Forming Chicago, New York, and London: How Aesthetics, Socio-Historical Context, and Problem-Solving have contributed to Innovation in Architecture

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Introduction

We all experience architecture on a daily basis: our homes, schools, libraries, and even train stations. I have always loved walking through a new neighborhood with my family, being able to see all of the houses, the different architectural styles, as well as the variety of materials used. I have always loved the ways architecture, something we encounter everyday, can have so many ways it can look, and how the aesthetic of building has evolved overtime.

The question that guided my research was: What is the relationship among architecture, specific problem-solving, and socio-historical context? From my research on this question I created the thesis: Architecture and society have reciprocal relationships with each other. Architectural forms are shaped by a variety of factors including their socio-historical context, architects working to find solutions to problems they face, past architectural forms, and constraints and limitations.

This literature review covers a variety of different aspects of architecture including form, function, aesthetic, socio-historical context, and how all of these things relate to problem-solving in architecture. In order to connect these various aspects, I used literature that focused on two seminal architectural examples: the Crystal Palace in England and the invention of skyscrapers in the United States. These examples represent two very different forms, but I discovered that they connect in some very interesting ways. They also illustrate different areas of my research question.

To start my research, I began by reading a little about the Crystal Palace, as well as the innovation of the skyscraper. After doing this initial reading, I needed to pick a book. I ended up reading the book by Andrea Simitch and Val Warke called *The Language of Architecture: 26 Principles Every Architect Should Know* about the basic concepts necessary for the

understanding and creation of architectural forms. Using my sources on the specific examples of the Crystal Palace and the origin of the skyscraper, I have been able to connect the basic architectural principles to actual architectural forms. Using these specific scenarios, I was able to use sources to explain how the creation of these forms was motivated by many different factors.

Terminology, Language, Technology, Materials

The book *The Language of Architecture 26 Principles Every Architect Should Know* by Andrea Simitch and Val Warke is dedicated to understanding the foundations of the architectural process. The book focuses on 26 principles that the authors propose are key to helping readers understand architecture and the architectural process. Simitch and Wakre address the architectural process and how the process

> …is inevitably compounded by architecture's lengthy processes of production by the vast array of individuals responsible for every stage of that production, by the final construction's relationship with with its various contexts, by its interrelationship with other known elements of architectural expression, and by the unique pasts and presents of each individual who observes the final construction. (6)

Simitch and Warke set up a variety of different aspects needed for the process of architecture and use them all together to explain how architectural forms come together (6). They include a variety of principles within the book including analysis, context, dialogue, and program.

Analysis

Simitch and Warke start their book by explaining analysis. An architect is always using analysis to understand the situation they are working with currently (10). Simitch and Warke define analysis as "...the process of exploration and discovery with which an architect not only develops a familiarity with the assumptions, expectations, and conditions that are given, but subsequently establishes the critical framework of the problem, the conceptual lens through which all design decisions are subsequently made" (8). Additionally, architects benefit from

studying the architectural work of the past because there are often projects that had similar goals, locations, or other parallels (13). The knowledge an architect can gain from understanding past projects can help them think about how previous architects used materials, dealt with problems, and worked with the program, and what parts of those forms the architect might want to use as inspiration and foundational knowledge (13). As Simitch and Warke claim, "In architecture, there is a firm belief that most everything has already been done, to some extent and in one manner or another, and that originality does not lie in the discovery of something new but in the interpretation and appropriation of something that already exists" (9-10). Analyzing the decisions, problem-solving, and forms of past architectural endeavors can help architects in their approaches to new projects (13). Analysis is key in understanding the givens of a situation and being able to problem-solve (10). The knowledge and ideas that come from analysis comprise the base of making decisions for an architectural form (14). There are many different methods and parts of analysis that are crucial to the design process, and architects can use analysis in many different parts of the process, including looking at finished forms, models, and diagrams (15).

Program

Simitch and Warke define the program as "...in its most basic form, the list of requirements that initiates a project" (37). Architects must always start somewhere when beginning a project, and this beginning is often the program (38). Simitch and Warke highlight the direct connection between analysis and program:

> Analysis is the process of exploration and discovery with which an architect not only develops a familiarity with the assumptions, expectations, and conditions that are given, but subsequently establishes the critical framework of the problem, the conceptual lens through which all design decisions are subsequently made. (10)

The program and analysis are directly related, and each architect is going to have their own way of working with the program with which they are presented (10). The list of requirements starts with the client, but it also relates to the physical space, and basic architectural rules (37-38). An architect also needs to keep in mind the people using the space, and the objects that might occupy the space (38). Furthermore, Simitch and Warke claim that architects need to consider the possibility that the needs and uses of a space may change over time (41). Another important constraint to consider is that there are building codes; these codes are very important in keeping buildings safe and the environment around the buildings safe (44). Thus, architectural designs should be flexible, and have the ability to adapt to different uses (41).

In *The Language of Architecture,* Simitch and Warke assure the reader that the constraints of a program can be inspiring: "Every program establishes a set of limits. Far from being deterrents to the design process these limits are occasionally the sites of genuine architectural innovation" (46). The architect must simultaneously work to create something that fits the program as well as deal with problems that might occur while designing (42).

Concept

Simitch and Warke claim that concept is essential to setting up how an architect thinks about the "design problem" (20). Concept starts off with some basic ideas, and in the end helps to create a plan and way to move forward (20). Simitch and Warke explain: "A concept... poses a way of thinking about a design problem while posing a set of objectives while implying potential exclusions…[T]he concept initiates the action of design" (20). Simtich and Warke state that the concept is important as it gives the architect a way to think about the potential problems for the project, and will generate the start of a design (20). Concept supports the architect's process as it gives them an understanding for what they want from the project and some tools to get there

(19). Simitch and Warke write about how a concept starts out rather abstract: "And, while intrinsically an abstraction, a concept also differs from an idea in that it has an obligation to suggest an image or a thing, since it must inevitably lead to a constructive proposition" (20). The concept also might seem disconnected from the practical aspects of architecture, but concepts almost always lead to concrete architectural forms (20).

Simitch and Warke remark that sketching is an essential element when in the conceptual part of the design process: "As generative tools, sketches provide the visual language with which architects test conceptual notions in their relationships to a set of goals or parameters" (23). There are many different types of sketches, such as the thumbnail sketch, which is used to focus on one aspect of the concept, rather than the concept as a whole (23). There are also sketch models which can include relief models--which are made out of paper and can help the architect understand the possibility of the three dimensional form--and material models which can be made from cardboard, metal, or clay (24). Simitch and Warke highlight the importance of sketches within a project: "Ultimately, the collection of conceptual sketches throughout the design process forms the diary of a project, recording an architect's creative process in terms of the formal ruminations that reveal the evolution of the conceptual idea" (24). A concept often involves a lot of sketching and helps a project move from abstract ideas to more solid ideas (24).

