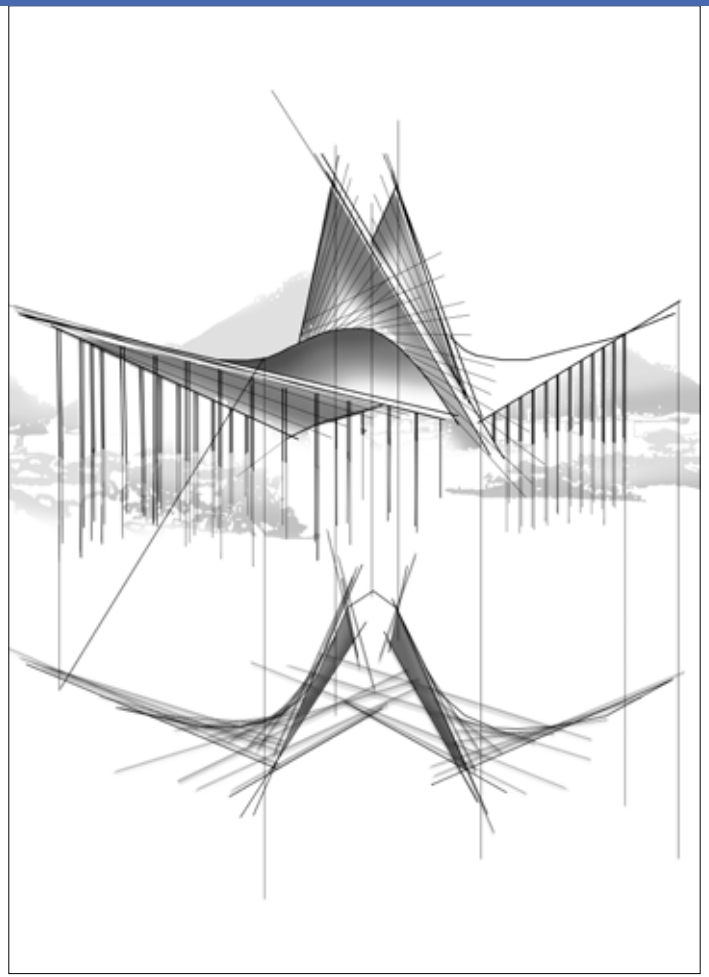
Lema: ARCHITECTURAIDEA

Registration Number: 115

Author: Andrey Kozlov

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia

DRAWINGS - PARTICIPANTS
RUSSIA

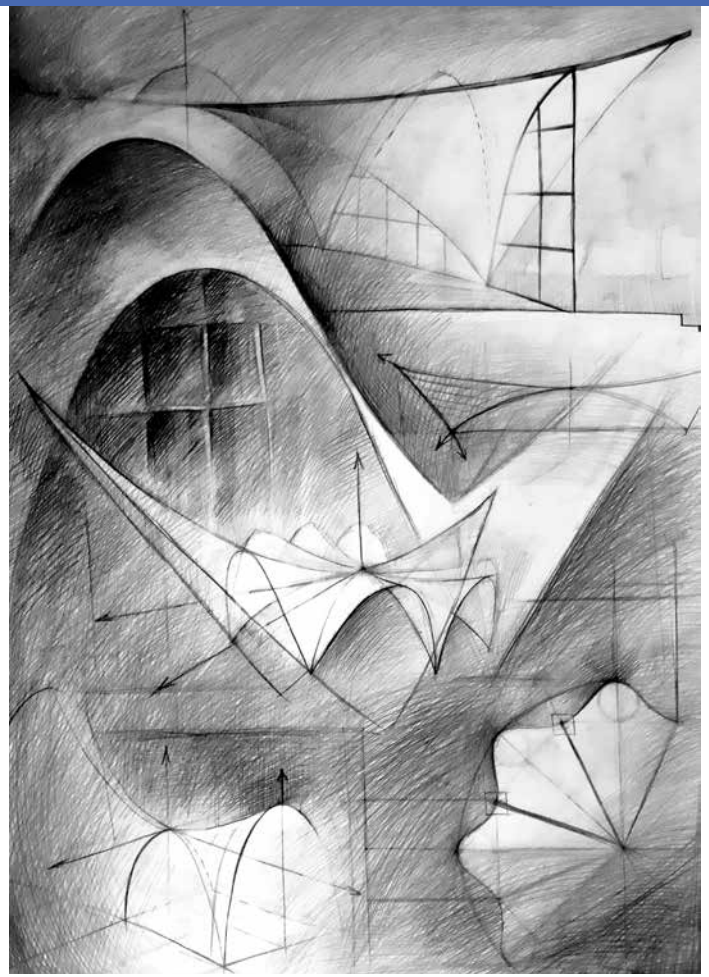


Lema: LINE ARCHITECTURE

Registration Number: 130

Author: Arina Mikhailova

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia



Lema: PARABOLA

Registration Number: 133

Author: Polina Tonkikh

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia

Lema: MEXICAN CHURCH

Registration Number: 137

Author: ALEKSANDR TORCHINOV

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia

DRAWINGS - PARTICIPANTS
RUSSIA

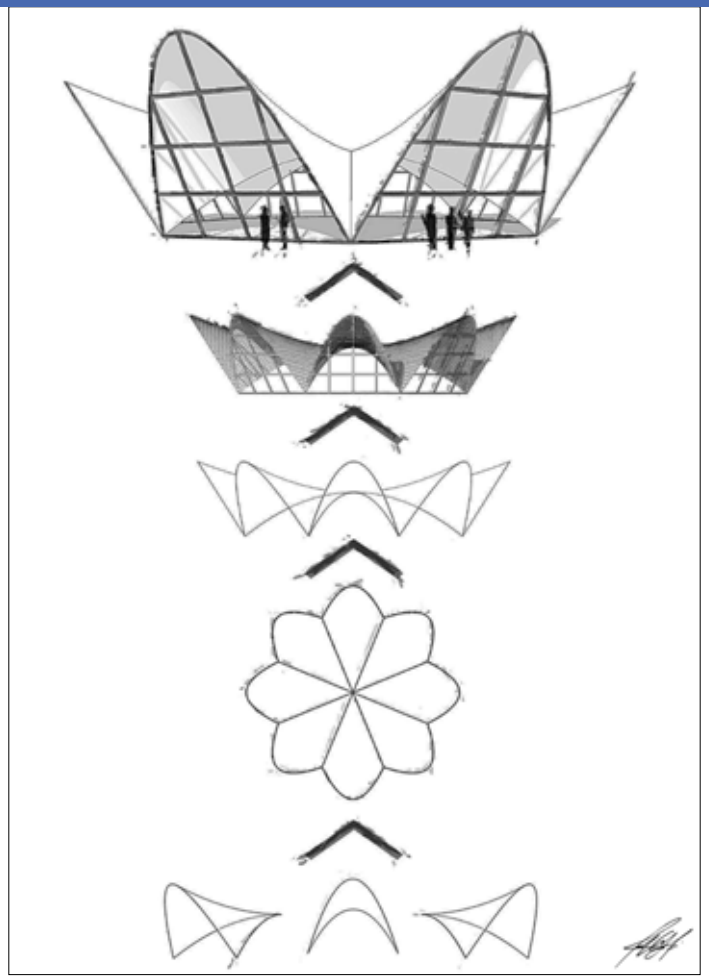
Lema: DRAWPAPERARCHING11

Registration Number: 240

Author: Arina Galanova

University: Saint Petersburg State University of Architecture and Civil Engineering (SpbGASU)- Rusia

