Authorship and Agency in the Design of The Sagrada Familia

Dissertation
Cultural Context 3
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Introduction

This dissertation considers whether The Sagrada Familia can be solely attributed to Antoni Gaudi. In exploring his collaborative approach to the ornamentation and building of The Sagrada Familia, the dissertation proposes that Gaudi did not, in fact, intend to be the sole creator of this church but instead allowed and anticipated other artists and builders a degree of creative freedom. Part of this research being done through a visit and close analysis of the church itself. This dissertation will also explore whether architectural authorship can be solely attributed to human ingenuity or whether systems such as Parametricsm can also be considered 'agents.' As he knew that the building would never be completed in his lifetime and strived to create a system that could be understood and followed. This idea of a parametric system, however, then removes authorship from the design as it creates a language understandable by many, but the architect then becomes the author of the system that is far beyond a singular design. This then poses the question: is an architect an author or simply a problem-solver?

Historical context

Figure 1- Antoni Gaudi

In 1883 when Antoni Gaudi was first appointed to The Sagrada Familia he designed knowing he would not be able to see it finished. He believed in conserving the 'spirit'[1] of the work and that the life of the church depended on the later generations that would take on the project. Allowing us an insight into what we may assume Gaudi's 'process' was, of creating a system that could be understood and developed through time, that didn't limit creativity but would give this now significant building relevance between what he lived to see and what we now know it as, basing it on nature[1], an element that would never change. To create this 'system' on a permanent environment allowed for both Gaudi, but also later architects, to base their design solutions on how the natural world would solve similar structural issues. He saw the natural world as perfect as it had been created by God[1].

Figure 2 – Francisco de Paula del Villar y Lozano

Gaudi was not the original architect of The Sagrada Familia which is important to note for this piece of writing. The original project began with Francisco de Paula del villar y Lozano who was appointed by Josep Maria Bocabella, founder of the Asociación Espiritual de Devotos de San José. Bocabella was inspired by the Holy House in Loreto that he came across on his return from Rome in 1970 after delivering a silver image of the Holy Family to Pope Pius IX. This house was believed to have housed The Holy Family in the 13th century after being moved from Nazareth to this Italian town, and so Bocabella, who was astounded by the beauty of this sanctuary was inspired to create a replica in Barcelona[2]. At the tail end of 1881 Bocabella's association acquired a plot of land that measured 12,800 meters squared[1] which allowed for this project to take life. The building was intended to be completely self-funded[2] through donations of the devotees of Bocabella's association, and to be awe inspiring to reignite the people's spirituality as Christianity faced a difficult moment in its history.

Originally the church followed the strong architectural stylistic guidelines of the time, leaning towards heavily neo-gothic elements such as a Latin-cross plan, ogival windows, buttresses, flying buttresses

[1] The Sagrada Familia, C/ de Mallorca, 401, 08013 Barcelona, Spain, 18th October 2022, Site Visit

[2] Fundació Junta Constructora del Temple Expiatori de la Sagrada Família, History of the Temple ,Sagrada Familia [website] https://sagradafamilia.org/en/history-of-the-temple (accessed on the 8th November 2022)

and a pointed bell tower[1]. Which although still resonate in the design we see today; we can also observe how changes to this original style were made. Lozano who had made these original design choices left after only a single year, due to disagreeing with Bocabella and his top advisor about wanting solid stone pillars in the crypt which Bocabella and his advisor believed would be too expensive[2]. And thus, with Lozano stepping down, his young apprentice Antoni Gaudi was put forth to replace him, finding a project that had been completely thought through with the first stones having been placed and the construction of the columns for the crypt already nearly done[2]. However, there were a lot of elements of the pre-drafted project that Gaudi was not happy with and so he put forth a new design of a temple of far larger scale and complexity, wanting to make the 'Sagrada Familia a link between heaven and earth'[2].