Representation

Simitch and Warke highlight that representation, models created that will lead to the creation of buildings, is an important part of an architectural process (27). These representations can be drawings, three-dimensional models, and, more recently, computer modeling (32-33). These models are each unique and can have their own important use; they can show perception of space, the qualities of materials, and much more (31). Models can be focused on the observer

and what they would be seeing and experiencing if they were spending time within the form, or an architect can also focus on a certain aspect of the form (35). Diagrams can help architects understand how the different components of a building work together and what strategies will be necessary to create the building (28). Simitch and Warke posit that crafting models helps to create the design of the final form, as well as show the architect new possibilities they might not have thought of: "Models constructed of more permanent materials such as plaster, wood, metal, or glass can explore both the perceptual and physical behaviors unique to a particular material's composition and fabrication practices" (31). Therefore, Simitch and Warke conclude, representations are also essential for architects to think about the possible solutions to practical problems faced in the design process (31).

Context

Simitch and Warke emphasize the centrality of context:

A work never exists in isolation. There is always a context in which it is situated, and in which a relationship to that context is established. And while that relationship can be platonic, casual, symbiotic, or detrimental, it is the specifics of that context and the ways in which it is interpreted that establish the terms of dialogue. (48)

For every project, there is a context, and that context has an impact on the perception of the form (49). Simitch and Warke also explain how the form and the context work together: "...[U]ltimately, a work has the ability to give meaning to a context, to encompass all that already exists within that context and the opportunity to inflect previously unknown contexts" (49). The form creates a relationship with the materials, location, and environment, which can help give the form, the context, or both new meaning (49). One example Simitch and Warke provide for context is the physical area around which a form is erected. This context can be the material, location, or a form's surroundings (50). For example, "... A building in the middle of the city will be affected by the scale of the neighborhood…or by the scale of the landscape in which it is

situated…" (49). Simitch and Warke also explain the ways that forms can interact with each other: "A building exists within a network of public spaces, and how a building relates to these spaces can establish conditions of entry and orientation" (53). Simitch and Warke add that context can also mean the materials with which a form is built: "Or perhaps the material context might be a particular species of wood in a local forest, or the granite of a nearby quarry" (49). The material of a form can be directly linked to the location in many ways (50). Professor Daniel Abramson elucidated on this when he mentioned the many meanings that glass can have: at one point glass was a symbol of modernity; it can be spiritual, or it can be used to represent ethics such as using glass to build government buildings to represent transparency in government. Abramson also explained how these meanings for glass can change over time, and how innovation and society has made that happen (Abramson Interview).

The environment and the culture in which a form is created will have a lot of impact on the final form (Simitch and Warke, 55-56): "One of the most important and pressing aspects of the design of a structure is its environmental context, a context that can either affect the building positively (as provide warmth or shade) or extremely negatively (as in erosion or collapse)" (56). An architectural form must at least be able to coexist with the environment it is in (56). Simitch and Warke also emphasize the importance of past forms in understanding a current form: "And even though it may not be physically present a historical context continues to be alive in the memories of citizens" (56). In some instances, architecture also has the ability to tell stories of legends or be created for specific ritual use, and these legends and rituals are often based in the culture of the location (55).

Architects must also work to predict the environment they are working in and build in a way that suits the area (56). One example of this is the impact wind had on the Shanghai Tower,

which X. Zhao, J. M. Ding, and H. H. Sun wrote about in their article "Structural Design of Shanghai Tower for Wind Loads." This article addresses all of the wind studies necessary for the creation and maintenance of the building. The authors explain that because of the height of the building, as well as the fact that the facade of the building twists, wind played a key role in the
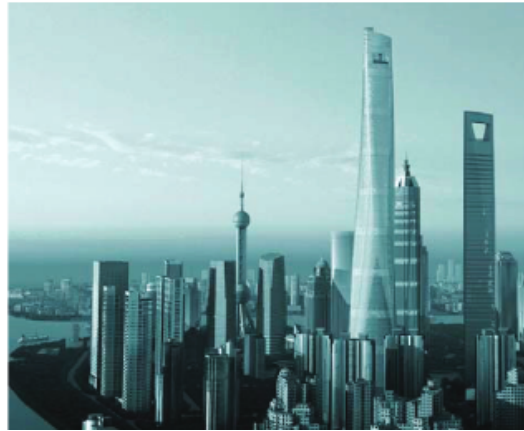
Shanghai Tower Construction and Development, Shanghai Tower, 2008-present, "Structural Design of Shanghai Tower for Wind Loads"

structural design of the building (1760). The researchers found that using certain building shapes, such as a twisting facade, decreased the wind load while simultaneously providing aesthetic inspiration for the architects (1766). This building is one example of the need to work with environmental factors to create an impressive and functional building.

Material

In *The Language of Architecture*, Simitch and Warke offer material as another essential part of architectural forms. Without materials, architectural forms could not be built (89). Simitch and Warke further state that materials have a huge impact on the conception of the final architectural form and the perception thereof: "...an architect's choice of material has a profound effect on both the form of the work and its reception by an audience" (89). Materials can have a variety of characteristics, as well as different relationships with the environment: "Materials, both natural and artificial, retain traces of their origin, and they communicate intrinsic qualities

that evoke associations and responses in their perceivers" (90). Simitch and Warke also argue that the materials will have constraints that will play into how the form is designed (97). An example of these constraints would be permeability of a material, which can have an impact on whether a building is humid, dry, hot, or cold (94). Materials have a large impact on what type of acoustics a building has and can also be used to create certain acoustics (94). The environment, as well as other outside influences, such as gravity, can have an impact on the way materials change and age over time (95). Simitch and Warke maintain that it is important to be able to consider and understand how materials change over time when creating an architectural form (95).

Dialogue

Dialogue is an essential element to the experience of architectural work (134). Architects want their forms to continue to engage new audiences. In other words, architects want to create dialogue by having people think and talk about their architectural forms (134). Simitch and Warke discuss two ways architecture can spark conversation: monological or dialogical (134). Monological architecture seeks to convey only one meaning (134). If an architect builds with the intention of a dialogical form, it means they want their audience to think about the meaning of the building and what it might represent. If one sees a monological form, the architect is going to tell the viewer exactly what the meaning of it is and what it represents (134). Some examples of monological works are statues or monuments, utilitarian buildings, or buildings that are copies of other buildings (134).

There are many different degrees on which architectural dialogue can occur (137). Simitch and Warke emphasize the importance of the viewer for dialogue: "Indeed, much of a work's meaning and identity is developed by an audience's past and present experiences as

elicited by the work, and their perceptions of the work's relationship to other works" (134). Simitch and Warke explain that an architectural form can engage with a city as a whole, or with specific parts of a city (137). A building can collaborate with another building to create new dialogue (137). A new building in relation to an old building can encourage new ways of looking at or understanding an older structure: "One of the most effective techniques of interpreting forms is to measure them against other forms, not just through similarities but also differences" (136-7). There can also be dialogue created from the relationship between the form and the environment it inhabits (136). An old form in a new environment can also create new meanings for the original form (136).

Simitch and Warke posit the architect as a facilitator of conversation: "The role of the architect is to facilitate the discursive aspect of forms, and by engaging various types of dialogue, to allow the continuous redefinition of a work's meanings by all of its observers and all of its contexts" (135). Dialogue happens after an architectural form is created, and is essential to its use and how people perceive the form over time (135). The architect has some control over how they build to create certain dialogue (135). They can use the program, site, many types of representation, materials, and locations as tools with which to spark dialogue (135). Though the architect does have some control over the kinds of conversations their work produces, they can never be certain of all the possible dialogue that can occur due to the often-changing roles of history, memory, world views, and individual people in relation to architecture (135). This is why Simitch and Warke say that, for the most part, dialogue is open ended (135).

