Trapped in a Glass House: No Stones to Throw
A Topical Study

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Abstract
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Throughout architectural history, materials have carried both a meaning and a story. While perhaps not always consciously chosen for these distinct purposes, much information can be drawn from the selection and application of materials in architecture. Oftentimes materials may have a great deal to do with the region of the construction and what is available to builders, illustrated in such places as Thomas Jefferson's Monticello, using the local red clay for its bricks. Still, materials have come to possess a power of communication, and the method of their application becomes an interesting point of study. For example, while stone was once used structurally and glass as a decoration, glass can now serve in a structural capacity and stone is more often than not simply a cladding attached to another structural system. Focusing on this comparison, this particular study will concentrate on the historical and contemporary meanings of stone and glass, how these meanings have or have not changed, and why this is the case.

By studying the history of both stone and glass, the typology of buildings in which they are generally used as a main or symbolic material, and how societies have changed, evolved, or remained constant, a thorough background will be assembled from which to begin interpreting this intertwined history. Two folded timelines consist of the historical and factual background of each material and their uses and meanings, as well as a running thought process and commentary illustrated through text and original drawings. The text will then be summarized through a reflective conclusive essay and an explanation of formatting choices.
A battle begins.

At what point does a material cease to be a thing and transcend through time and space to incur a meaning; to become a representative force rather than a mere piece of earth?

Stone...is incompressible, incorruptible and resists time.

A representative force. A piece of earth.

Stone.
These rocks...waiting to be split, ripped, pounded, reborn; waiting for the shape my hands will give them…”

Ayn Rand The Fountainhead

Stone Structures have existed since the first nomadic cultures stopped and put down roots. Since this time, one meaning of stone has been that of permanence. To build in stone is to harness the earth to create a shelter, a place. It is to mimic mountains, to use the same method as the earth to bridge the realm of terrestrial and the realm of the sky. Carving the earth, shaping the rock on which we all live, creating place.

Stone resists time, yet shows age. It is honest about days, seasons, years passing. It reflects its environment, changes with light, with moisture. A morphing shield.
When stone is used as a structural component, it often comes from local sources. Thus, there is usually a strong sense of local character and identity in true stone structures, as a piece of local earth is brought above the surface.


Just as stone varies with its place of origin, various stone types carry unique feelings and meanings. For instance, igneous rocks such as granite are a flexible type, used in interiors and on exteriors and is found in a vast spectrum of colors. Sedimentary stones like limestone are heavily used as dimensional stones, especially in many formal institutional structures. Marble speaks of wealth, power, and purity, whereas slate is considered a more commonplace stone, though both are metamorphic.

The same material reading differently based on appearance and structure. Stone or Man?
Architecture acting as enforcer through materiality and massing.

Stone structures depend on massiveness to ensure their stability.

Belief systems depend on massive quantities of followers to ensure their stability.
Throughout history, religion, government, and academia have been closely linked, encompassing most means of organizing and educating society—exuding a formidable presence in human life. To communicate this strength and power, these bodies often turned to the use of stone, a built manifestation of the permanent, dominant nature of these institutions.

A parallel between stone construction and built environments of faith. Why stone? Stone means protection, shielding from external forces. It can create a safe haven. Various religious sectors have made similar claims of their faith throughout history, thus creating a tight relationship.

How does this relate to the tradition of using stone in governmental and academic structures? Or is there a connection?

This materiality choice was made consciously to convey these intentions, the immovability and stability of these fixtures in society. However, such a choice also has other connotations.
An element of the earth to combat natural forces: stone buttressing.

Stone buried deep in the earth, creating the solid on which life occurs. Transcending to the surface, supporting itself against the forces of the heavens. Delving down, reaching high.

Buildings where stone is used as a structural component are expressive of the loads being carried to the earth. Columns enlarge as the load increases at the base, buttresses visually combat the lateral forces at work on vertical elements. There is an honesty and evident visual logic to these systems.