Gaudi, who was incredibly invested in this project and decided to not take on any other projects from 1914 and worked solely on The Sagrada Familia up until his death in 1926 when he was run over by a tram[3]. At this point, The Sagrada Familia was not close to being finished and since his death 7 different architects have led the project in hopes to progress its design and construction methods to finish it. These seven architects being – Francesc de Paula Quintana, Isidre Puig I Boada, Lluis Bonet I Gari, Francesc de Paula Cardoner I Blanc, Jordi Bonet i Armengol, Jordi Fauli I Oller.[3]

Systems

Gaudi was a strong pioneer for advanced technologies, in a time where mostly all architects continued to design in 2D, Gaudi was known for his preference of plaster models[4]. This is due to the complexity of Gaudi's designs which were simply too difficult to communicate though two-dimensional illustrations[4] and having them in the physical allowed him to also test their structural stability, which

[1] Fundació Junta Constructora del Temple Expiatori de la Sagrada Família, History of the Temple ,Sagrada Familia [website] https://sagradafamilia.org/en/history-of-the-temple (accessed on the 8th November 2022)

[2] unknown, 'What would the Sagrada Família be like if Gaudí hadn't taken over the project?', [web blog], 3rd November 2017, Blog Sagrada Família, https://blog.sagradafamilia.org/en/divulgation/what-would-the-sagrada-familia-be-like-if-gaudi-hadnt-taken-over-the-project/ ,accessed 14th December 2022)

[3] The Sagrada Familia, C/ de Mallorca, 401, 08013 Barcelona, Spain, 18th October 2022, Site Visit

[4] Gomez-Moriana, Rafael, 'Gaudi's hanging chain models: parametric design avant la letter?' Criticalista [web blog] 16th of august 2012, https://criticalista.com/2012/08/16/gaudis-hanging-chain-models-parametric-design-avant-la-lettre/ (accessed on the 19th November 2022)

left him preferring to design majoritively in 3D plaster models. Due to incompletion of The Sagrada Familia at the time of Gaudi's death, the project was inherited by the 7 architects previously named, over the following 100 years the church continued being built but at a very slow pace as they couldn't quite understand the system that Gaudi had created. These changes in generations meant a change in technology and a development in techniques and construction methods that allowed the church to begin being built more efficiently but also faster once the advanced technology had been adopted. Up until 1990, the architects relied on hand drawn sketches and went directly to the stonemason's workshop to create the individual elements of the building.[1] The shift to programmes such as Rhino, Cadds5, Catia and Cam and an aeronautical software were all introduced as well as 3D printers which allowed the design team a new way to analyse and solve the construction issues they were facing.

Figure 3 - Photograph of the studios within the church

These softwares also allowed for a better understanding of Gaudi's design through reverse engineering, although originally when the issue of solving and understanding Gaudi's designs, such softwares didn't exist. Mark Burry, an architect from New Zealand but also professor at the Swinburne University of Technology, was tasked in understanding and dismantling Gaudi's logic with only broken plaster models to base himself off[2]. These models which had been Gaudi's primary tool for the translation and communication of his ideas, had been heavily damaged during the Spanish civil war, and what was left were fragments of the originals and piles of dust, of which it became increasingly difficult to decipher the original design forms and structures[2].

Figure 4 - plaster model fragments reconstructed

[1] Caminal I Homar, Antoni and Serrallonga, Jaume, 'The Sagrada Família, a pioneer in applying manufacturing robots to architecture', [web blog], 4th October 2019, Blog Sagrada Família, https://blog.sagradafamilia.org/en/specialists/applying-manufacturing-robots-to-architecture/ (accessed 14th December 2022)

[2] Krakovsky, Marina, 'A Model Restoration', Communication of the ACM, vol.64, no.9, 2021, 13-15

The key to these complex broken models was figuring out the underlying geometrical pattern, which Burry soon understood was the connection between all the surfaces and exactly how "three adjacent three-dimensional surfaces intersected at a single point, called a triple point.".1 The complexity of this problem arose from the way the geometry was designed, using a hyperboloid of revolution made from rotating a hyperbola around its axis which individually is not difficult to understand but when two hyperboloids of different shapes (such as a circular hyperboloid and an elliptical hyperboloid)[2] are intersected into the same surfaces, the curves that are created become incredibly "sinuous"[1]. Therefore, finding the triple point of three different hyperboloids spun on the same axis becomes incredibly difficult. Thus, it can only be applauded how Gaudi were to engineer these forms in the time in which he created them. The only plausible way for Burry to solve this three-point challenge was by creating contour lines, similar to how it would be done for a mountain, but there was no such software that could enable him to do this in 1979 and so it had to be done on paper.[1]