DRAWINGS - PARTICIPANTS
MEXICO



Lema: TRAZOS DE INGENIO

Registration Number: 006

Author: Mario Testelli Flores

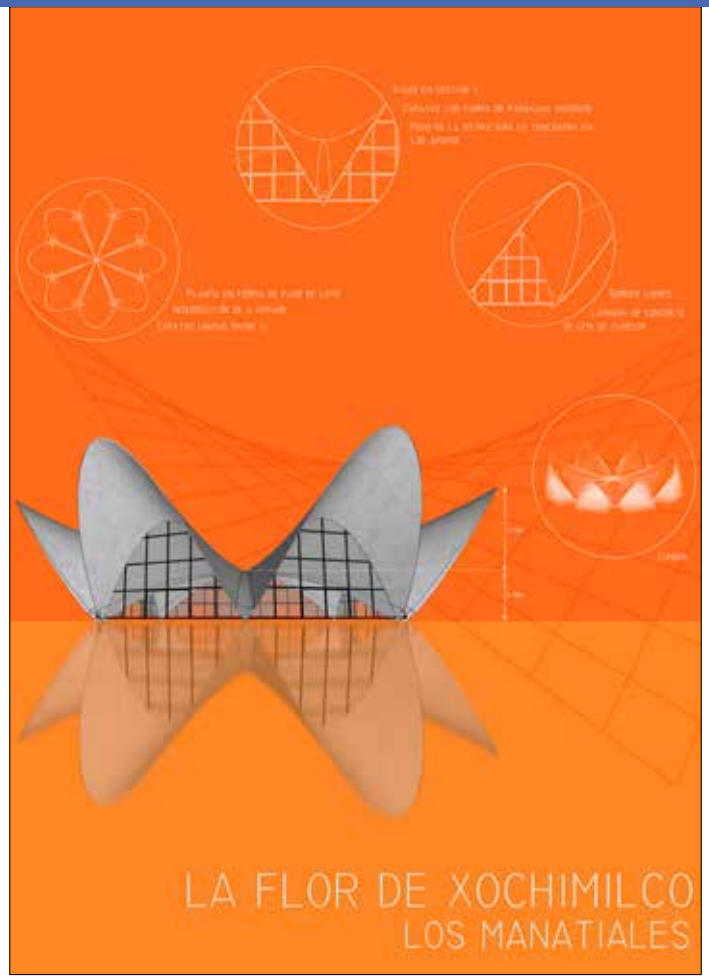
University: Universidad Iberoamericana Campus México- México

Lema: TRANSFORMACIÓN GEOMÉTRICA

Registration Number: 007

Authors: Ana Karen Vidal Méndez,
Daniela Cortés Aguilar

University: Universidad de las Américas Puebla (UDLAP)- México



Lema: LA FLOR DE MEXICO

Registration Number: 014

Authors: Ana Teresa Vera Rojas, Grizel Amairany Diaz Zapata

University: Universidad de las Américas Puebla (UDLAP)- México

DRAWINGS - PARTICIPANTS
MEXICO

Lema: ARRIAGA

Registration Number: 020

Author: Pamela Candelaria Coronel Coronel

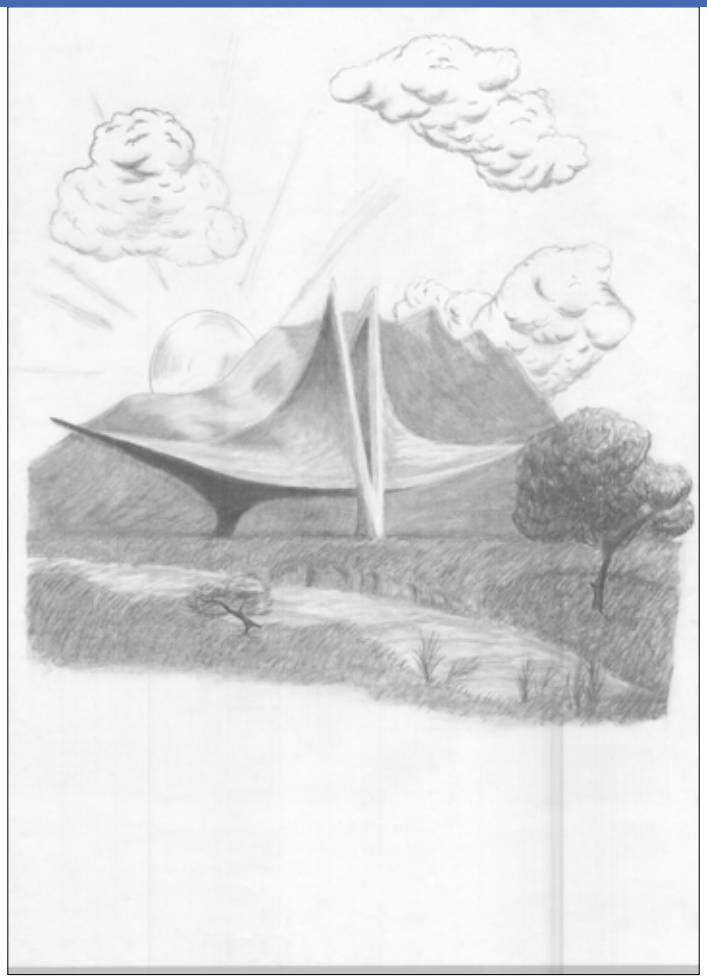
University: Universidad de las Américas Puebla (UDLAP)- México