Is truth in vision? Or is truth in execution, in action, in tangibility? Vision: people desire to see in order to believe, requiring transparency. However, a visual representation of natural forces at work is perhaps a more convincing indicator of a straightforward system. Is importance in seeing through a structure [building/material/government/institution] or in understanding its complexities on the surface?

Stone possesses the power to last over time. Though this existence does not go unrepresented in a visual sense, and can ultimately lead to the destruction of the structure after much exposure and wear, stone can live almost eternally in a built environment through reuse. Once the life of the building is over, the stone material can be used again either in a new construction or in a ground fill capacity.

What is real and what is false become more difficult to determine.
Only the image of stonework is translated into the cladding of today; a suggestion, an echo of the qualities of the truth in stone.

The Chapel of Santa Maria built by Mario Botta in Switzerland stands as an example of just such deceit. The chapel appears to be a traditional load-bearing stone structure, however, this is merely an exterior application, a handful of inches to imply the weight and unit structure of stone, masking the expanse of concrete found beneath. If actually built of stone, the chapel could stand as an extension of the striking earthen power of the mountain from which it projects. Instead, it stands as an addition of man, yet pretends otherwise.

Dichotomy between old and new, truthful and masking. The placement of a modern museum directly adjacent to the ruins of a gothic church exacerbates the differences between the real structural quality of the gothic church as it crumbles after centuries of existence and the clean, hard lines and unstructural quality of the outer stone appearance of the museum.

There is an expressive strength in the flying buttresses of the cathedral clearly indicate the structural nature of the stone. The rough surface plays with shadow and illumination, creating a dynamic surface condition.

The museum hides its true structure behind a façade of stone. The flush joints and L-shaped corners give the appearance of a uniform solid in plane, yet lacking the section necessary to truly be of stone, to grow from the earth. This surface draws attention to the contents rather than the building itself, a difference in programmatic importances.

Enter: glass.
SiO2


Glass becomes a rock for the Modern Age, bringing stability and clarity to human environments.

A modern society desires clarity, honesty, peace.

What can be done with one substance must never be done with another. No two materials are alike. No two sites on earth are alike. No two buildings have the same purpose.

Ayn Rand The Fountainhead
Glass, the conundrum. Resembling crystals through its rigid nature, yet also sharing the structure of a liquid in its random molecular arrangement.

Glass, the riddle. Carrying an implied clarity due to its generally transparent nature, yet maintaining the ability to transform and distort what passes through its surface. Questioning the tangibility and realness of that which is on the other side.

Though glass is not as ancient and directly associated with the earth as stone, the material has an extensive history dating back five thousand years to Eastern Mesopotamia. A new society creates new architectural opportunities. Glass becomes a staple for modern programs such as exhibit halls and public transportation stations. Was there a place for these programs in earlier history? How would they have been different as a stone piece? A transporting/transforming society.

The Church saw an opportunity to spread its message through the implementation of glass in its spaces. With glass, they could tell a visual tale to their typically illiterate followers. These colorful illuminated stories could be said to have acted as some of the first advertisements, promoting that found within the walls of Medieval and Gothic cathedrals. This tradition of glass in religious architecture to filter light to create a spiritual atmosphere and elaborate on the ideas of the institution continues to this day with such examples as Allmann Sattler Wappner Architekten’s Church of the Sacred Heart in Munich, Germany.

Architects shift from an architecture focused on creating penetrated enclosures to one of intended total understandability and openness.

Openings versus Openness.

One can maintain protection from weather and outside elements while creating a new opportunity for views out and in, a less private but more liberated society.

A more liberated society?

note: religious buildings were among the first to implement glazing in their openings to future communicate the ideals of the institution. Governmental structures soon followed suit.

Authoritative architecture utilizing stone...

now utilizing glass.


The Identity of a New Society: clean, modern, sleek, open, honest, straightforward, unobstructing, peaceful, universal, strength in directness.
Structural application of glass arrives. 19th century: Gustave Falconnier of France introduces glass bricks with limited load-bearing capacities for a new application of glass in structure.

Glass becomes a preferred material among Modernists. Le Corbusier, Mies Van der Rohe, Owens, Saarinen, employing glass as a representation of a new society. A material without a local or cultural identity.