A decade later when Mark Burry was brought back to finish the process of understanding the geometrical complexities of the forms, he was told that it would be a much easier job with the introduction of AutoCAD which he found was not the case for this software (as it was simply recreating 2D drawings but through a screen) or any other architectural softwares.[1] He began by looking at different fields that faced similar spatial challenges and found one for vehicle design systems named Intergraph VDS, yet unfortunately it was far too expensive of a programme for The Sagrada Familia to invest in[2]. Finding an alternative led him into different engineering softwares, he found one that granted him free access called Computervision.[1] Soon after adopting the software, an upgrade was introduced which allowed for parametric modelling, which Mark Burry described as "the quantum leap in stepping away from Gaudi's world to the contemporary design world".[1]

Parametricsm

Parametricsm is the computer representation of geometrical objects that possess attributes or properties. Some of these values are fixed and are called constraints whereas some remain variable and are called parameters.[2] Within a parametric model if one were to change a variable, then in turn all the fixed values would have to readapt and reconfigure themselves to the new values to stay

[1] Krakovsky, Marina, 'A Model Restoration', Communication of the ACM, vol.64, no.9, 2021, 13-15

[2] Hernandez, Carlos Roberto Barrios, 'Thinking parametric design: introducing parametric Gaudi', Design Studies Thesis, Massachusetts, Massachusetts Institute of Technology, 2005

balanced. A visual example of this was created by Gaudi named the polyfunicular model[1] (or the hanging chain model) which was a string model intended to recreate the construction of one of his other projects, the church at Colonia Guell.[1] It was believed to be the first inverted 3D model and was used by the architect as a way of using traditional Catalan masonry techniques[1] to construct catenary arches, but Gaudi's intention was to use this theory and applying tension and compression to chains on chains to create an asymmetrical and more fluid architecture[1]. This chain model was essentially the beginnings of Parametricsm as it allowed Gaudi to test his design by adding and removing lead shot bags,[1] in effect create the same response as a modern-day parametric programme would, as the lead shot bags would be added and removed (used to mimic the weight of the masonry) and thus the weight changed the entire model would have to shift to re-balance itself. Gaudi then used this model over a mirror to visualise his design.[1]

Figure 5 - The ceiling of the church where we can see the intersection of two doubly ruled surfaces

What has allowed the following generations to continue designing and building The Sagrada Familia in the same fashion as Gaudi had, is this 'system' that he created using a systematic algorithmic approach to the architecture. He wanted to apply a geometry which was doubly ruled surfaces[2] of which there are only three – planes, hyperboloid revolutions and hyperbolic paraboloids.[2] These are simple to understand as they are essentially straight lines in space, meaning anyone wanting to make one could be pointed to where these lines start and end and creating the same results.[2]The architects who followed in Gaudi's footsteps knew that there was a system to the forms he created, but it was a complicated system made more complicated by the fact all the models had been broken into pieces as previously mentioned, and that there were no drawings, as Gaudi didn't like to draw and any that did exist were destroyed and never considered the authority of what the design should look like. Thus

[1] Gomez-Moriana, Rafael, 'Gaudi's hanging chain models: parametric design avant la letter?' Criticalista [web blog] 16th of august 2012, https://criticalista.com/2012/08/16/gaudis-hanging-chain-models-parametric-design-avant-la-lettre/ (accessed on the 19th November 2022)

[2] Antoni Gaudi architect and structural artist – M. Burry, Mark Burry, 11th December 2019, https://www.youtube.com/watch?v=oiofvf_4EcY&t=2363s (accessed on the 20th October 2022) – 32mins

began Mark Burry's reverse engineering of the models in which knowing there was a system meant he had only to find the pattern using an archaeological standpoint.