Case Studies

The above principles can be connected to the Crystal Palace and the development of skyscrapers. The first chapter of Kate Nichols and Sarah Victoria Turner's book *The Material*

and Visual Cultures of the Crystal Palace at Sydenham is called "'What is to Become of the Crystal Palace' The Crystal Palace After 1851". Within this chapter, Nichols and Turner write about the social impact of the Sydham Crystal Palace and its uses. Nichols and Turner explain the many purposes of the building: "The Sydenham site offers cultural and social historians a vast and largely unexplored archive showing the intersections of leisure, pleasure and education, articulated through the dazzling display of imperial, industrial and artistic material culture" (3). Alan Colquhoun offers an example of dialogue in the second chapter of his book *Modern Architecture*. Colquhoun writes about the development of skyscrapers in Chicago and theorizes about the importance of the Worlds Fair in Chicago as a big factor in the formation of the skyscraper because architects wanted to create an architectural style that would represent the United States as part of the fair (49).

Form/Function

In our interview, Professor and Architect Daniel Abramson observed:

I think that buildings mediate their relationships with each other socially. […] Think about your own home. The parents usually have a larger bedroom and children have a smaller one, and the living room is downstairs, and the bedrooms are upstairs. There's no reason that all those things shouldn't be reversed, except that what architecture does is it kind of creates the structure with which we know who we are and how we stand in relationship to other people.

Architectural creations are always influenced by societal ideals (Abramson Interview). Abramson also mentioned that there can be symbolic associations with buildings, such as the State House in Boston, which has a big dome that has been used to show the importance of this building, and has historically shown the importance of buildings on which domes are built.

Skyscrapers

There are many specific circumstances and necessities that led to the invention of skyscrapers. There was also a lot of architectural innovation necessary in order to create

skyscrapers (Bletter, Colquhoun, Simitch & Warke). All of these ideas are addressed in the article "The Invention of Skyscrapers: Notes on Its Diverse History" by Rosemarie Haag Bletter. Bletter writes about how skyscrapers are some of the most inventive new buildings from the nineteenth century because they had to depart radically from pre-standing ideas about buildings (110). Bletter states that a building's intended use will have an impact on what it looks like from the inside and the outside (110). However, with skyscrapers, what influenced their appearance was less about the intended use and more about the space constraints (110). Skyscrapers also had a huge impact on the look and density of a city (110). Bletter also provides her reader with a very in depth definition of what a skyscraper is from a paper written by J. Carson Webster. Here are some selections from this definition: "Economic - such as high value of land; availability of labor and capital … Technological - such as availability of suitable tools, processes and sources of power; development of plumbing, heating, etc.; growth of engineering; development of the craft of building to a certain point; … Psychological - desires (conscious or unconscious) which a tall form can express" (112).

In *The Language of Architecture 26 Principles Every Architect Should Know,* Andrea Simitch and Val Warke have a collection of chapters about organization in relation to architecture. All cities have infrastructural elements that work with the different aspects of the city to create the ever-changing city (157). Infrastructure can also be defined as the tissue that is connecting the city (158). Simitch and Warke address how order can be created within a city: "An identifiable grid of streets produces an organizational structure that collects an infinite variety of individual buildings and programs" (166). Bletter explains that there is often a debate about if skyscrapers were born in Chicago or New York (Bletter).

In *Modern Architecture*, Colquhoun uses a quote from Fiske Kimball, "'The issue whether function should determine form or whether an ideal form might be imposed from without, had been decided for a generation by a sweeping victory for the formal idea'" (53). This demonstrates the idea that architects have always been grappling with how form and function can work together and this is how it played out in Chicago as well as impacting the rest of the United States.

Professor Daniel Abramson, when asked why Chicago often takes academic precedence over other cities when it comes to the invention of the skyscraper, stated that often the skyscrapers of Chicago looked more modern, and seemed to be more innovative. Alan Colquhoun addresses the relationship between the city of Chicago and the invention of skyscrapers in his book *Modern Architecture*. Colquhoun writes that in 1884, Montgomery Schuyler gave a lecture focused on architecture in Chicago (40). During this lecture, Schuyler made some important points, including the idea that there needed to be a type of architecture to represent the United States (40). Schuyler believed that architects in Chicago had started to work towards finding a solution for these problems but there was still work to do (40).

After 1871, Chicago dealt with an economic depression (42). After this depression occured the cost of commercial real estate went up, which meant a lot of architects came to Chicago seeking work (42). The reason that skyscrapers started to be built there was both for economic reasons and technical advancements, which allowed architects to build up (42). Peter Gössel and Gabriele Leuthäuser highlight the many technical aspects that all came together, which led to the creation of the skyscraper: "One by one the preconditions for high-rise building were all met: the invention of a fireproof steel frame, the technology for sufficiently load-bearing

foundations and, above all, the passenger elevator…" (35). All of these developments made building tall seem more feasible and appealing.

The development of skyscrapers within Chicago was aided by many different events, people, and styles of design (41). Colquhoun highlights the role of "Chicago School," which was a term that came about in 1908 and was first used by Thomas Tallmadge (42). This term mostly focused on domestic architects until 1929 when it came to include commercial architects as well (42). The Chicago School was most important between 1893 to 1917 (42). Currently, The Chicago School is more focused on the commercial architects of the 1880s and 1890s (42).

One essential event in the development of skyscrapers was the Chicago Worlds Fair, which had buildings and grounds designed by Fredrick Law Olmsted and Daniel Burnham (49). Colquhoun states that during the preparation for the fair there was a lot of thought put into creating an architectural style that would represent the United States (47). The preparation for this exhibition was when Chicago started to focus more on the classicism style (49). This was also around the time when Chicago was moving away from the style of individualism, which had been essential to the Chicago School (49). Many Chicago buildings were designed around Beaux-Arts aestheticism, and many architects had been chosen to design buildings for the fair from the East, where Beaux-Arts had already become important (50). In *Modern Architecture,* Colquhoun writes about how these decisions had a lot of impact on architecture in Chicago: "This choice reversed the Chicago School's practice in two ways: it proposed first that groups of buildings should be subjected to total visual control, and second that architecture was a ready-made language rather than the product of individual invention in a world ruled by contingency and change" (50). These ideas were very important to creating a national image, not just an image for Chicago (49). The planning for the fair was also a collaboration between

"landscape and urban design" (51). The fair had a huge impact on the United States and led to a large amount of classic architecture (53). Different contemporary architectural styles contributed to the various approaches to skyscraper construction in Chicago. Beaux-Arts eclecticism had been an important part of the style on the East Coast, but in Chicago, the architects were starting to move away from it (Colquhoun, 42). Beaux-Arts principles, however, became more important for the Worlds Fair and other architecture in Chicago after (50).