Lema: UN FUTURO PASADO

Registration Number: 023

Authors: Rosario Guadalupe López, Ilse Domínguez Vigoritto

University: Universidad de las Américas Puebla (UDLAP)- México



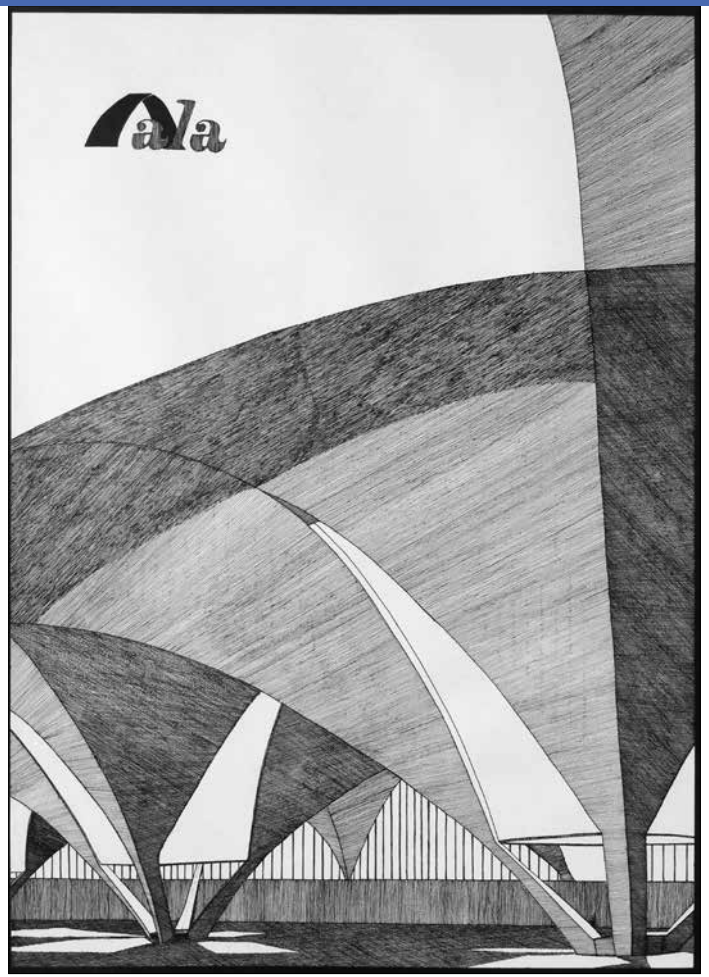
Lema: ESPÍRITU AEREO

Registration Number: 107

Author: Gustavo Medina Serrano

University: Universidad Autónoma Metropolitana – Azcapotzalco - México

DRAWINGS - PARTICIPANTS
MEXICO

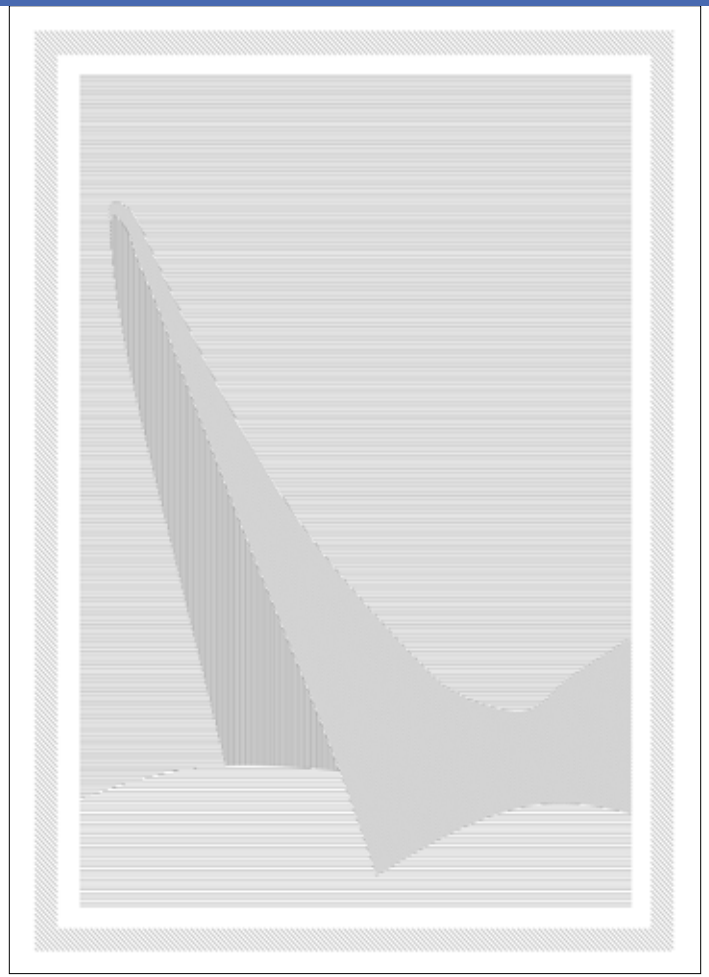


Lema: WITH BLACKBERRIES

Registration Number: 132

Author: José Alberto Lara Sosa

University: Instituto Tecnológico de Chihuahua II – México



Lema: PARABLE

Registration Number: 195

Author: Jorge Vásquez Espinosa

University: Universidad Autónoma “Benito Juárez” de Oaxaca, Facultad de Arquitectura de la UABJO- México

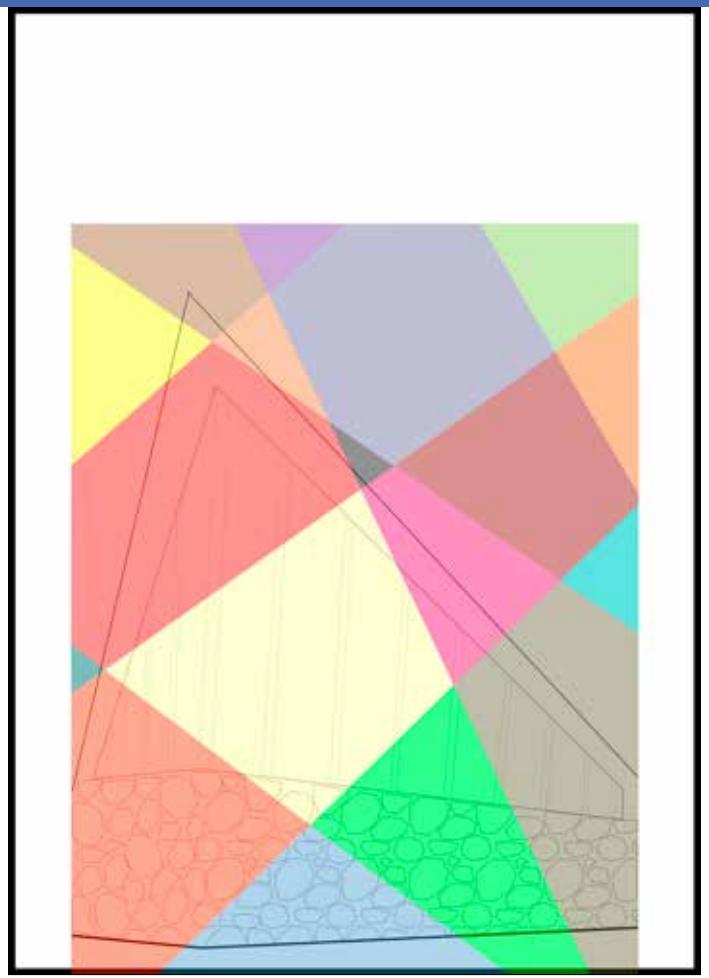
Lema: CURVILINEA

Registration Number: 196

Author: José Francisco González Martínez

University: Universidad Autónoma “Benito Juárez” de Oaxaca, Facultad de Arquitectura de la UABJO- México

DRAWINGS - PARTICIPANTS
MEXICO



Lema: DESENLACE

Registration Number: 200

Authors: Karen Itzel, Contreras López

University: Universidad Autónoma “Benito Juárez” de Oaxaca, Facultad de Arquitectura de la UABJO- México

