Through his unusual treatment of surfaces, Guadi was able to derive qualities that hovered between the beautiful and the deformed. Although the Sagrada Familia follows a Gothic Revival Idiom in both scope and layered meaning, its architect moved beyond its paradigm in his thinking and execution of the elusive intangibility of freeform. During his time, Gaudi pioneered ideas of metamorphosis, *morphogenesis*, and polymorphism through an exploratory process establishing a sort of *architectural teratology* through conceptions of evocative surfaces.

Through an inherent quality of the carved stone surfaces, the symbolism of the figurative biblical references at the Sagrada Familia and their consistency with the architect’s *Puginian* intentions where only superficial layers of a narrative that went much deeper into a system of abstract elements. It was Guadi’s unique treatment of surface that suggest that the architect had an understanding of issues that would come more than a half century later within post-modern abstraction - “a belief that the organic goes beyond the surfaces that appear to fix us from without and bind us within.”

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3 The notion of teratology (the scientific study of visible conditions caused by the interruption or alteration of normal development) is in reference to Guadi’s metamorphosis of normal surfaces and forms to more complex and warped geometries.
The common and perhaps problematic misconception of ‘organic’ architecture is that too often, organic means that the built form only bears a resemblance to certain attributes commonly found within nature. However, it is possible to speculate that Gaudi’s work, through its abstract qualities of metamorphosis, offer a closer kinship to an organic architecture by considering a family of relationships between surfaces bounded by their geometry.

It has long been documented that in order to make possible his ideas of morphogenesis, Gaudi employed a method of second order geometry. Although it had long been documented as a method that the architect used in the entire composition of the nave, the principal advantage of the method - its capacity to be fragmented into several individual components, that when combined, form a seamless whole - wasn’t discovered until the 1990’s.

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5 The fundamental characteristic for second order geometry is the way non-coplanar straight lines can variously describe warped surfaces with a pragmatism that is masked by the apparently free-form composition. The principal practical advantage of is the way each of these surfaces can be fragmented into individual components which, when combined, will form a seamless whole. “Gaudi, Teratology and Kinship.” Mark Burry. Architectural Design, May-June 1998.
An analysis of the geometries used by Gaudi during the last period of his work indicates a slightly more pragmatic approach in its relationship to program and the construction process. From early in his career Gaudi was understood to have a comprehension of ruled-surface geometry—a method that allows for the generation of curved surfaces through a geometrical ordering of straight lines. Found within natural structural forms of most organisms, ruled-surface geometry facilitated Gaudi’s formal strategies through the development of the complex forms and geometries of the Hyperbolic Paraboloid, the Helicoid, and Parabolic arch. Furthermore, it's apparent that within his final years Gaudi continued to perfect the use of this system, which allowed complex surfaces to be defined so perfectly, not only to further his development of a rational organic

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6 Ruled-surface geometries are “curved surfaces generated through straight lines geometrically ordered so not to lie on a plane and are the basis for the structural forms of most plants and organisms.” Sagrada Familia,” Mark Burry. *Architects Journal*, April 1992.

architecture, but to offer a methodology that would make possible the continuation of the construction process of the Sagrada Familia by his successors.

Diagrams showing the three geometries of the hyperbolic paraboloid, helicoid, and hyperboloid which Gaudi used for the design of the nave.

(The Expiatory Church of the Sagrada Familia. Mark Burry. Phaidon Press, London. 1993.)