Sullivan, Louis, and Dankmar Adler, The Wainwright Building, 1890-2, *Modern Architecture.*

According to Colquhoun, an important architect in Chicago during this time, Louis Sullivan, was very much against the use of Beaux-Art style which was not a common style in the Chicago School (47). Colquhoun explains the Tacoma Building, Monadnock Building, and the Reliance Building, all skyscrapers in Chicago, had similar outer styles, which Sullivan took issue with (44). Alan Colquhoun describes the look of these buildings in *Modern Architecture*: "the floors were not grouped in a hierarchy but expressed as a uniform series, the loss of vertical

thrust being compensated for by projecting stacks of bay windows" (44). Colquhoun mentions

that Louis Sullivan felt like the fact that the floors of the Tacoma, Monadnock, and Reliance

buildings looked the same was a problem (45). Sullivan designed the Wainwright Building,

which had a defined base, middle, and attic. The only problem was that it would not have worked

well for a much larger building (46). Sullivan's style was shaped by many different architectural

ideas which all had an impact on his philosophies about skyscrapers. One of these architectural

ideas was Transcendentalism, which Colquhoun describes in *Modern Architecture*:

> The 'organic' idea can be traced back to the Romantic movement of around
> 1800—particularly to such writers as Schelling and the Schlegel brothers, who believed
> that the external form of the work of art should, as in plants and animals, be the product
> of an inner force or essence, rather than being mechanically imposed from without, as
> they judged to be the case with classicism. (47)

Sullivan also based many of his ideas on the connection between architecture and nature (47).

Many of Sullivan's buildings included ornaments as a key aspect, and he wrote about how he

thought of ornament as an extension of an architectural form (48). Sullivan's Wainwright

building was different and set apart from its surroundings (47). Around the 1890s, Sullivan

became a much less important architectural figure in Chicago as the city moved away from the

ideas he found important (49). Colquhoun explains how Sullivan became a less important

architect in Chicago: "But already in the 1890s the climate of opinion in Chicago was changing.

Architects no longer listened to the Transcendental message they had found so compelling a

short time before, nor were they so interested in Sullivan's doctrine of the redemption of a

materialistic society through inspired individual creativity" (49).

(Left) Le Baron Jenney,William, Home Life Insurance Company Building, Chicago, 1884-85, "The Invention of the Skyscraper: Notes on Its Diverse Histories." (Right) Buffington, Leroy, design for a twenty-eight-story office building, Chicago, 1888, "The Invention of the Skyscraper: Notes on Its Diverse Histories."

Colquhoun's book makes clear Chicago's role in the invention of the skyscraper. However, Rosemarie Haag Bletter points out that there was some debate around what can be considered the first skyscraper and where it was invented. Bletter recounts that Leroy S. Buffington patented a metal skeleton in 1888 which was an improvement of the work of William Le Born Jenney, which made some people claim that he was the inventor of the skyscraper in Chicago (111). Carl W. Condit was another very important figure in the discussion around skyscraper history, and he wrote two books about skyscrapers: *The Rise of Skyscrapers* and *The Chicago School of Architecture* (112). In his first book he focuses on establishing the first skyscraper as Jenney's Home Insurance Building in Chicago (112). He also makes claims for the importance of the Chicago School in the invention of the skyscraper, but also recognizes the

essential aspect of balloon frames and cast-iron in New York skyscrapers (112). In Condit's

second book, *The Chicago School of Architecture*, he is less focused on the importance of

determining a first skyscraper, opting instead to include a general definition for the skyscraper, a

definition from an essay by J. Carson Webster, part of which was mentioned before (112). Bletter

comments that "Webster's categories are meaningful because he includes, in addition to

technological aspects, economic, psychological, and aesthetic factors. In addition, he does not

take the steel skeleton as an absolute prerequisite for the skyscraper, but sees it simply as the

most effective way to achieve great height" (112). Both Webster and Condit had a similar

definition for the skyscraper, and both placed the first skyscraper somewhere in Chicago (113).
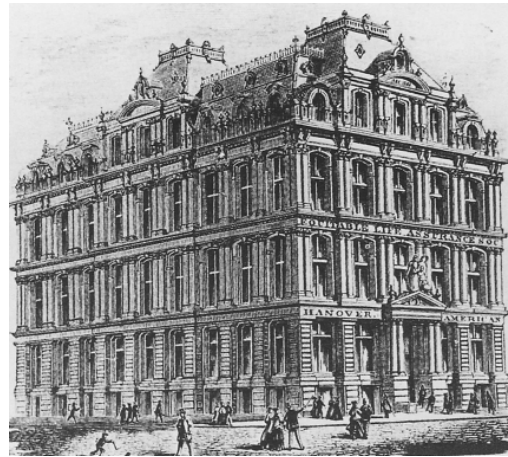
(Left) Hunt, Morris Richard, Tribune Building, New York, 1873-75," The Invention of the Skyscraper: Notes on Its Diverse Histories". (Right) Gilman and Kendall and George B. Post, Equitable Life Assurance Company Building, New York, 1868-70, "The Invention of the Skyscraper: Notes on Its Diverse Histories".

Webster and Condit were not the only people with ideas in the debate over the first skyscraper.

Bletter also includes the ideas of Winston Weisman, who wrote the essay with his "New York

and the Problem of the First Skyscraper" (113). He rejected Condit's definition that skyscrapers

only needed to be tall, and that the need for a metal skeleton was too technological (113).

Wiesman contended that the first skyscrapers were the George B. Post's Western Union Building and Richard Morris Hunt's New York Tribune Building, both in New York City (113). Henry-Russell Hitchcock expressed similar ideas as Wiesman in his book *Architecture: Nineteenth and Twentieth Centuries* (114). Hitchcock also suggested that Equitable Life Assurance Company Building by Gilman & Kendall and George B. Post was one of the first prototypes for a skyscraper (114).

In 1969, Northwestern University held a talk surrounding the history of skyscrapers at which Condit and Wiesman were the main representatives for the debate (115). At this event, Allen Brooks made the point that Chicago might have been more inventive because their laws were less strict (115). Bletter notes the changing perception of height as cities filled with skyscrapers: "Yesterday's skyscrapers become today's smaller commercial buildings, as the eye measures height in relation to the upwardly mobile skyline" (111). Over time, a building that might have once been considered a skyscraper might not seem so impressive anymore because of a new ability to build even higher. In the end, Bletter decided that finding the first skyscraper is an impossible task because even if architects could agree, they might find an older skyscraper later (116).

The Crystal Palace

The Crystal Palace was designed by Joseph Paxton for the World Exhibition in London in 1851 (Schoenefeldt, 233). Paxton had started his work as an architect designing greenhouses and conservatories (233). Greenhouses had been used for a long time as a structure in which to keep plants, but there was a lot of concern about whether they would be able to work for people (233). Paxton and his team of architects had to put a lot of work into making sure the Crystal Palace building could be properly heated and ventilated.

Henrik Schoenefeldt notes that there were two different Crystal Palaces (236). The first one was built temporarily for the Exhibition of 1851, and the second was built as a permanent structure in Sydenham in June of 1854 (236). Schoenefeldt mentions that the second palace was based on the first but there were a lot of notable differences (236). Kate Nichols and Sarah Victoria Turner's book *The Materials and Visual Cultures at Sydenham* examines the history of the Sydenham Crystal Palace and covers the many exhibits that took place there. The first chapter of this book titled "'What is to Become of the Crystal Palace' The Crystal Palace After 1851" addresses the changes that were made from the first Palace to the second, and the impact it had on society and its surroundings.