Examples of the system in use are seen within the roof of the sacristy where two hyperbolic paraboloids intersect and creates the generation of the roof[1]. Furthermore, this system remains a parametrically variable entity and all the towers – other than those on the perimeter – follow this same construct as well as the ornamentations and the ceilings are all based on these intersecting doubly ruled surfaces.[1]

Part of this system can be understood best in the construction of the columns. These are designed based on a section through a hyperbolic paraboloid which is called a parabola. A formation of repetitive concave and convex parabolas for a profile around the perimeter, which all the columns have as their base and when extruded it creates a singly rotated profile. However, the columns that Gaudi designed had two profiles sitting on top of one another which when extruded the profiles would

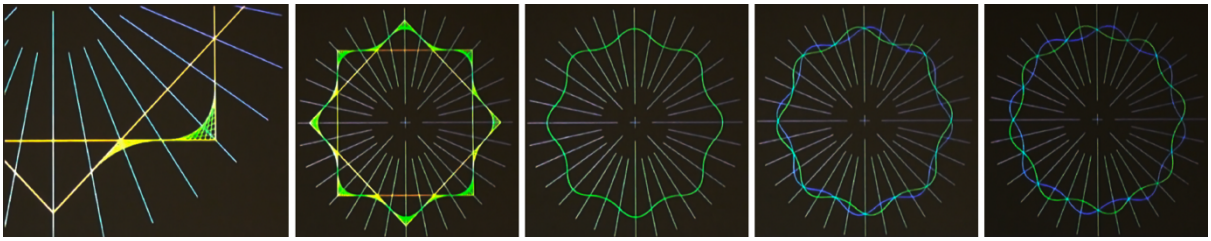

Figure 6 - Convex and concave parabolas to show how the columns are designed

wander away from each (Figure 6) as the column becomes taller but upon reaching a certain point these two profiles will come back on themselves. This would ultimately limit the height of the column and so Gaudi inspired himself from natures solutions to this sort of structural problem and so doubled up the parabolas to restart and continue the extrusion. It is difficult to understand coherently how these parabolas work in the two dimensional as Gaudi both designed but understood these techniques using three dimensional tools and the formation of these models was all done manually in his time.[1]

[1] Antoni Gaudi architect and structural artist – M. Burry, Mark Burry, 11th December 2019, https://www.youtube.com/watch?v=oiofvf_4EcY&t=2363s (accessed on the 20th October 2022) – 37mins

Considering Gaudi's creation of the polyfunicular model, the question arises of whether Gaudi's work could or not be considered parametric. On one hand it would be possible to argue that it isn't in relation to The Sagrada Familia, as although Gaudi created what is known as the first parametric model, his theory and workings were never applied to a built building as the church at Colonia Guell was never finished, so what is considered to be his work never showed any true Parametricsm in the definition we understand it by of which being adapting variable parameters and allowing the fixed to shift in order to create something structurally sound, for which the entire building would need to be built for it to be truly parametric as all the fixed and variable figures rely on one another. However, it would be arguable that Gaudi's work was in fact parametric due to the geometrical forms he used to create his designs. The principle of the doubly ruled surfaces is fundamentally parametric as this one system and principle with varying changes to the variables creates a set of curves that in turn form the bases and curves for all the structures and ornamentation whilst distributing the forces along the curves.

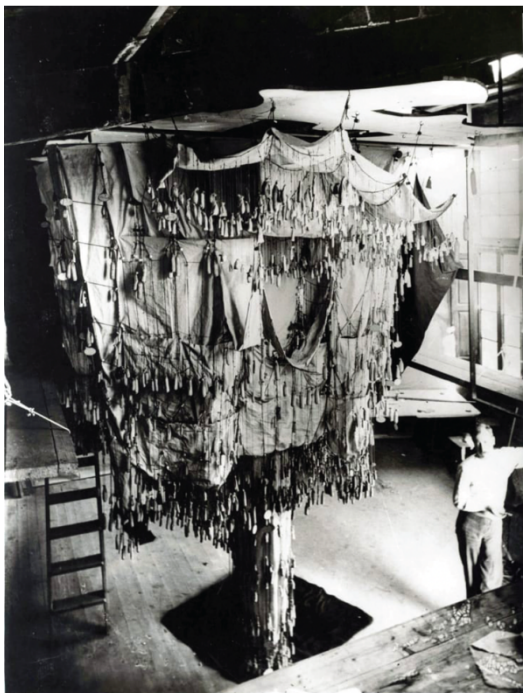

Figure 7 - Photograph of the original polyfunicular model

Computer-Aided Design

CAD (Computer-Aided Design) became a significant part of the development of The Sagrada Familia when the softwares were developed. Up until 1990[1] the studio worked primarily through hand drawings as stated above and the use of technology was non-existent as they also continued making models by hand in plaster, exactly in the way Gaudi had. However, when CAD and other softwares were introduced, it allowed for not only creating what the architects had already been doing on computers, but it also introduced production techniques that would allow them to develop iterations and problem solve faster using machines such as CNC robots and 3D printers. The use of these numerical controlled machines – which were run and programmed using CAD softwares – allowed for the architects to replace handmade models with 3D printed models which would allow for a higher rate of production and a faster decision-making process. The CNC robots also became incredibly useful, saving both time and money in the production and construction of some of the towers.