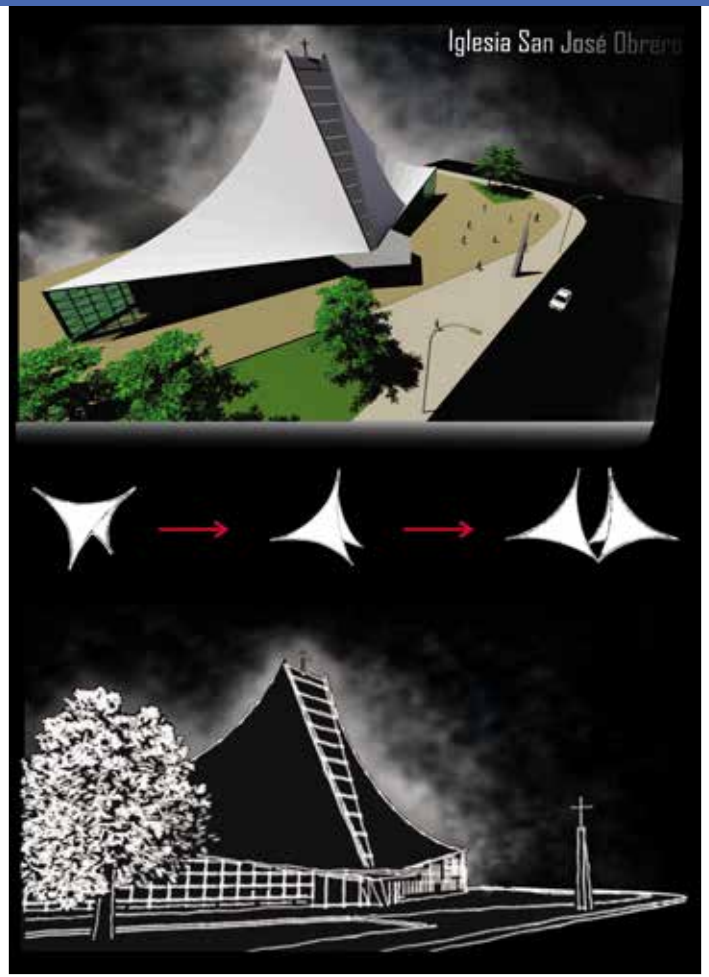
DRAWINGS - PARTICIPANTS
ARGENTINA

Lema: PALMA

Registration Number: 027

Author: Santiago Francia

University: Universidad Nacional de Rosario - Facultad de Arquitectura, Planeamiento y Diseño- Rosario, Santa Fe



Lema: TECTONICO

Registration Number: 069

Author: Fernando Martínez Santillán

University: Universidad Nacional de Tucumán- Facultad de Arquitectura y Urbanismo- Argentina

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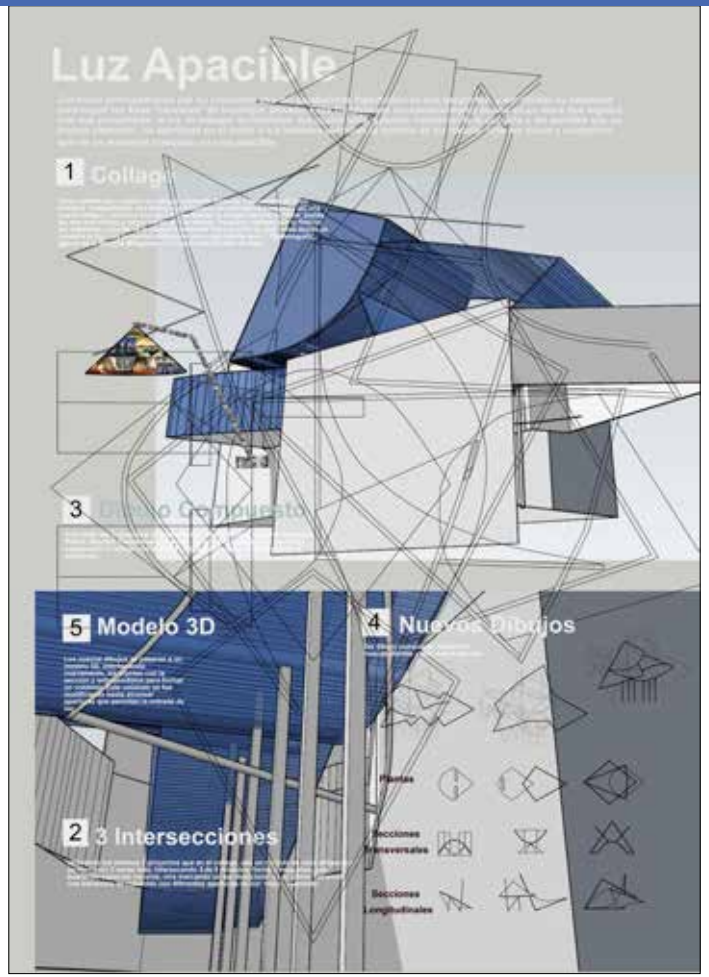
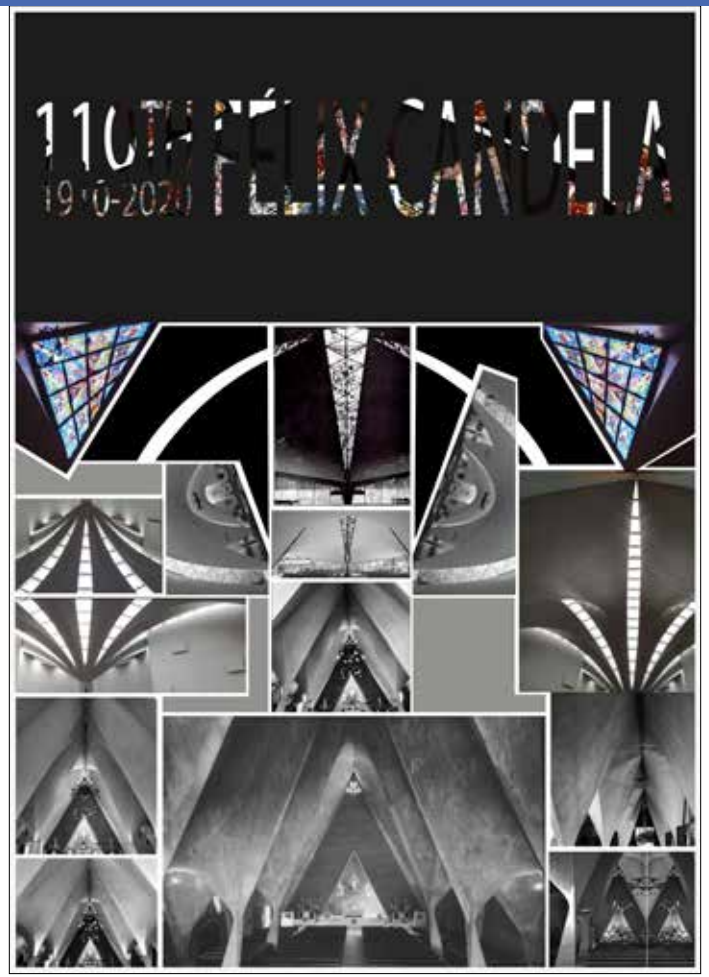