Schoenefeldt focuses on the ventilation and temperature work done for both the first and second Crystal Palaces in his article "Adapting Glasshouses for Human Use: Environmental Experimentation in Paxton's Designs for the 1851 Great Exhibition Building and the Crystal Palace, Sydenham". Schoenefeldt makes a point to distinguish between the two iterations of the Crystal Palace: "Although both buildings are often referred to as the 'Crystal Palace', this article will refer to the Hyde Park building as the 'Great Exhibition Building' and to the Sydenham version as the 'Crystal Palace'. The distinction is important, not least because Paxton made a number of significant alternations to the design in translating it from one design to the other" (236). Paxton used much of the knowledge he had gained from building the Great Exhibition building to make improvements to the ventilation and temperature of the Crystal Palace (Schoenefeldt, 236).

The argument of Schoenefeldt's article is that "Much research has focused on these buildings' structural innovations. In contrast, their environmental history has been virtually ignored, despite the survival of extensive original data and numerous contemporary accounts"

(236). His thesis is that "By examining these sources, it is possible to arrive at an understanding of the two buildings on their own terms rather than as the precursors to subsequent development" (236). Schoenefeldt states the importance of each iteration of the Crystal Palace as an innovation, and the beginning of a new style: "The Great Exhibition Building and the Crystal Palace were seminal structures for the early historians of the Modern Movement, often being presented as evidence of an innovative approach to architecture that was open to the possibilities of new materials and construction methods" (236). For the rest of the article, Schoenefeldt details the inside of the buildings and all the innovation that was necessary.

Paxton started with the goals to provide proper light and atmosphere for the exhibits as well as providing protection for the visitors from the summer heat (237). Shoenefeldt describes the roof of the building: "The roof featured a ridge-and-furrow glazing system system, informed by Paxton's earlier experiments in horticultural glasshouse design, which made it possible to cover and naturally illuminate the entire width of the structure" (238). This system helped provide light to all areas of a space and was an idea Paxton had learned about while designing glasshouses (238). There were also screens added to the roofing to diminish the glare (238). Schoenefedt adds that Paxton used condensation drains in the building to provide the right humidity level for the exhibits (239). Schoenefeldt writes that Paxton had hoped to keep to a rather natural ventilation system location many ventilators within different sections of the wall (239). Of Paxton's ventilation goals, Schoenefeldt writes: "Paxton's design ...paid particular attention to matters of ventilation and shading in order to generate an internal environment that would suit the objects displayed in the Great Exhibition whilst also ensuring comfort for visitors" (240). As part of the building, there were ninety different ventilation sections that needed to be operated (240). Paxton did have some concern about the ability for his ventilation methods to be

able to lower the building temperature, so he also considered adding wet canvas sheets in front of the ventilators or adding Indian punkah fans to create breeze (240).

Schoenefeldt notes many climate issues for the building, but reminds the reader that it is important to understand that there were ventilation problems with many public buildings at the time (243). Schoenefeldt identifies an article that describes the atmosphere of the building: "[T]he *Art Journal* suggested that the atmosphere at Hyde Park actually led to fewer problems with exhaustion and fatigue than might be experienced in theatres and picture galleries" (243). At the time of the Exhibition in 1851, there were many articles published in papers and journals about the climate of the Crystal Palace (240): "Numerous articles in contemporary British newspapers and journals provide an invaluable insight into the experience of the Exhibition Building in use, including accounts of people's perception of the internal environment and the various measures that were taken by the management to improve the comfort of visitors and staff." (240). Schoenefeldt explains "Internal temperatures were systematically monitored and recorded…" (240). Schoenefeldt also mentions an article in *The Times* that noted some days that were just too hot to be inside the building, reaching a temperature of 97 degrees Farenheit in the afternoons (241). The ventilation issues and the hot summer days often left people dizzy and lightheaded (241).

Due to some climate problems within the building, the managers of the building decided to think about additional ways to improve the ventilation and temperature (243). They ended up deciding to remove the glazing from both the east and west sides of the building (243). There was still some issue with the climate, so some other glazing was also removed from the building (243). These areas of glazing were added back when the temperatures were more manageable (243).

Schoenefeldt presents a report from Henry C. Owen analyzing the climate of the Great Exhibition Building in 1852 (245). One of his findings was that there was varying temperature throughout the day, which was probably related to sunlight (245). Schoenefeldt makes it a point to share that "The report, however, did not claim [the fluctuating temperature inside of the building] to be a general defect of the original design, but rather stated that the proper operation of the ventilation system had been inhibited by the presence of exhibits and by internal partitions on the ground floor" (245). This work with ventilation and temperature control helped Paxton work with glass and allowed him to go on to design other buildings from glass, as well as the Sydenham Crystal Palace in 1952 (246). Schoenefedt notes Paxton's thoughts on his own work:

> In summer 1851, Paxton wrote that he considered the building at Hyde Park to be only a first step in his long-term effort to exploit the environmental possibilities of the glasshouse as a habitable environment for human beings. He stressed that his main interest had thus far been the provision of an adequate environment for the display and preservation of exhibits; improvements in thermal comfort could now follow (245).

Schoenefeldt shares that Paxton made plans for the Great Exhibition Building to be turned into a year-round building (248).

For the Sydenham Crystal Palace, Paxton needed to put a lot of work into the heating system, as the Hyde Park building was only designed for summer (248). He looked into many new ways to increase ventilation and improve the building (248). He proposed a heating system that consisted of boilers and pipes running through the building that would carry hot water; to house these systems, he planned to build two brick buildings at either side of the Palace (248). The plan for this system was to increase the temperature throughout the building, but not make it too warm in the winter (248). To improve summer ventilation, Paxton wanted to add stacks to each side of the building that would use the hot air from the furnace to push large amounts of air

into the building and use the principles of thermal buoyancy (250). Paxton also planned to add

smaller changes to the ventilation, such as increasing the size of the top ventilators (248).

Schoenefeldt describes Paxton's journey from building the Crystal Palace in 1851 to

rebuilding it for its permanent home in Sydenham:

> In May 1852, the Crystal Palace Company acquired the Great Exhibition Building, reconstructing it on a new site at Sydenham, then on the southern fringe of London. Paxton was hired to oversee the work and was thus afforded the opportunity to remodel his original building by implementing some of the ideas that he had explored in the...winter garden schemes. The intention was to combine a public winter garden of tropical and temperate plants with permanent exhibitions of art, architecture, science and technology (250).

Schoelefeldt points out that one significant difference between the two Crystal Palaces was that

the Sydenham building did not have any of the shading devices the original building had, partly

because they thought the light would be needed for the plants (250). Paxton believed his new

ventilation system was much improved and that the air would be able to move around and escape

through air vents at the top of the building (252). Paxton claimed that the key to heating and

cooling the building was thermal buoyancy (252). Schoenefeldt mentions that the new model of

the Crystal Palace was much taller than the Hyde Park building which made Paxton believe there

would be more space available for air to escape, which would in turn would help with

temperature control (255). Schoenefeldt illustrates how much time and work Paxton put into the

heating system: "It was reported that Paxton spent three hours a day for three months planning an

elaborate heating apparatus with the assistance of John Henderson and other specialists" (255).