[1] Caminal I Homar, Antoni and Serrallonga, Jaume, 'The Sagrada Família, a pioneer in applying manufacturing robots to architecture', [web blog], 4th October 2019, Blog Sagrada Família,

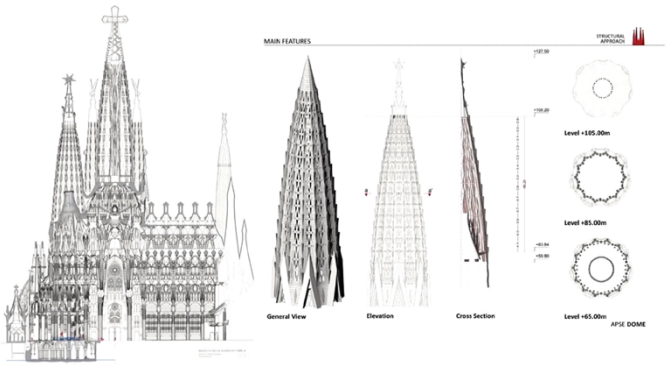

Figure 8 - the process of elongating the Mary tower

One example of where these tools (CAD and CNC) can be seen to be incredibly useful and beneficial are within the design and construction of the Mary tower as now within the last 10 years of the build (2016-2026) they have still to build 40% of the church, when the last 60% was built over the span of 140 years, raising the construction levels by a factor of 10 and so the efficiency in creating and testing ideas was to be elevated[1]. The Mary tower, which now sits above the crypt, was calculated to have too much weight for the foundations that were put in, in 1877[1], if it were to be constructed in the same way the others had been built using reinforced concrete and masonry cladding. Therefore, the engineers (led by Tristram Carfrae) had to problem solve how to create something that would remain structurally sound but would stay true to the original design and system of the church.

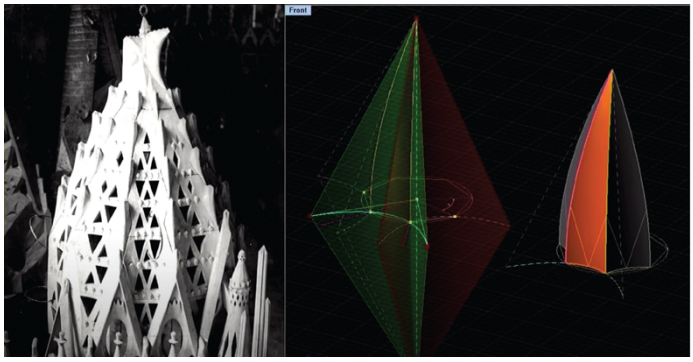

Figure 9 - the surving model of the sacristy and the geometrical structure from which the Mary tower was designed

The geometry of the tower is taken from one of the surviving models – that had been reconstructed by Mark Burry – of the sacristy, as none of the models showing the Mary tower survived[2]. This tower would be made up of hyperbolic paraboloids that are rotated around a central axis and intersected to give the shape of the tower, creating 14 sides of these intersecting hyperbolic paraboloids which give a catenary shape in elevation but a scalloped shape in plan. (A catenary arch, also known as a hyperbolic cosine, can support its own weight by minimising the forces in compression by equally distributing gravity along the curve.)[1] A form which was difficult for the structural engineers to understand how it would stand and how it would behave, especially with the triangular windows cut throughout. To begin the process, Tristram Carfrae had to

[1] Completing La Sagrada Familia, a talk by Tristram Carfrae, Tristram Carfrae, 15th March 2018, https://www.youtube.com/watch?v=b0WqWrnrMGA (accessed 12th October 2022) – 29 mins

