Introduction

This book has two main objectives: to divulge the roots of Gaudí's organic architecture and to encourage the readers to go back in time and try to decipher that '*great book of nature*' as he used to say, searching for the geometry of the animal, mineral and vegetal realms. In other words: to look at nature through his eyes. After observing the environment in detail, Gaudí reached a synthesis of structure and form, easily visible in his mature works, especially in his last and most admired construction: the naves of the temple of the Sagrada Familia. As a guiding thread, it includes some of his observations (in italics), recorded by his disciples during long conversations in his studio and in the temple workshops.

After working for almost fifty years in the scale model workshop (thirty three of them in the place where Gaudi had his laboratory), surrounded by the original plaster models which were destroyed (along with his studio and workshop) in July of 1936 during the first days of the Spanish Civil War, with the collaboration of his past helpers, we have managed to restore the thousands of fragments of the original work, rendering it suitable for further study. A painstaking labour which has familiarized me with the process Gaudí probably followed, from the first Neo-Gothic project for a church to the last version of the temple naves, learning to understand the geometric surfaces that he so wisely employed. Especially the ruled surfaces, false planes or *planoids* —as Gaudí

used to say—; comparing them with the richness of the natural forms. It was a pleasant study which led me to live in the middle of nature, taking care of a small garden. This book is the result of that enthralling investigation and its astounding findings. I want the reader to enjoy both Gaudí and nature, as has been my case since I first contracted the "Gaudí virus". And, please, do not vaccinate yourself against it before you start…

After having read the Intergovernmental Panel report on Climactic Change, where we are warned about more drastic and imminent alterations than it was first thought, it's clear that only we can change the progressive heating of the planet and its ultimate destruction —while there's still time— through our daily behaviour, by following the credo of love and respect for nature proposed by Gaudí.

I have an ambitious goal: to make a small contribution to the "Gaudinists" around the world —through talks, articles, seminars and other activities— who divulge the work of the Maestro. With a very clear aim: to stimulate and incite new generations of architects, technicians, designers and artists, towards the use of the superbly equilibrated natural forms that Gaudí identified and employed more than a century ago. "*It seems strange that I have been the first man to use them. To be original, you must return to the sources.*" Return to nature, breaking away from routine, by being original. Only in this way we can discover that "*great open book that one must strive to read: the Book of Nature*." We must think positively, be humble and partake of the natural perfection and harmony, the result of millions of years of evolution. We mustn't forget that we also are part of it.

1852-1878. Childhood and schooling

Antoni Gaudí i Cornet was born on the 25th of June 1852 in Baix Camp (Tarragona), the fifth son of Francesc Gaudí i Serra, a native of Riudoms, and Antònia Cornet i Bertran, a native of Reus.

He was baptized the following day in the parish church of Sant Pere in Reus. There is only a record of his baptism, not of his birth, leaving unclear whether he was born in Reus or in Riudoms.

He was a frail baby who only a few months later, started suffering from rheumatism in the joints. Because of that he was never able to play with the other children and didn't go to school until quite late.

His infancy would turn out to be crucial to his future work, as his mother used the time she had to keep him by her side to teach him to observe the environment, the natural surroundings of the family home in Riudoms and of the Maset de la Calderera ("the boiler maker wife's little farm"), a place they visited regularly, full of trees, plants and animals. Gaudí would say of this place: "*That's where I got my most pure and pleasurable glimpses of nature.*" Those images instilled an enormous interest, appreciation and respect for the environment and showed him the way towards his concept of a peculiarly organic 'naturalistic architecture', which he would develop in all his buildings.

The times he spent in his grandfather's workshop would also be very important for his development, as they were responsible for acquiring a sense of spatial vision, perhaps in a sense, innate. "*I am gifted with a sense of spatial perception, because I am the son, grandson and great grandson of coppersmiths.*"

In 1860, he started his schooling with a teacher named Francesc Berenguer, who witnessed one of the first anecdotes we know about the child. When the teacher affirmed that the reason birds had wings was so that they could fly, Gaudí replied: "*The chickens at the farm have quite large wings but they do not fly.*" In later years he would attend the school of Rafael Palau.

In the school year of 1863-1864, he went to the Piarists High School of Reus. He got all kinds of grades but made adequate progress until, in 1868, he transferred to the High School of Carme Street, in Barcelona. After graduation, he went on to the Architecture School of the same city.