The heating system involved 50 miles of pipes and 11,000 gallons of water (255). All of this was

amimed to only heat most of the building mildly (254).

Schoenefeldt goes on to describe the setup and the experience of the Crystal Palace:

There were a lot of complaints and trouble heating the building to a comfortable temperature

(257). To increase the temperature, the directors of the Sydenham Crystal Palace also covered

some of the ventilators with canvas during the winter (257). The directors of the Sydenham

Crystal Palace also tried increasing the tropical wing of the building, as well as adding some

smaller rooms that had a better temperature (257). Schoenefeldt describes the continuing work

they did to improve the temperature of the building: "In 1867, in response to continuing

complaints about uncomfortable temperatures and cold draughts during the Christmas

performances, the company rearranged the heating system below the transept floor to boost

temperatures" (258). There was also a lot of information indicating that the temperature of the

building varied a lot and was hard to maintain (259). There was very little shading for the

building which made it very hot, so they ended up adding shading in 1855 (262). Schoenefeldt

also compares the people needed to operate the two Palaces: "Two hundred and sixteen feet of

ventilators could be operated from one position, which meant that a total of 103 operations

would have been required to adjust the entire set of ventilators at Sydenham, compared to only

seventy-eight operations at Hyde Park" (264). Schoenefeldt discusses the many purposes that

motivated the construction of both of the Crystal Palaces: "It would be wrong to describe the

Sydenham building as the outcome of a straightforward and purely functional design approach;

its design was not solely motivated by environmental concerns. Indeed, it was difficult to

reconcile the requirements of comfort with the desire to achieve a building of architectural

character" (265).

Beauty/Aesthetics

Since the onset of architectural design, architects have wanted to build forms that are

aesthetically pleasing on a very basic level because humans enjoy looking at aesthetically

pleasing forms (Aesthetic in Everyday…). There are multiple reasons aesthetics are important in

architecture, many of which are addressed in a blog piece on the Portella website entitled

"Aesthetics in Everyday Architecture and Design." Portella is the website of an architectural company that sells steel doors and windows. This blog post suggests there is a variety of physiological means that drive us to want aesthetically pleasing buildings (Aesthetic in Everyday…). Within this article, they explain why people make objects and buildings look aesthetically pleasing: "Essentially, the short answer is, we make things look nice because we like to look at nice things" (Aesthetic in Everyday…). They also address the connection between art and functionality: "Art and design are often almost purely for enjoyment, but when we cross into things like architecture, interior design, and product design that's complicated a bit by the fact that all of these things are also practical and useful." (Aesthetic in Everyday…). Aesthetics can also contribute to the creation of iconic architectural forms (Aesthetic in Everyday…). There are many other reasons to create aesthetic forms such as art, as well as many ways building aesthetics have changed over time.

Simitch and Warke present the idea of the aesthetics of architectural structures changing over time:

> The exterior and interior spaces of prehistoric ancient architecture were inevitably a direct manifestation of their structure. As time passed, the desire to embellish this structure with additional elements, to infill gaps with windows or decorative features, to attach finials and gargoyles and false façades, led to a certain cloaking of structure. (81)

The consideration of aesthetics applies to both the Crystal Palaces and skyscrapers, but in very different ways. There are many different aspects that can play into the aesthetics and beauty of a building. As written about in Portella's blog post, humans like to look at objects and places that are beautiful, and within architecture people must balance beauty and functionality of space (Aesthetic in Everyday…).

Skyscrapers & Skylines

The concept of aesthetics does not just pertain to single buildings, but to whole cities as well. In his article "The politics of design: architecture, tall buildings and the skyline of central London," Scholar and Professor Igal Charney presents a case study on the argument in London between the mayor and conservationists about whether or not to build skyscrapers in their city. Charney's article uses the city of London as an illustrative example of the desire to attract visitors to cities. London's leaders wanted to create an aesthetically attractive city in order to draw tourists. Charney explains the importance of skyscrapers in cities: "In the linkage of global city status with spectacular tall buildings, high-quality design was repeatedly stressed to make such developments acceptable and appreciable" (196).

Charney explains that skyscrapers became a worldwide phenomenon, and that London was no exception: "Building tall became an obsession for architects not just in Asia and America, but in Europe too" (195). Ken Livingstone became the Mayor of London in the early 2000s, and he was very interested in adding skyscrapers to the city (Charney, 195). One reason Livingstone was in strong support of skyscrapers was because he thought the city needed more office space, which would keep London being seen as an attractive city that people want to visit (198): "For Livingstone, unless London gets more top-quality office space in tall buildings, it risks losing its position as the predominant financial centre in Europe" (198). Charney explains the way that Livingstone tried to make skyscrapers appealing:

> The campaign orchestrated by Livingstone expressed a strategy that made use of the artistic and aesthetic values associated with iconic architecture and global architects. In the linkage of global city status with spectacular tall buildings, high-quality design was repeatedly stressed to make such developments acceptable and appreciable (196)

Thus, Charney explains, an important part of Livingstone's argument in favor of skyscrapers was that London needed to focus on aesthetically pleasing buildings and global architects (196).

Charney describes global architects and their importance in creating aesthetically pleasing skylines as well as city appeal: "Property firms acknowledge the aura associated with global architects in promoting developments; political leaders likewise appreciate the instrumental role of architecture as an expressive means of urban re-imaging" (195). The mayor tried to use the aesthetic appeal of the work of the global architect to draw more interest in adding skyscrapers to the London skyline (196).

Charney uses two notable buildings that were erected in recent years in London to show how skyscrapers are being incorporated into the skyline of London (201). The first building, called the Gherkin, was designed by Norman Foster and Partners, and was opened in 2004 (201). Charney states that it has quickly become a recognizable building as part of London (201). The other building, named the Shard, was designed by Renzo Piano, and is one of the most impressive towers built in London so far (201):

> Rising to 305 metres on the south bank of the Thames, Shard London Bridge will be the most extravagant tower to be erected in London in the near future. Decision-makers in the hosting borough (Southwark) view this tower as a chance to generate additional spillover benefits. For that reason extreme height and striking design are of significance. (201)

 In London, the government's most important focus when building skyscrapers was not only about being tall, but also having high-quality designs: "Consensus prevailed in the pursuit of high-quality design, unifying all who did not wish to repeat previous mistakes, particularly the disastrous architecture of the 1960s" (202).

Charney explains that the tactic of using tall buildings to enhance a skyline has not just become important for London, but many cities around the world (165). After the 1970s, many cities in Europe became very interested in the idea of including skyscrapers into their cities (195). Charney explains: "As spectacular architecture became a desired element in many cities, it

was placed high on the development agenda" (196). Architecture, and how it was incorporated into cities, started to become an important part of the design of cities and the skyline that was created. This also made the work of architects essential to a city's aesthetic appeal (202). Charney explains: "Today architects are not just artists engaged in design per se, they also engage in promoting and even shaping urban planning policies" (202). Charney addresses the importance of architects in shaping the aesthetic of the city. A city might want one building to represent it or to create a unique skyline to stand for the city. Over time cities have all wanted architecture that stands out and makes people want to visit them (197).