[2] The Sagrada Familia, C/ de Mallorca, 401, 08013 Barcelona, Spain, 18th October 2022, Site Visit

look and analyse how the structure would work in masonry as the model could only work in compression as any tension would cause the joints between the stone to open under a wind load. This test done on CAD showed that this structure would hold up well under normal wind pressures however when tested against the ultimate wind load – used for a degree of safety when designing – the structure failed and showed that the front face would go into tension.[1] Using CAD allowed Carfrae to do these tests and understand the constraints of the material at a much quicker pace then they would have been able to if they had had to create 1:1 scale models of these pieces to test them. Such experiments might not have been able to be done so thoroughly and to such a depth of understanding without softwares, saving them a lot of time, money, and material. These computer-generated tests therefore led to a conclusion that creating pre-compressed panels with post-tensioned steel[1] to create the overall panel would allow the masonry to work at its best and safest under the wind load.

The builders, who work only on Sagrada Familia, were very present in the conversations and where they had previously been building things out of reinforced concrete and cladding it in stone, to meet the earthquake requirement that was put in place for the church at the end of the 20th century[1], it seemed easier for them to thread the masonry onto the steel rods. Thus, within a month of Carfrae putting the idea forward – the builders had built a piece and even said that one of these panels would only take a day to make, whereas a reinforced concrete panel would have taken a week plus the added time for it to be stitched together in situ.[1] This 1:1 piece that the builders had made was then used to test the force in real life as due to stone being a natural material and therefore having potentially inconsistent properties, they could test the theoretical theories that had been tested in CAD out on site, proving their theory right.

In addition to this CAD allowed them to develop the construction techniques. In such a case as the panels the advancement in technology meant that they could use a natural material that has been used for centuries and approach it and adapt it from a technological perspective. They used a fully computer-controlled diamond tip band saw with a vertical traverse and turntable to cut these materials.[1] Handily, this type of saw can cut only ruled surfaces of which all those that Gaudi designed were. This allowed for all the elements to be cut with millimetric precision directly from a rhino model as these computer-controlled processors would directly use the 3D CAD model.[1] This created an extremely efficient process that only required the stonemasons to finish the pieces by hand by

[1] Completing La Sagrada Familia, a talk by Tristram Carfrae, Tristram Carfrae, 15th March 2018, https://www.youtube.com/watch?v=b0WqWrnrMGA (accessed 12th October 2022) – 48 mins

hammering the exterior to match the texture of the original materials that would at the time been completely cut by hand.

Artificial Intelligence

Artificial Intelligence is also another technological development that is developing into the architectural and construction industries. It is particularly appliable to The Sagrada Familia due to the base of its design being set on a geometrical system. In the book 'Machine Hallucinations : Architecture and Artificial Intelligence" edited by Matias del Campo and Neil Leach, they discuss how technology is in the process of shifting from expert systems to learning systems, the prior being a system requiring an 'expert' or a human to give it its base of information, as it is made up of two subsystems, one which specifies the rules – the knowledge base, and one which applies the rules to known facts in order to create new facts – the inference engine.[1] However, learning systems are systems that use raw data to derive solutions and are based on neural networks[2]. The system we understand the best is the 'expert' system as it is the one used in Computer-aided design and Parametricsm and has imbedded itself within the architectural field in the development of design. This book however raises the question of what were to happen if learning systems were to venture into the architectural world, this being a question which serves itself well to this essay as if this were the case and that the system could learn relevant semantic information without having to rely on or be fed hardcoded information[2], then could the system have a level of agency in the production and design of architecture? It may very well be that by teaching the neural networks a pattern, the artificial intelligence may be able to recognise and design similar patterns and so assume and calculate design solutions for future problems regarding The Sagrada Familia because it is built off of the parametric system that Gaudi created and if that same system is applicable to Gaudi's 'style' then would it be possible for this system to create new works to the level of Gaudi.

The ongoing research project led by Daniel Bolojan titled "Gaudi + Neural Networks" is exploring the possibility a neural network may be able to identify compositional features that are relevant in Gaudi's work by looking at samples from The Sagrada Familia and comparing those to samples from nature.[2]

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1 Del Campo, Matias and Leach, Neil, 'Machine Hallucinations', vol 92, Augmenting Design Potency, New York, Wiley, 2022, pp 23-27.