From 1868 until 1878, he combined his studies with a paid job with several architects; he collaborated on several of Francesc de P. Villar i Lozano and Josep Fontserè i Mestres projects. He frequently visited the workshop of Eudald Puntí, where he learnt several trades (carpentry, blacksmithing and plaster modelling) under the guiding hand of some excellent artisans, such as the sculptor

Llorenç Matamala i Piñol who would be one of his most important collaborators in the construction of the Sagrada Familia. While still an undergraduate student he drafted a few private projects.

The interest, love and respect instilled in him by his mother during the first years of his life, a time when every child is like a sponge, were responsible for his lifelong analytical observation of the environment. He felt the perennial human yearning for learning something new each day. After joining several hiking associations he made excursions around Catalonia with other hikers or alone. His constant reading of books borrowed from the school's library and the collecting of postcards from the world's different regions, helped to complete his naturalist formation.

He obtained his official title of architect on March 15th of 1878 and began working professionally, developing a new and original concept of building which, with the passage of time, would become his unique style.

MASET DE LA CALDERERA IN RIUDOMS
A view of the present building (smaller and with only one floor) constructed in 1922 on the land where the farm of his infancy stood.

MASET DE LA CALDERERA IN RIUDOMS
House built in 1922.

PEDESTAL OF THE NATIVITY FACADE
Pedestal with poultry; a reference to the Maset de la Calderera.

I was breast-fed for a long time. Very soon I had attacks of rheumatism in my joints, which persisted throughout my life. The sickness took an important toll on my education: I remember that when we went to the Maset I had to ride a donkey because I could not walk.

In later years, I started going to school with the teacher Berenguer and, after, with the teacher Palau.

Antoni Gaudí

THE GAUDÍ HOME IN REUS
The house of Gaudí's maternal family in number 4 Sant Vicenç Street, where, on the ground floor, his grandfather's boiler-making workshop used to be.

THE ANCESTRAL HOME OF THE GAUDÍS IN RIUDOMS
In number 14 of Raval de Sant Francesc, recently restored.

Next to the flower pots, surrounded by vineyards and olive trees, cheered by the birds singing and the bugs buzzing, with the mountains of Prades as a backdrop, I became aware of the most pure and pleasurable images of Nature, that Nature which will always be my teacher.

Antoni Gaudí

As a result of my frailty, I had to abstain from participating in children's games, which pushed me to observe my surroundings. Once, when the teacher was explaining that birds had wings so they could fly, I said: 'The fowl on our farm have very large wings but they don't know how to fly; they use them to steady themselves when they run."

Antoni Gaudí

CORBEL WITH SWIFTS' NESTS
Family home of the Gaudís in Riudoms.

1878-1883. Gaudí, architect. First works

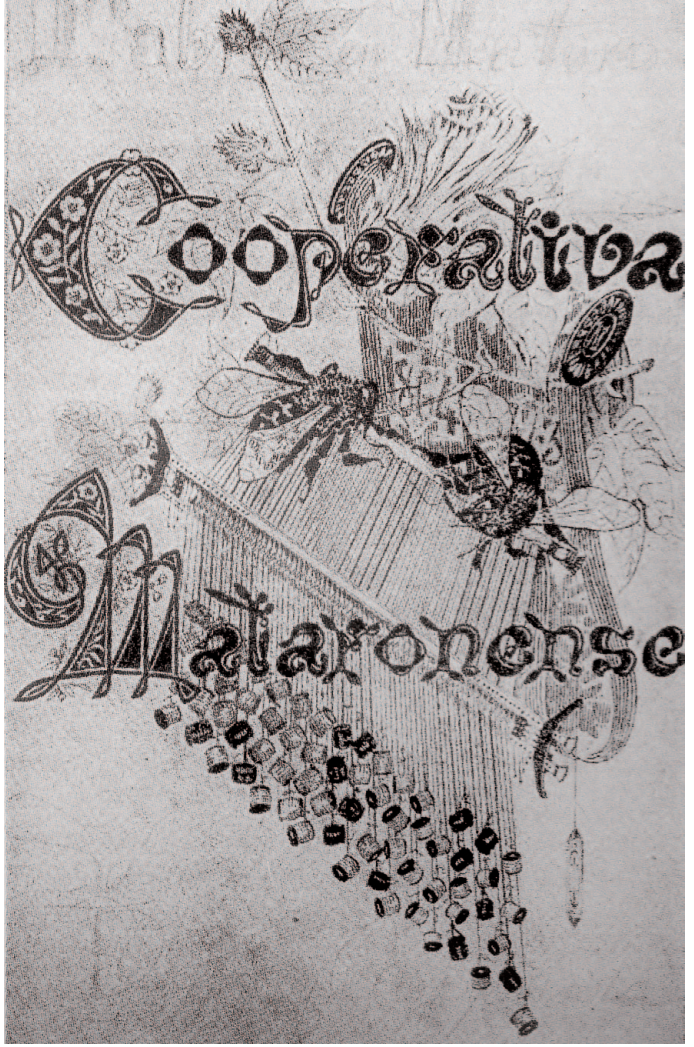
Once he obtained the professional title of architect, Gaudí started work on several projects. One of them was the Workers Cooperative of Mataró, the capital of the Maresme region; a project he undertook with interest since it was one of the first cooperatives started in the country. He designed several buildings for it: the textile factory, the workers' homes and a social centre, the Casino, inside the same urbanization, which would be only partially built.