Does glass resist time? Or does it merely conceal its age, less marked on its surface by life.

A lack of reference to its past. Perhaps modern society prefers not to reference its past.

Clean (washing our hands of our past)
Modern (advancing technologies)
Sleek (smoothing the edges)
Open (yet still sealed)
Honest (total exposure)
Straightforward (laying it all out)
Unobstructing (nothing to hide)
Peaceful (passive existence)
Universal (little variation by locale)
Is glass honest? The idea that a transparent material acts as a structural solid may indicate otherwise. Glass is often used to simulate nothing at all, thus nothing is acting as the structure and a structure is floating. Anti-gravity architecture? Is this honest? Is modern honest?

Glass is applied not only to religious and governmental buildings. It comes to the modern scene with a set of buildings with new purposes and programs such as exhibition halls [opening information] and transportation stations [opening the world]. Expansive use of glass creates a monumental quality in these structures, communicating the importance and widespread reach of their contents.

Acting as an example of a structure truly of glass, the experimental Glass Dome by Lucio Blandini in Stuttgart, Germany is constructed by gluing spherical glass panes together for a frameless structural glass shell. The project is an exploration into the structural possibilities of glass as an element supporting the entire building to achieve a more minimal built form.


Totally open, yet sealed. An Invisible Barrier creating unseen walls. An indication of a Modern Society? Glass transforming from a role as shield to that of manipulator.
Though the glass facade of Snohetta’s Oslo Opera House is not structural in that it supports the main building loads, it is self-supporting through the integration of a system of laminated glass fins and steel cables.

Is self-supporting enough? In a sense, self-supporting is still a form of structural responsibility, but does not take on the same intense roles that much true stone construction does.
Exuding a quality of lightness and structural integrity, the cantilevered glass canopy designed by Dewhurst Macfarlane and Partners at the Tokyo International Forum stands as an example of glass acting as its own structural component. Four component beams consisting of laminated glass and acrylic are pinned in two places to create an arch form. These all connect to a main supporting stainless steel beam with V-shaped stainless steel brackets.

Acrylic? Assisting supposed glass structure, acting as glass? Deceiving the eye, the mixing of materials with similar visual qualities to compensate for something lacking. A case of clarity of form or false pretenses?


A different, perhaps more truthfully structural glass application is utilized by REX architects for the Vakko Fashion Center in Istanbul, Turkey. In this case, sheets of glass are heated to the point at which the solid glass becomes more malleable. It then “slumped” into a formwork that created an X shape in the sheet. This X not only makes for a more animated facade treatment, but transforms the glass from simply a surface material of enclosure to an active structural component.

Glass acts structurally as a more pure material/no mullions or cables required/reduced thickness/increased strength.


Centralizing forces: structurally/actively.
As it turns out, there is no particular inherent honesty in either material. Instead, it is the manner in which man uses the physical qualities of glass and stone to represent his ideas, his propaganda, or his purposes that creates meaning. It has been shown here that both stone and glass, though standing in apparent stark contrast, can cross boundaries and imply meaning opposing that which is intuitive. Thus, it is not an internal property but a projected image and matter of implementation that prescribes such characteristics.

It is present/It is absent. Materiality? or Idea?
Final Comments
In conclusion of this investigation, it has been determined that materials are not borne of the earth carrying within them any kind of meaning or message. Instead, it is a construct of humankind to interpret and apply these meanings upon evaluation of terms such as physical properties and applications. This assertion is determined after accumulating and evaluating the various meanings and perceptions associated with both stone and glass, seemingly opposing materials. It was found that both materials have the ability to carry contradictory meanings and can represent similar ideals, thus the logic of inherent meanings loses ground.

An interesting follow up topic may be questioning why society applies the meanings that it does to certain materials. Are such construed meanings derived purely from the physical properties of the material and its source, or are historical experiences and other issues a factor? It may even be pertinent to investigate why people feel the need to find meaning in their surrounding spaces, if this is even a conscious choice. Does man feel or apply a meaning to raw materials still in the earth, or are these sensed as part of a natural element, devoid of extraneous connotations? Another possible vein of related study would be to compare and contrast the meanings and uses of stone and concrete throughout history--two very similar and related materials that still stand in juxtaposition to one another. This could very well be the first installment in a series of material studies, resulting in comparative topic investigations and interpretations.