2 Bolojan, Daniel, 'Gaudi + Neural Networks', [web blog], 2020, AIArchitects.org , https://aiarchitects.org/portfolio/daniel-bolojan/, (accessed 21st December 2022)

In order to allow it to learn what structural properties from nature are relevant and allowing it to ignore those that don't lend themselves to the design in order, not to change the design, but to encompass 'geometrical strategies for liberating the composition while retaining the underlying composition of tectonic details'[1] which should in turn create an entire new set of varying compositions.

This would therefore give the 'architect' design options to choose from but where his role would no longer be to design a piece of work from scratch but instead allow for the programme to learn and then create varying iterations of structurally sound designs which the architect would simply have to pick and choose from according to personal aesthetic choices. A programme such as this would further shift the meaning and role of an architect as to what we could really consider the profession to be, as if we are stripped of even designing and simply surveying these systems then the need for architects is in turn useless.

The Role of the Architect

The traditional definition for an architect was an individual who was a master builder and who was responsible for both the design and the construction of a building with the term architect being derived from ancient Greece, "arkhi" meaning head chef/master and "tekton" meaning worker or builder[1]. Although this is the traditional, even historical, definition of the role, it has progressed and evolved since its origins. The development of technology and the difficulties and complexities of buildings meant that architects' responsibilities shifted into more specialisation into specific areas meaning that they could no longer take on overlooking the entire project single-handedly. This has fragmented the discipline as multiple people would be needed to give their own specialised expertise such as within the area of architecture having consultants for interiors, structural, landscape etc. This also devises responsibility and thus there is no longer only one person responsible for the construction and design of a building, which although may sound ideal as there are more ideas and more overlooking individuals, it also puts considerable strain on collaboration as no one voice is allowed to lead.

[1] Dejtiar, Fabian, Translated by Comberg, Ella, 'Etymology in Architecture: Tracing the Language of Design to its Roots', 30th July 2018, ArchDaily, https://www.archdaily.com/898648/etymology-in-architecture-tracing-the-language-of-design-to-its-roots , (accessed on the 3rd January 2023)

Thus, with a continuously shifting landscape of what the profession of architecture entails it becomes difficult to place architects such as Gaudi within this. Gaudi was both an embodiment of a historical architect as he is considered *the* architect of The Sagrada Familia yet contrastingly he was also pushing for a development in involvement from others and within technology. He would allow the craftsmen working on the church a degree of creative freedom, giving sculptors only an idea of what he imagined and allowing them to recreate what they had interpreted of his idea[1]. He had within his lifetime also started incorporating reinforced concrete within the construction of the church[1], a technique which required specialised builders due to how new it was.

In addition to this Gaudi also knew he would not live to see the church complete, and he may have known that designing it in any sort of constrictive way may have meant that the church could have not been continued to be built as generations shifted and technology evolved. And so, it would be possible to argue that Gaudi had thought of this as he is known to have said; "I know the personal taste of the architects that follow me will influence the works, but that doesn't bother me: I think the Temple will benefit from it […] Great temples have never been the work of just one architect."[1] This encompasses Gaudi's mindset and attitude towards the continuation and supposedly the agency of who designs the church, of it not being of one person but of a collective effort.

Authorship within Architecture

Having looked at different forms of systems and their inclusion and effect into the design and construction of the church The Sagrada Familia, it presents the question of how much of the modern design is reliant on these systems and whether they and other architects possess agency and authorship over the design of the temple.

In his book 'The Image of the Architect'[2], Andrew Saint considers what is considered the architect as "hero and genius" through the analysis of the fictional novel by Ayn Rand 'The Fountainhead' which itself discusses the struggles of a talented 'genius' young architect fighting against the conventions of the 1920s/30s, whilst ultimately coming out victorious and as devoted to his work as a 'hero' architect.[2] The novel also discusses idea of collectivism and how "the individual [architect] becomes increasingly frustrated by collectivism, to the detriment of society"[2] as architects are pictured as

[1] The Sagrada Familia, C/ de Mallorca, 401, 08013 Barcelona, Spain, 18th October 2022, Site Visit

[2] Saint, Andrew, 'The Image of the Architect', New Haven, Connecticut, Yale University Press, 1983

individualist, following a stereotype that "the creative individual [is] manifesting his will in action"[1]. This however portrays architects as self-centred individuals that only believe in their own designs, which Gaudi seemed to be the opposite of. In fact, his attitude regarding the remainder of the church that wouldn't be built when he died, he knew would be changed and influenced by the people put in place, thus disproving the ideology of a self-obsessed individual.