Lema: LUZ APACIBLE

Registration Number: 057

Author: Kinayshamar Cuadrado Andino

University: Universidad Politécnica de Puerto Rico

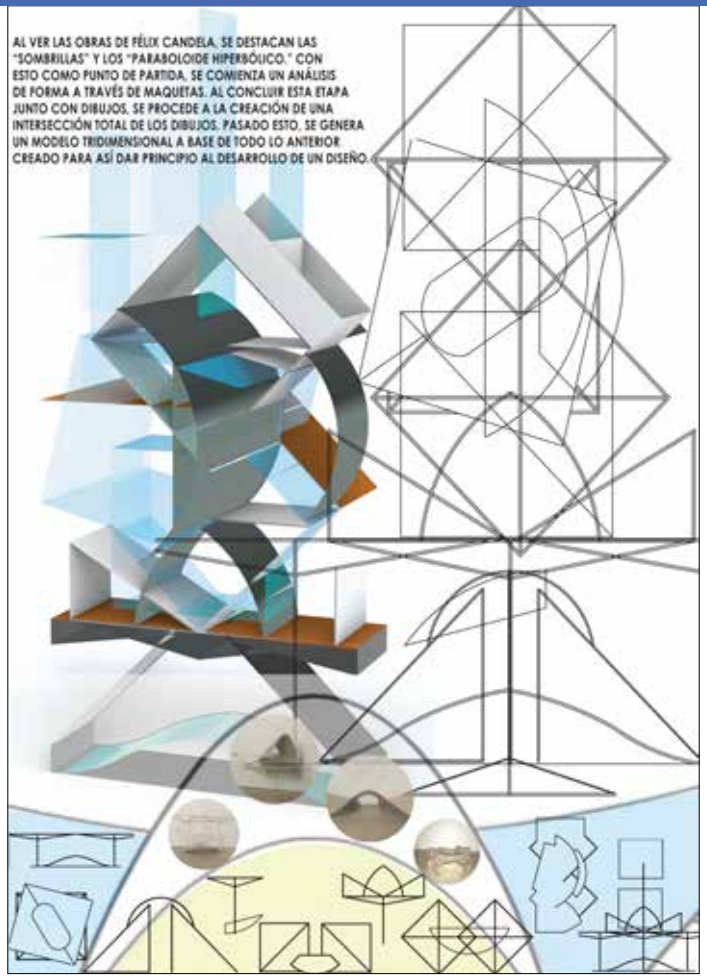


Lema: FRAGMENTO LUMINISCENTE

Registration Number: 058

Author: Adni María Mercedes Fernández

University: Universidad Politécnica de Puerto Rico



Lema: TRASCENDENCIA INIMAGINABLE

Registration Number: 059

Author: Kelly Ann Pérez Rodríguez

University: Universidad Politécnica de Puerto Rico

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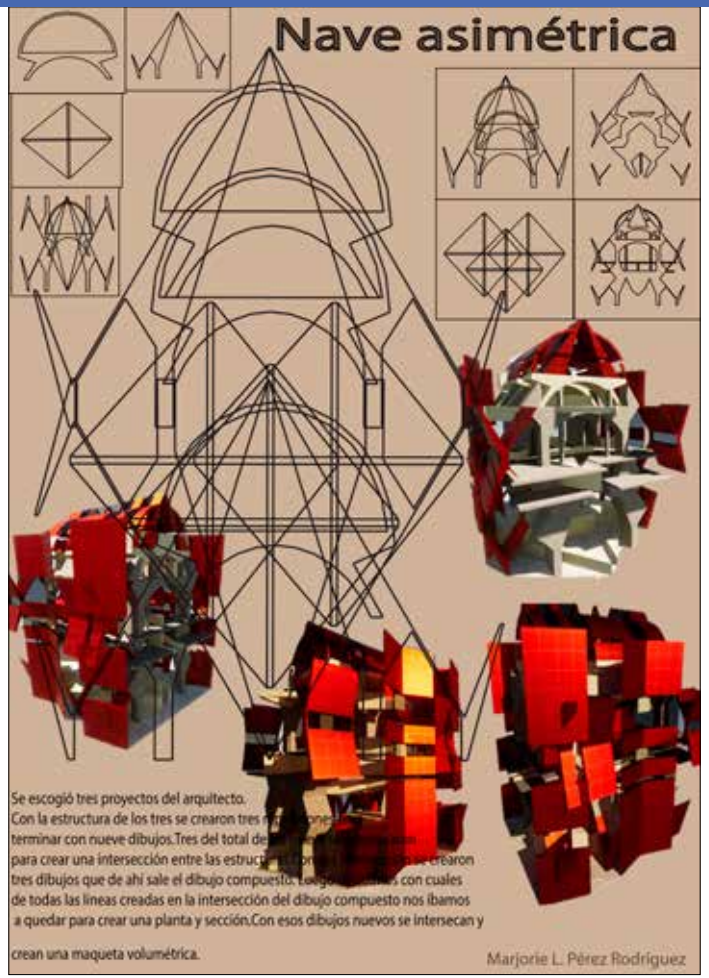
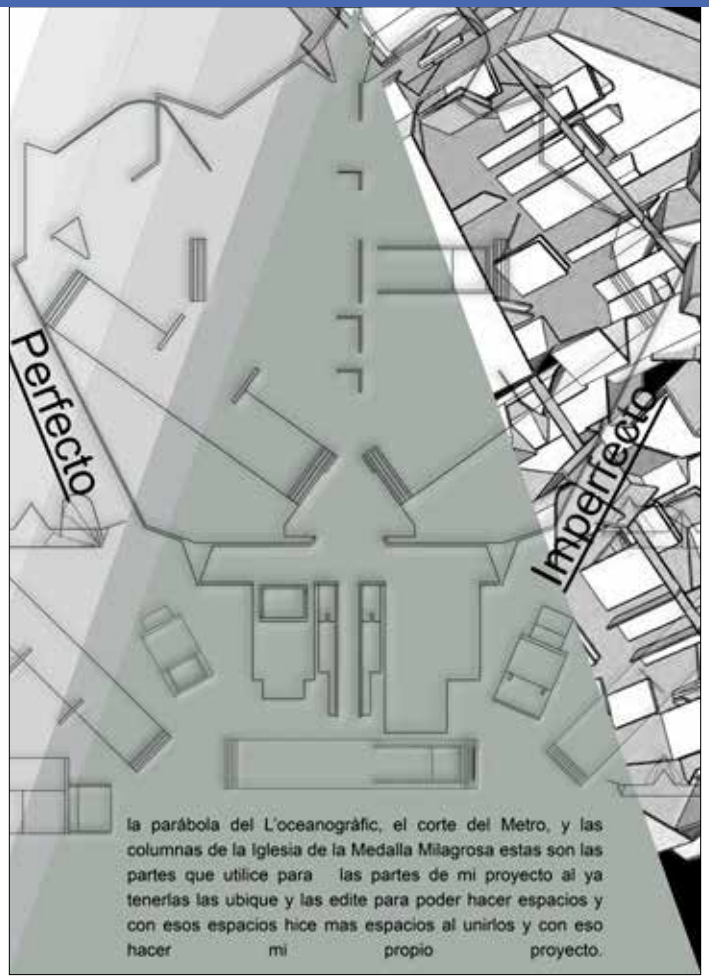