If pressed to make a final assessment of the relationship between stone and glass, it would seem to be that though glass is perceived to be a material of honesty, especially when used structurally, because of its transparent nature, it may be more arguable that stone as a structural application (as opposed to its veneer applications) that is more truthful, as stone can support not only itself but other structural members and ennunciates its loads on the interior and exterior as walls thicken and buttresses appear. One can actually follow the path of a force through a stone structure somewhat easily due to its very honest and open nature in this sense, whereas glass becomes a somewhat more ambiguous.

Overall, the project was a successful venture into a comparative topic study. As is generally the case with such endeavors, one is left with more questions than answers. However, this only opens the opportunity for more study in a variety of areas. As this project was an extension of a tangent from a previous Summer Scholar’s experience, it seemed only natural that it would follow suit and become a more thought-provoking process than one that gathers tangible, final results.
Process Reflection
When initially commencing this project, I felt that I could not simply write a lengthy, more insightful paper. I knew I could write a paper; the main objective in that scenario was to learn how to go so in-depth into a single topic and refrain from redundancy. I discovered an interest in learning to integrate images and text and to represent ideas in a concrete drawing and felt that this could present an unusual and exciting undertaking. Throughout my undergraduate experience, I have written about visual representations and transformed simple two-dimensional pieces into three-dimensional spaces. However, I had not greatly explored abstract drawing as a means of representation itself. To further this idea, I undertook integrating these with text, sometimes more clearly integrated than in others where it is perhaps only the idea and nothing physical uniting each entity.

Once this idea was settled upon, I had to decide upon a communicative strategy for organizing a more stream-of-consciousness narrative and integrated, as opposed to auxillary, visual elements. Though at first hesitant to take a more unconventional approach through a less formal, standard prose for the text, it became clear that this method best suited the discovery-oriented organization and illustrated a way to better integrate the text as a visual itself. Everything included had to be adapted to meet the standards introduced to maintain a visually cohesive document. This meant that not only drawings were representing ideas found within the explored topics and text, but photos, cropping and editing of photos, vocabulary, and even the formation of text and arrangement on the page were important factors to the communicative and culminating success of the document as a whole.

The first question at hand was how to structure the project in a standard layout form. Many typical solutions seemed too unilateral and lacked a flow to them—a simple left-to-right, top-to-bottom set-up was too confined and disjointed. Initially, I struggled to find a coherent method that complimented the unfolding of history, ideas, and social constructs until I began to use this idea of unfolding in a more literal sense as an organizational mechanism. As the project developed into two parts, one as a factual, history based segment and one as a stream of associated thoughts and constructed meanings, I also began assembling my final product in a bi-linear fashion. The final result, a dual timeline unfolding in two directions to delineate information between opposing materials, allows for a distinction between thought processes and flows freely in a logical manner, yet imposes a structure that unites them both to form a more singular train of thought and set of conclusions.

As a next step in a following project with a similar process, I would consider creating physical unfolding branches of thought from the main text. Oftentimes in a large, complex thought process, new information or connected ideas are thrown to the side in pursuit of the main objective. However, these tangents have the potential to be extremely valuable lines of thought to consider and can lead to even more exciting and unexpected ends, thus validating a place in the final presented document. Such an alternative route physical unfolding from a main body of text provides the reader with the option to pursue another train of thought without forcing such an issue. Perhaps an even more interesting possibility is one in which readers can contribute their own knowledge or thoughts in a physical web centered around a single origin, as a means of sharing and connecting on a topic. However many unusual options this presents, I strongly sense that this project is only the beginning of a series of explorations into unique formatting methods that may themselves communicate with their content in a stronger way than the traditional paper format that is so dominate as to suggest no other means of relaying a fully developed series of information.
Works Referenced