BLEACHING ROOM
A nave of the Workers Cooperative of Mataró, for which Gaudí designed a structure of twelve catenary arches in wood. A vintage photo.

STRUCTURE OF THE WAREHOUSE
In 2002, during the International Gaudí Year, the Mataró Town Hall undertook to restore the bleaching room. View of the restored arches in the summer of 2006.

In this project, we begin to find references to nature, such as the catenaries shaped arches, a curve frequently found in nature. I would like to underline the resorting to the bee as a symbol of laboriousness in one of the posters and in the flag's mast. In the case of the poster, Gaudí substitutes the word "Workers" for two bees toiling on a loom. In the same poster he drew a plant, a thistle (*Carduus sp.*), as a reference to the carding of wool, a way to comb impurities out of the fleece. Sometimes, dried burs were used for the same purpose.

CROWN OF THE FLAG'S MAST
The bee, a symbol of laboriousness: motif of Gaudí for crowning the flag's mast of the cooperative.



POSTER
In this poster of the Workers' Cooperative of Mataró, a drawing of some bees stands for the word "Workers".

The catenary arch

In most of his buildings, Gaudí used catenaries, the curve adopted by a chain suspended from two points, more or less open depending on the distance between them.

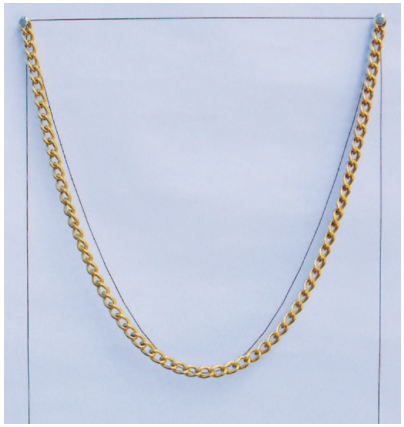
Gaudí thought that when inverting this hanging curve he obtained a natural and perfect arch, aesthetically pleasing and with unbeatable mechanic properties, as it sustains itself by its own weight, without the buttresses required in other types of arches. We find them in his principal works: the Cooperative of Mataró, the Teresianas School, the stables and belvedere of the Güell Mansion, the attic of the Milà House, the main doors of the Güell Palace and even in the Sagrada Familia's naves.

It's a curve frequently seen in nature: in the vines hanging from two branches, cobwebs and in the strings of eggs spawned by toads.

Vines are tropical creepers that frequently hang between branches adopting the shape of catenaries.

The common toad, *Bufo bufo*, is an amphibian; the female spawns a string of eggs that she deposits in the water, where they form catenaries between the plants. In each string there can be between 1.000 and 6.000 eggs that will hatch within 12 days of being spawned.

Cobwebs are nets created by spiders by secreting a silken, flexible and very sturdy thread, from paired glands called spinnerets in the lower part of their abdomen. The wind blows them away until they stick to an obstacle; when they do, they form catenaries (which we tear apart when walking through them).



CATENARIES
The pull of gravity determines the shape (somewhat similar to a parabola) a chain adopts when you hang it from two hooks.

The force of gravity is radial (not parallel); therefore, a compressed catenary is a curve that closes itself towards the centre of the Earth, while an elongated one tends to raise itself indefinitely towards the sky. This means that it is a curve of transition between the ellipse (closed) and the hyperbole (open).

Antoni Gaudí

VINES
Vines are creepers that describe catenaries between the jungle's trees.

STRINGS OF TOAD'S EGGS
The female toad deposits over the water strings of eggs that form a catenary.

SPIDER'S WEB STRING
Spiders are tireless spinners of catenaries.

The hyperbole, parabola and catenary are funicular curves; in the first one the main charge is in the centre and it decreases when the distance augments; in the second, the charge increases with the distance from the centre (that's the reason for the curve being between the parabola and the ellipse). A funicular is a paraboloid.

Antoni Gaudí