Lema: NAVE ASIMETRICA

Registration Number: 064

Author: Marjorie L. Pérez Rodríguez

University: Universidad Politécnica de Puerto Rico

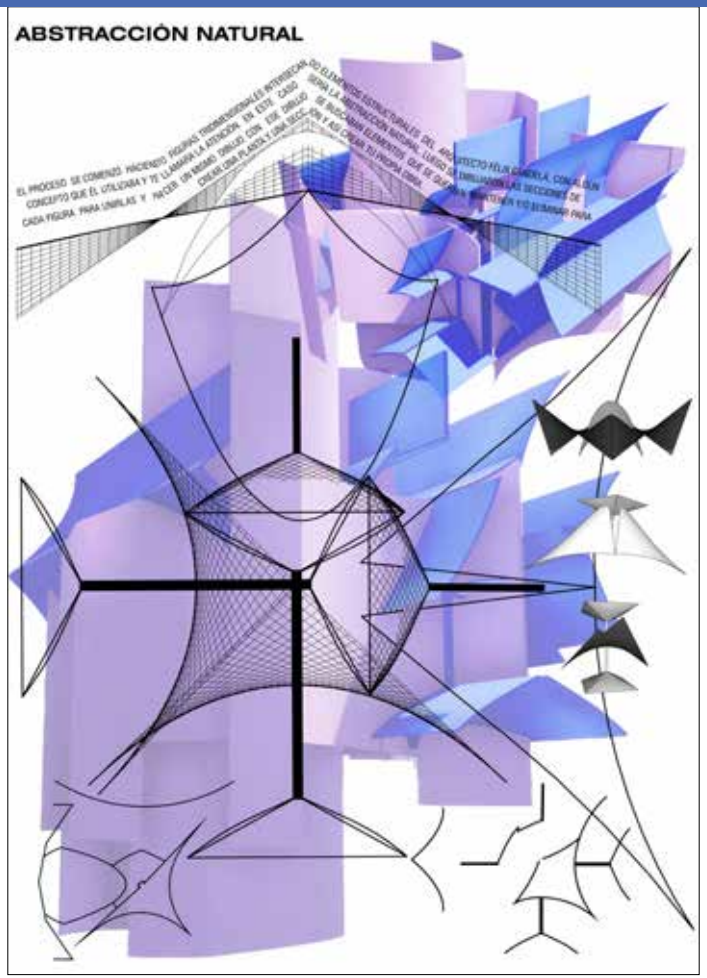


Lema: PERFECTO IMPERPECTO

Registration Number: 089

Author: Dominic Jr. Morales González

University: Universidad Politécnica de Puerto Rico



Lema: ABSTRACCIÓN NATURAL

Registration Number: 091

Author: Carla G. Villarrubia Sánchez

University: Universidad Politécnica de Puerto Rico

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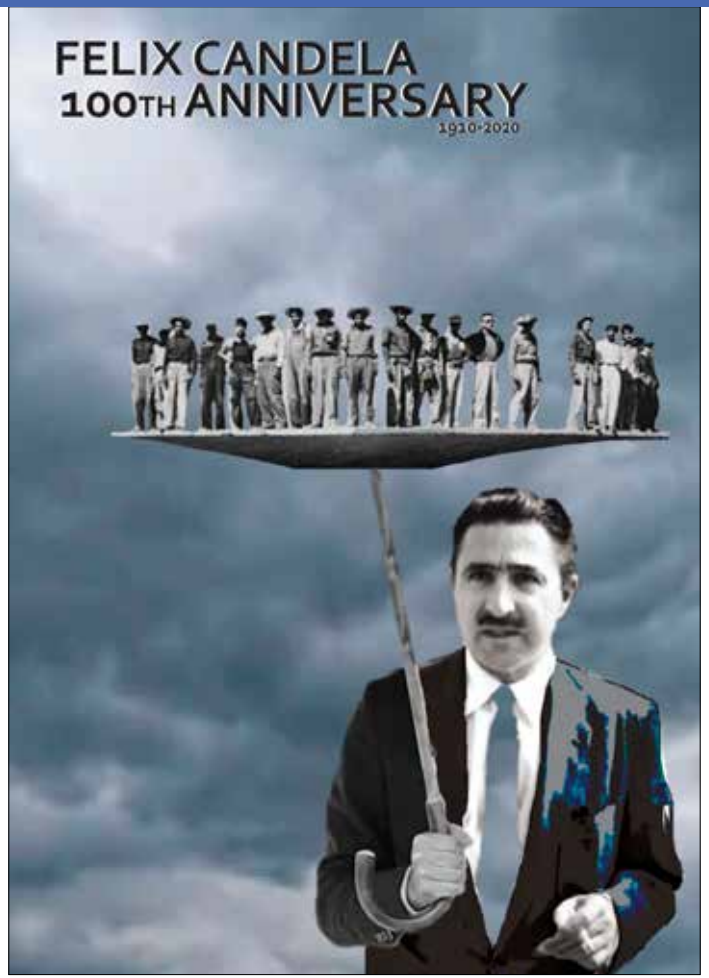
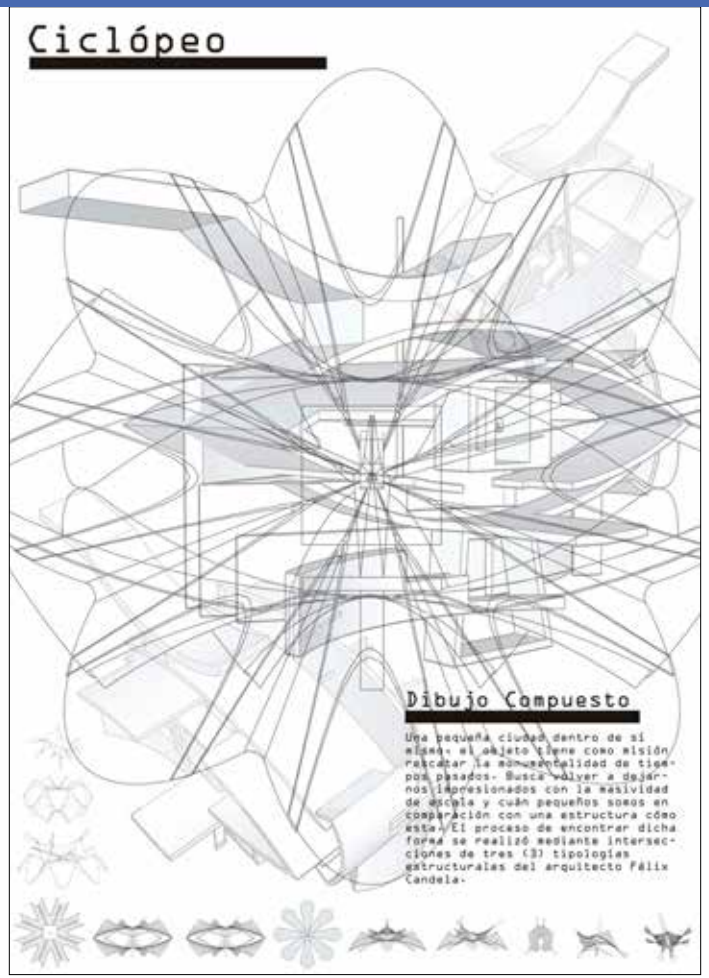