Crystal Palace & Victorian London Aesthetics

Joseph Paxton designed the Crystal Palace during a time when glass was an extremely important part of the aesthetic in London, the Victorian Era (Armstrong, 133). For the Great Exhibition, Paxton wanted to create a building that was extremely impressive, beautiful, and unique from other buildings in London (Schoenefeldt, 233). Isobel Armstrong's book *Victorian Glassworlds*, which includes a chapter entitled "Glassing London," addresses the importance of glass during Victorian London: glass was becoming part of the culture of London as well as being used to create a shiny image to hide the poverty of the city (133). During this time, many other uses were being found for glass, including glass boxes that were created for plants because of the pollution in the city (141). Initially, conservatories were only used for growing plants, but overtime people wanted conservatories that were nice to look at (140). Armstrong shares that Bailey of Holborn created the largest conservatory that had a ceiling of 33 feet high (141). This idea of building with glass was also extended to train stations, which were also supposed to appear to be very magical places (147). One of the earliest glass buildings for human use was in

Surrey Park by Henry Philips in 1831, which was designed to hold animals (146). These are examples of the glass aesthetic that had taken over London during the Victorian Era.

Glass became very important in London because, as Armstrong states, "An 'ideal' glassworld appeared, grafted onto the noise and dirt of existing urban space" (133). The use of glass succeeded in combining these ideas by putting a glass world into the current noise-filled and dirty world and also fulfilled the glass fantasy ideas (139-140). The glassworld that was being created combined the real and imaginary worlds (133). Some of the architectural work in Victorian London was influenced by stories involving glass worlds, and these ideas were then used to create their real glass world in London (140).

Armstrong explains that in Victorian England, glass storefronts became very prominent: the huge open spaces of the stores were displayed for the public to see as new plate glass windows replaced smaller windows (134). Armstrong writes: "These gas-lit, mirrored spaces that were all shop windows had begun to contradict the received architectural principles that solids should outweigh voids. They opened out a new visual experience—the massive glassed chasm in a wall" (134). Some people even described the windows as looking as if they were floating (139). These stores were a part of a constructed fantasy because the people who worked at them often lived in poorer areas, and these areas were a more hidden part of the city (139). Armstrong explains this was one of the many ways glass started to make its way into London architecture in the nineteenth century (139).

The arcade was a very prominent glass form, which often looked similar to forms detailed in Charlotte Brontë's *Glasstown* (140). Armstrong describes the world Brontë penned:

> Charlotte Brontë's Glasstown glitters with reflective surfaces, but it is hollowed out from below, an underground complex of gothic caves and caverns, where prison and sepulchres are haunted with body snatchers and the urban poor, who work in these subterranean environments, giving out 'a rancid odour' (140).

The images from Brontë's story had a large impact on the glass world that ended up being added to London (140). This glass world being created in London involved glass store fronts, arcades, train stations, and so many more new ideas, such as plans to cover London completely in glass. These plans were to cover London in raised glass roads and train stations and arcades, but they were never able to be completed (154-155).
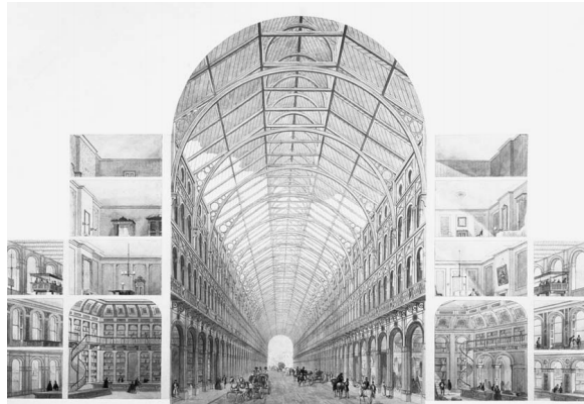
Paxton, Joseph, Great Victorian Way, London, 1855, *Victorian Glassworlds: Glass Culture and the Imagination.*

Many architects participated in plans for these glass arcades, including Frederic Gye in 1845, as well as William Mosely and Joseph Paxton in 1855 (155). Armstrong describes Gye's plan:

> This, presented in November 1845 to Charles Barry and Mr Manby, secretary to the Society of Civil Engineers, was a plan for a massive, elevated glass and iron street raised on a brick viaduct over London—'constructed entirely on arches of sufficient height to pass the numerous streets, without presenting any obstacle to the ordinary traffic, entrances being made at the principal cross streets' (155).

Paxton had his own idea for what he called the Great Victorian Way, which would connect all of the train terminals in London (156). Moseley created a similar plan to Paxton that had a lower planned capacity for travel (156). These proposals were also thought to be able to bring visitors

to the city and hide away the filth and poverty within the city (158). All of this work was in search of aesthetically pleasing designs that also created a certain visual aesthetic for the city (158).

Paxton, Joseph, The Crystal Palace, 1856-1936, "'What is to become of the Crystal Palace?' The Crystal Palace after 1851"

Joseph Paxton started his career designing greenhouses and conservatories (Schoenefeldt, 233). He was chosen to build the Crystal Palace for the Great Exhibition in 1851 in London because his proposed design seemed to be feasible, very impressive, and quick to build (233, Schoenefedt). In her article titled "A Forgotten Greenhouse by Joseph Paxton: The Conservatory at Hampton Court, Herefordshire," Catherine Beale addresses the design and aesthetic changes Paxton made when he went from erecting greenhouses to conservatories: The Conservatory at Hampton Court shows the transition from functional greenhouses to conservatories which were more aesthetically pleasing buildings attached to homes (74). Beale argues that in a lot of ways

this conservatory shows the transition from use-oriented conservatories to more ornamental conservatories (74). Beale states that The Conservatory at Hampton Courts is thought to be designed by Paxton and reflects some of his design ideas (76). Beale explains that the conservatory was different from many other buildings of the time in part because it had a ridge and furrow roof (76).

Glass was an essential part of the building and gave it many different meanings, including a sense of modernity and transparency, as well as scratches and air bubbles which gave it some impurity (6). Nichols and Turner explore the variety of meanings of glass: "Even its very building fabric, glass, as Isobel Armstrong has explored, is contradictory and many-faceted, claiming transparency and industrial modernity, but riddled with the 'scratches, fingerprints ... impurities and bubbles of air' that testify to its production by human breath" (6).