Following the commentary made in this book, it becomes hard to separate the building from the architect, in fact most known buildings names are always followed by the name of the architect who designed them. Which although at a time in the history of the profession was true, that the designer became the creator, the modern-day shifts mean that modern day buildings and the 'great' architects we know were probably not alone in the design of these buildings. Gaudi stands somewhere in the middle of this spectrum between the 'hero' architects that were given full credit for their work between the design and the construction, and the modern-day approach of a collective or team where architects work together to create and develop ideas. It could be seen that Gaudi was pushing for this development in the industry, acknowledging that the design would only benefit from the input of others by integrating their own creative freedom. This creative freedom also meant that to some degree every generation would have the ability to imprint on the church the progress of their time and of the individuals that partook within the work either as a craftsman or as an architect.

Conclusion

As commented on above architects were ultimately problem solvers that worked to making something aesthetically beautiful into something that also would stand and fulfil its function. Gaudi, the other architects and even the varying systems all work for that same purpose of problem solving and therefore the ideology of a single mind is more nuanced if this definition is acknowledged. In addition to this, Gaudi's own work was a product of collaboration as he took an already fully drafted project. There were some of Lozano's ideas that had already been built and so became permanent features, such as the cross layout and the decided orientation of the building, an orientation that Gaudi was not fond of but through respect to his predecessor[2], he did not change and so we can see that Gaudi himself was already adopting and adapting previous ideas from another architect and style and

[1] Saint, Andrew, 'The Image of the Architect', New Haven, Connecticut, Yale University Press, 1983

[2] unknown, 'What would the Sagrada Família be like if Gaudí hadn't taken over the project?', [web blog], 3rd November 2017, Blog Sagrada Família, https://blog.sagradafamilia.org/en/divulgation/what-would-the-sagrada-familia-be-like-if-gaudi-hadnt-taken-over-the-project/ ,accessed 14th December 2022)

preferences to it. Much like the architects that followed him that would have inevitably left design decisions that were representative of each of them.

Through this logic, The Sagrada Familia becomes an interesting building to look at, as although it is accredited to Gaudi, the previous explanations in this essay show that the design reaches far beyond him, through other architects but also into technological systems. Which makes us consider whether these systems have agency of their own, whether they can be considered to have had significant enough of a role in the design to be separated from those providing the systems with information. And if that were to be the case then it would be possible to see Antoni Gaudi as more than an architect but the author of a geometrical/ parametric system, which allowed the following generations but also modern technology to continue and improve his original designs. As the structures based on doubly ruled surfaces could now be considered an incredible feat for him to have imagined and successfully accomplished in his time due to the complexity of the geometry. I believe this to be true and that The Sagrada Familia is a feat much greater than a single individual and instead stands as a representation of collaborative and forward-thinking work that through time has made space and allowed for technological developments to take place. Although Gaudi initiated this process and in his own right should be recognised as the author of using doubly ruled surfaces in design through the inspiration of nature, he should not however be considered as the only architect as in the end he was simply one of nine to have worked and developed this design. Furthermore, it is not only the people but also the programmes that should hold a level of agency on this design, as if the role of the architect or 'designer' is to problem solve than it is only fair to recognise that both the architects and the programmes had a heavy involvement in solving issues in a more efficient manner.

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Figures

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Figure 2	https://blog.sagradafamilia.org/en/divulgation/what-would-the-sagrada-familia-be-like-if-gaudi-hadnt-taken-over-the-project/
Figure 3	Own Photograph
Figure 4	Own Photograph
Figure 5	Own Photograph
Figure 6	https://www.youtube.com/watch?v=oiofvf_4EcY&t=2363s
Figure 7	https://blog.sagradafamilia.org/en/divulgation/seismic-activity-sagrada-familia/
Figure 8	https://www.youtube.com/watch?v=b0WqWrnrMGA
Figure 9	https://www.youtube.com/watch?v=b0WqWrnrMGA