Lema: ENCAPSULATED REPETITION

Registration Number: 131

Author: Imel Sierra Cabrera

University: Universidad Politécnica de Puerto Rico

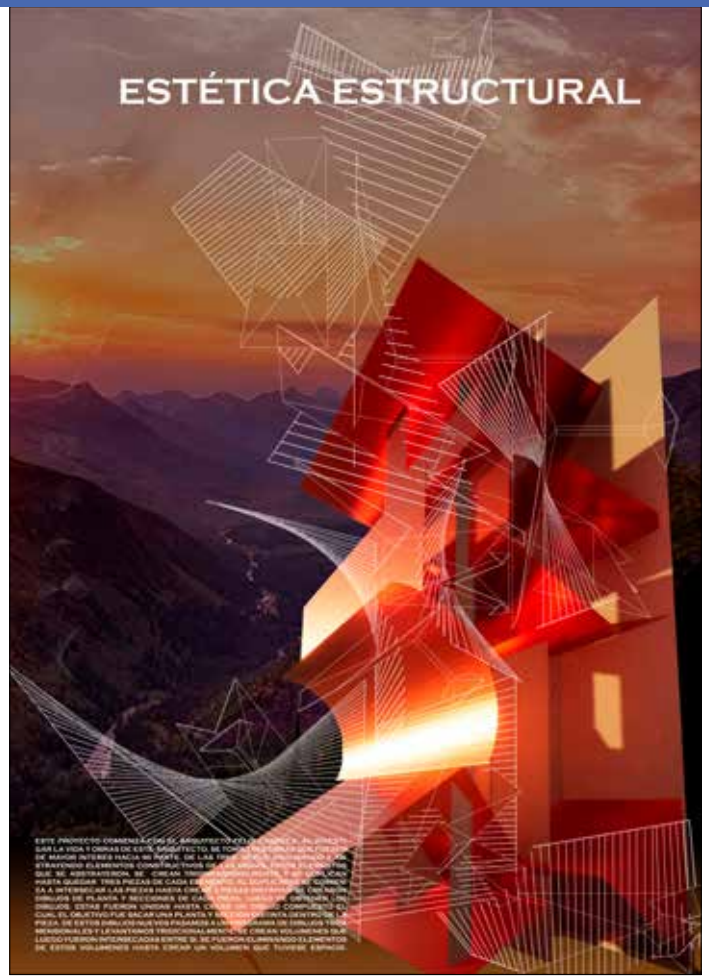


Lema: CICLOPEO

Registration Number: 153

Author: Edwin Armando Ortiz Díaz

University: Universidad Politécnica de Puerto Rico



Lema: ESTETICA ESTRUCTURAL

Registration Number: 216

Author: Edgar J. Algarin Morales

University: Universidad Politécnica de Puerto Rico

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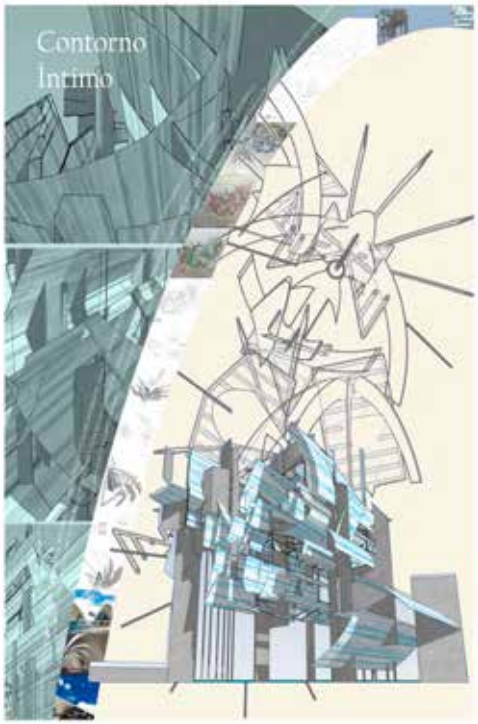

Lema: CONTORNO ÍNTIMO

Registration Number: 255

Author: Gabriel Enrique Rodríguez

University: Universidad Politécnica de Puerto Rico

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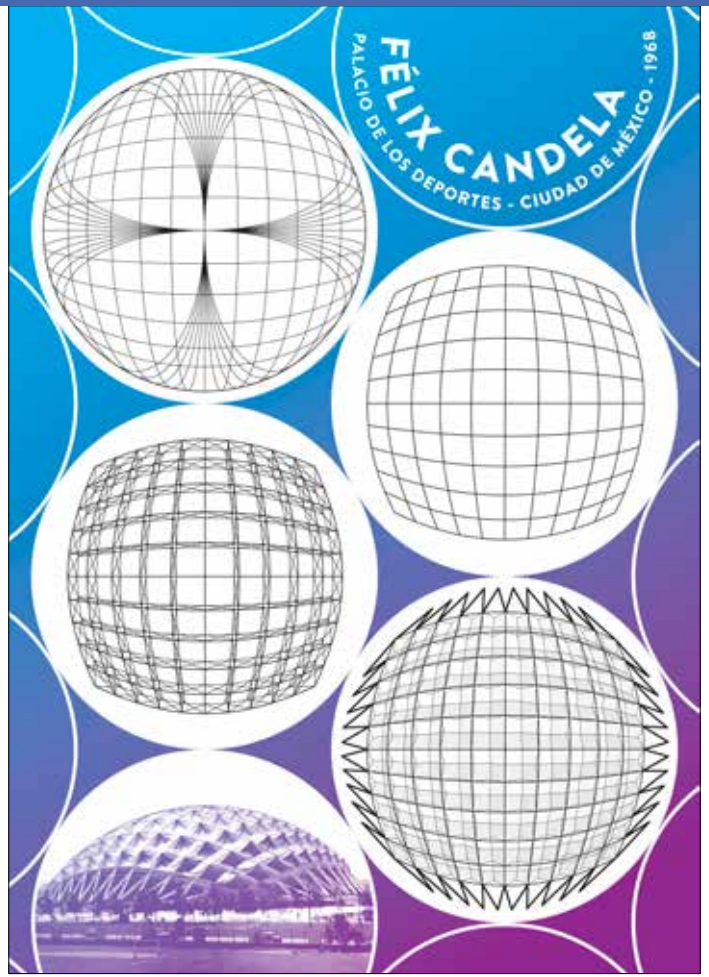
ITALIA