Henrik Schoenefedt, in his article "Adapting Glasshouses for Human Use: Environmental Experimentation in Paxton's Designs for the 1851 Great Exhibition Building and the Crystal Palace, Sydenham," details the ways in which Paxton used greenhouse architecture as the basis for his plans to create a building inspired by greenhouses that would be suitable for human use. Schoenefeldt writes that it is important to note that creating a building from glass of this size and for public use had never been done before: "The use of glasshouses for the cultivation of plants was well established, but could this type of building now be adapted to the task of accommodating artefacts? Could it also provide visitors to the Exhibition with a comfortable environment?" (233). Much of the work discussed in this article follows the ventilation and heating work that was necessary to create forms so that they would be able to make this very beautiful building (236). Nichols and Turner argue that, generally, experts on the Crystal Palace focus on the building erected for the Great Exhibition of 1851, and not the Sydenham Palace

structure (1). Studies were frequently conducted around the 1851 Palace, but there are few studies of the Sydenham Palace, which had a much longer life (1). Nichols and Turner believe that it is very important to study the Sydenham Palace, as it was so unique and included so many exhibits, and that "Many contemporary commentators deemed the Sydenham Palace's contents superior, the building more spectacular and its educative potential much greater than its predecessor" (1). It also had a much longer life and left a lot behind, and is still remembered in so many ways (19). When writing about the importance of the Sydenham structure, Nichols and Turner emphasize how the Crystal Palace included architectural ideas from many different times: "The Crystal Palace at Sydenham, both as a complete structure (1854–1936) and as ruin, does not belong exclusively to any one period. It was an icon of mid-Victorian Britain, but at the same time embodied from its inception architectural innovation and modernity…" (1). Henrik Schoenefedt also writes about how the architectural work that went into the design of both Palaces was very innovative, and that Paxton was open to the use of new materials and methods of building (Schoenefeldt, 236). Both of the Palaces were also the first attempts to use greenhouses as a template for a building fit for humans made almost entirely out of glass (236). Nichols, Turner, and Schoenefeldt point to the idea that Paxton was doing something new both aesthetically and architecturally, which makes the Crystal Palace an important building to study. In his article, Henrik Schoenefeldt focused mostly on the technical aspects of both Crystal Palaces, while Nichols and Turner highlight their societal impacts. These are both key views toward a complete understanding of the Crystal Palaces, their functionality, and the wider impact they had on society.

One main goal of the Sydenham Palace was that it was a place for both leisure and education: "The Sydenham site offers cultural and social historians a vast and largely unexplored

archive showing the intersections of leisure, pleasure and education, articulated through the dazzling display of imperial, industrial and artistic material culture" (Nichols and Turner, 3). This combination of education and pleasure, however, caused some tension: "Detractors tirelessly lamented the loss of its lofty educative mission and descent into the pursuit of crass popularism, while supporters into the twentieth century praised its dual ambition to continue to combine education and entertainment" (9). However, Nichols and Turner say that the Palace was also an attraction for all different types of people: average middle class people, as well as tourists and diplomats (4). One important part of the design was the very particular layout of the different exhibits that the visitors could follow to aid in learning (4).

There have been numerous descriptions of visiting the Sydenham Palace, which Nichols and Turner share. To arrive at the Sydenham Palace one needed to take a train, which was joined to the Palace by a glass corridor (7). This corridor was similar to the arcades that Armstrong covers in *Victorian Glassworlds* (140). Nichols and Turner employ the writings of Alfred Rosling Bennet, who describes a visit he took to the palace in 1924:

> 'The platforms were at a considerable distance from the Palace proper, but, being joined to it by long glass corridors embellished with flowers and climbing plants and affording views of the beautiful grounds, the hiatus was not much felt; indeed, it served to heighten expectation by avoiding a too rapid transition between the prosaic puffer and fairyland' (7).

Paxton, Joseph, The Crystal Palace, 1856-1936, "'What is to become of the Crystal Palace?' The Crystal Palace after 1851"

Bennet also said that he felt like the corridor connecting the train station to the Palace was attempting to prepare visitors for the experience of the Palace (8). The Sydenham Palace, like the previous Palace, had a large amount of greenery, statues, and even parrots (8). Nichols and Turner highlight the many purposes of the Sydenham Crystal Palace, stating that it was part museum and also a place for visitors to relax (9, 18).

Nichols and Turner establish the importance of the location of the Sydenham Crystal Palace, sitting in a place between the countryside and the city: "Perched atop Sydenham Hill, the Palace offered a physical vantage point from which to survey and take in a panoramic sweep of

London – and the quintessentially 'English' countryside" (10). Nichols and Turner also explain the importance of the Sydenham Crystal Palace for society: "the Palace at Sydenham was envisioned as a key site in the symbolic geography of imperial London right from its inauguration, where it was described as a 'fitting ornament to the greatest metropolis of the civilised world; an unrivalled school of art and instrument of education and a monument worthy of the British empire'" (10). This quote demonstrates the importance of the location of the Palace as well as the way it tied together many different places including school and a monument.

The Sydenham Palace burned down in 1866 (8), but it did not completely disappear. Nichols and Turner state that its legacy has prevailed in many different areas, both real and imaginary (17). Even after the fire, it was tied into children's stories, films, and can be found in many photos (17). One can still see some of the ruins of the Sydenham Crystal Palace (19). Many of the walls, stairs, fountains, and other structure pieces of the Palace have been incorporated into the current use of the location (19).

Conclusion

This review included some of the basic architectural concepts that my sources believe are necessary for understanding architectural processes and the development of architectural forms. The case studies of the two Crystal Palaces and the origin of the skyscraper are meant to demonstrate in specific circumstances how architectural innovation occurs and what forces drive this innovation.

One difficult part of the project was working with sources that addressed very different aspects of one idea, but having all of these sources helped create a complete understanding of these ideas. For example, the sources I used for the Crystal Palace covered very different aspects of the building. For example, "Adapting Glasshouses for Human Use: Environmental

Experimentation in Paxton's Designs for the 1851 Great Exhibition Building and the Crystal Palace, Sydenham" was more focused on the technical aspects, whereas "'What is to become of the Crystal Palace?' The Crystal Palace after 1851" was focused on the aesthetics of the building. These are very different ideas, but I do not think one can have a complete understanding of the Crystal Palace without being able to understand both aspects. If I read only one of these sources, I would not be able to get a full understanding of the work that went into conceiving and creating the Crystal Palace. Yes, there were a lot of technical issues with the building, but it also had a huge impact on society and was not soon forgotten. Thus, without the breadth of information the combination of these sources can provide, it would be almost impossible to fully comprehend the impact of the building. These ideas could probably be applied to so many other forms as well because there is such a variety of ways to determine the success and influence of a building.

When looking at a city currently, one will see a variety of different skyscrapers that make up the city. Both skyscrapers and the Crystal Palace had a huge impact on the world. Architects and city planners were hoping to use skyscrapers to create an aesthetically pleasing skyline, whereas Joseph Paxton was trying to add one impressive building to the city with the Crystal Palace. Through these two case studies, I was able to focus on very different ideas about architecture, but I was also able to see some ways that they can be connected. For example, both of these architectural endeavors involved a lot of technological advancement and both had an impact on the places they inhabited. One element I found very often was the struggle between the functionality and the aesthetic of architectural forms. Often, when architects want to create impressive architectural forms, they focus on the aesthetic of the building. This does not mean I think functionality is a less important part of architectural design. From my case studies I have

also been able to see how constraints and limitations can help with the development of a new form.

From my interview with Daniel Abramson, I was also able to understand the importance of socio-historical context, not just as it pertained to my case studies, but for all architectural forms. We structure buildings the way we do because of societal standards. For example, in Victorian London, the use of glass was partially driven by the societal desire to create a shiny city that hid away the dirt and poverty within the city (Armstrong, 139).

I began my study with so many different areas of research that interested me and had no idea how to focus my question and my research has given me more questions. The place I have landed has allowed for me to have a better understanding of how architectural development happens and how to understand the process of architecture. I have found case studies that help me to understand how form, function, aesthetic, problem solving, and location can influence architectural development. Through my process I have been able to see how constraints and limits can actually help with new development but this is also an area that I wish I had been able to read more literature about, as it is something that will always impact architectural development.

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