Felix Candela
Church of la Virgen Milagrosa

Felix Candela is a mathematician, engineer, architect and contractor. He has frequently been credited as the master of Shell Architecture. Candela has also experimented with conoids, folded shells, and elliptical domes. The use of the hyperbolic paraboloid is regarded as his trademark. Candela was often quoted saying that he was a prisoner of geometry.

The church of la Virgen Milagrosa can only be the culmination of an original vision. The project is a triangulated Gothic church with a strong emphasis on its vertical elements. The building visibly exudes its hierarchal nature with its varying scale and repeated forms. The tower shares the same geometry as the church resulting in a timeless elegance. The vaults, spans, and openings are atypical yet aesthetically pleasing in their complex geometry and symmetry.

The interior columns appear sculpted and well integrated as they rise upwards to receive the ceiling vaults in a seamless union.

Guillermo Rosell
Manual Larrosa
Lomas De Cuernavaca Church

The structure and cross are perhaps two of the most grandiose sculptures to ever grace a site. Both sculptures work in unison while serving a religious function. The church is a hyperbolic paraboloid that has very lean edges. The roof slopes in such a way that it functions in essence as a skylight. Sharing the landscape with the building is a tapered cross that surges towards the heavens from a lonely hill.

Antonin Raymond
Church at Negros

The Catholic Church at the Island Negros was built in the Philippines. The vertical column articulation creates subtractive spaces as a result of the design translation at the upper levels. Translation, rotation, repetition, and hierarchy are all visibly apparent on the floor plan. The built scheme employees all of the aforementioned design principals through one element, a concrete pier. In response to the climate, side walls were left open thus permitting the free flow of air to mitigate the heat and humidity. The three liturgical features that the building possesses are the sanctuary, baptistery, and confessional. The bell tower rests directly over the sanctuary as the primary visual element. The tower also provides a lofty ceiling and is an outward manifestation of the sanctuary below.

Antonin Raymond
St. Anselem's Church

St. Anselem's Church of Tokyo is comprised of folded slabs that form the walls. Ceilings and walls have a natural concrete finish. Openings for light are formed by diagonal and rectilinear structures.

5. Thiry, Paul, *Churches & Temples. Reinhold Publishing Coroportaion, Newy York, 1953*

Pier Luigi Nervi

Turin Exhibition Hall
Warehouses
Airplane Hangar
Salone Agnelli
Kursaal Pavilion

Italian born Pier Nervi is an engineer and architect. Nervi is best known for his Italian Air force hangar design. His designs exhibit a seamless structural integration through all of the building components. The structures span vast distances without the use of intermediate interior columns. In the instance where a column is used, the structure is exposed and celebrated. Ribs that join elements in the ceiling were left exposed. The upper and lower roof sections are precast. It is clear in Nervi's designs that he intended for his structural elements to remain exposed at the inception the design process.

In all of the aforementioned projects designed by the inspirational architects, there are parallels. One of the most common was the consistent use of concrete whether site cast or precast. The material allows the designer to create any structural form imaginable. After an in depth study of the previous buildings I can appreciate why some authors have referred to the projects as *structural art*.

The buildings are true in their function, purpose, and concurrently exhibit a sense of permanence through their material composition. The concrete was used to form curves, angles, arches, vaults, ribbed ceilings, and shells.

The geometric results are pristine and have an ornamental quality. The use of form was strictly based on understanding of the complex structural possibilities that exist in the plasticity of concrete.

Nervi once commented that,

"to build correctly is the essence of architecture, structural correctness… is identical with functional, technical, and economical truthfulness and is a necessity and sufficient condition of satisfactory aesthetic results." (8)

Eero Saarinen

Dulles International Airport
TWA Airport Terminal

Eero Saarinen was born eighteen miles from Helsinki yet he is responsible for two of the best known airports on the east coast of the United States. Dulles Airport and the TWA terminal were each constructed with concrete. The TWA terminal has four sculpted columns that support the vaulted interlaced domes at 50' above grade. The building's various elements function as a whole. Every element appears to be a uniform entity that relates to all others as one cohesive body, forming a single structure.

Dulles Airport originally spanned 150' but was expanded in the late 1990's to provide an increased volume of service. Like TWA, Dulles makes use of exterior concrete columns but also has one interior column. Each exterior columns stands in uniform perfection as if they had each been chiseled by hand.
Dulles Airport and the TWA terminal each make full use of exposed concrete structural elements in both the exterior and interior simultaneously. The precision of the columns at Dulles Airport are most likely attributed to the controlled conditions required of precast concrete forms. The vertical structures and roof forms of each building are joined together by geometric design and are forever inextricably linked.

The Dulles Airport building envelope does not include a single exterior wall. Instead the voids between the columns are filled in with window frames or trusses that were integrated into the structural design of the building. The window framing extends from the floor to the ceiling. The structurally enclosed framing is at an angle to reduce the potential for glare on the pilots. The repetition of a single element, in this instance a column, affords Dulles an elegant and ageless appearance that few buildings ever achieve. The roof is a simple concave shell. The single column which rest beneath the roof is used to collect water off of the roof. The scale and materials used at Dulles exhibit a majestic presence that conjures-up images of the Roman temples from the distant path. Both Dulles and the TWA terminal span great distances while soaring to staggering heights with out the support of any internal structural columns. In both buildings, form and structure are combined into one element.