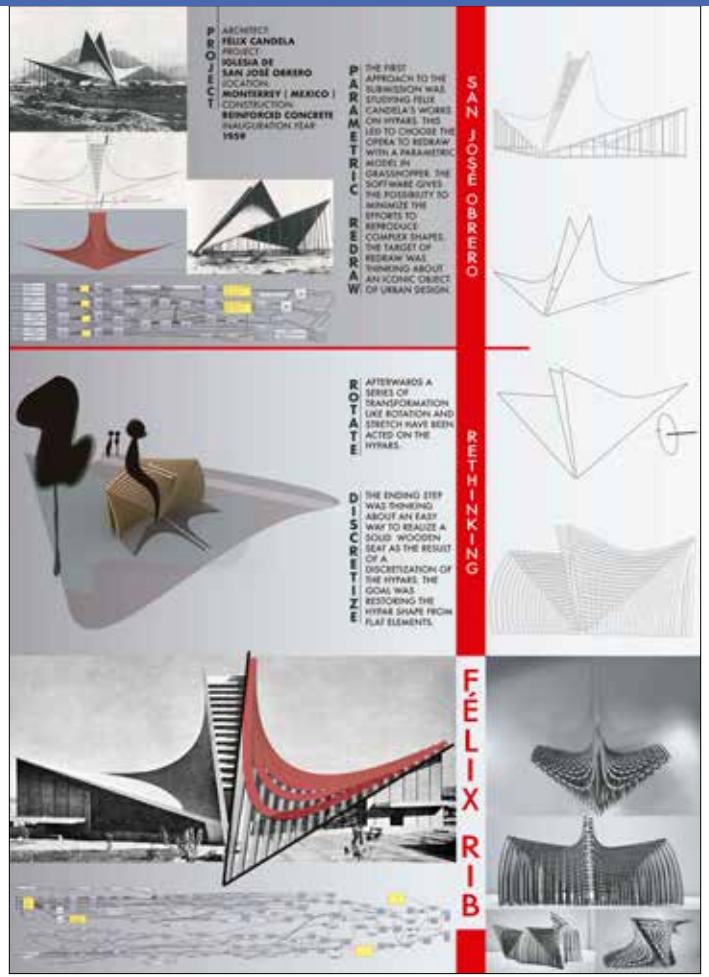


Lema: FILOSOFÍA ESFÉRICA

Registration Number: 080

Author: Alessandro Azzolini

University: Politecnico di Milano – Italia

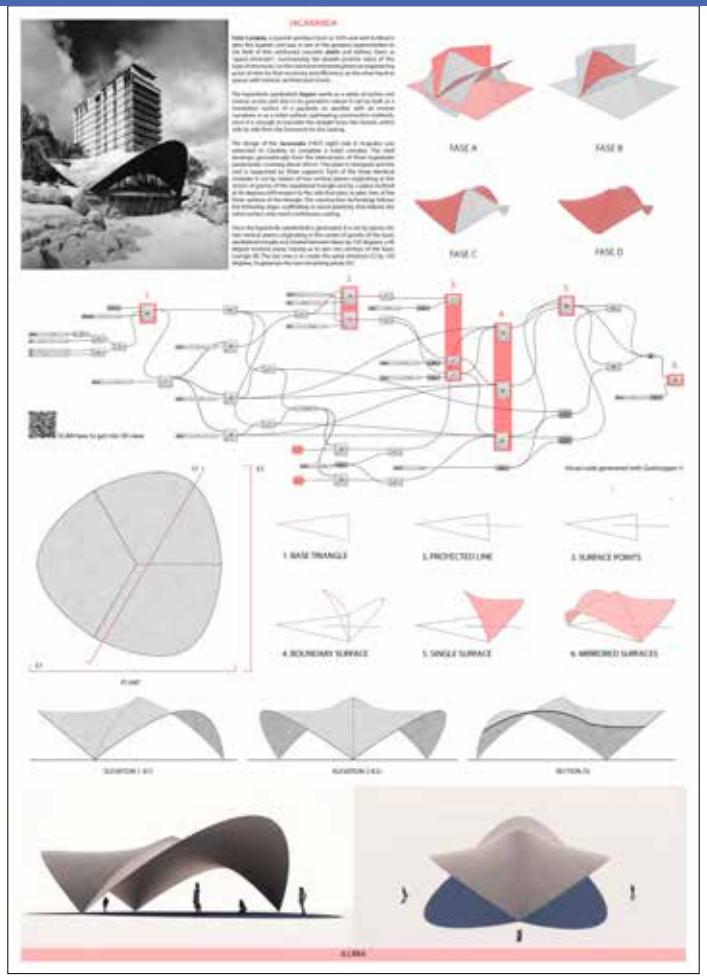


Lema: SHADOW

Registration Number: 083

Author: Gabriele Miglietta

University: Università degli Studi di Roma " Tor Vergata " – Italia



Lema: ILLIRIA

Registration Number: 099

Authors: Alessia Bisconti, Gabriele Mattei

University: Università degli Studi di Roma " Tor Vergata " – Italia

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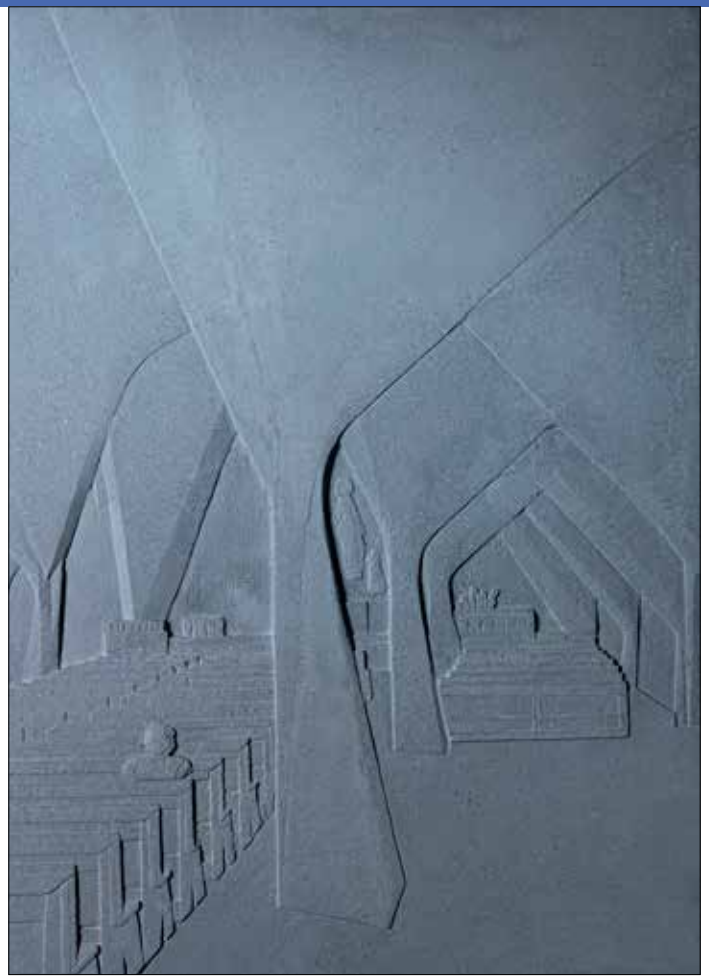
PERÚ



Lema: IMPERECEDERO

Registration Number: 100

Author: Miguel Ángel Viera Vásquez

University: Universidad Católica Santo Toribio de Mogrovejo (Lambayeque) – Perú

2020 Family Photo - 110th Félix Candela

The Structural Art of Thin Concrete Shells