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Chair: X

Gordon Simmons

X

Barry Stedman
The Interaction of *Poesis* and *Tekne* in Tectonics

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Adam Erbaugh

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**Committee Chairs**

Gordon Simmons
Barry Stedman
ABSTRACT

The term “tectonics” might be thought of solely as technical resolution. To use the word in only this sense is to rob it of a greater significance. Tectonics is derived from the Greek word for carpenter, *tekton* which is closely related to *tekne*, which connotes construction. *Tekne*, as knowledgeable assembly or construction, also encompasses the poetic sense of making, *poesis*. Man’s need to create is an effort to relate to his environment and to ponder his own origin.

These two concepts, *poesis* and *tekne* are each enriched and to a degree defined by the other. Both concepts are addressed and executed in architecture the goal in tectonics is a sensible integration of the two, as they are inherently linked.

Tectonics, as a practice of poetic and technical collaboration, is at very least worthy of consideration and in a larger sense it can encompass all that is necessary in design.
God is in the details

-Mies van der Rohe

Euclid alone has seen beauty bare

-Bertrand Russell

An architect is a poet who speaks construction

-August Perret
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“Tectonics” is derived from the Greek word for carpenter, *tekton* [Frampton, p.3]. The meaning of *tekton* involves craft and art, in the sense of the care and exactness of a carpenter’s work, which consists of the quality of assemblage and the visual character of the finished product. This notion of *tekton* is related etymologically to the Greek word *tekne*, which connotes construction and know-how. *Tekne*, as knowledgeable assembly or construction, also encompasses the poetic sense of making, *poesis* [Heidegger3, p.76]. When making, the poetic nature of man is imbedded in everything created. In this sense, making as *poesis* denotes an intended expression. Thus *poesis* refers to artistic expression, or the “world of the thing” as characterized by Heidegger [Heidegger1, passim]. However, the world cannot be expressed in art or architecture without technical realization as in Heidegger’s “work of art,” which brings us back to *tekne*.

These two concepts, *poesis* and *tekne*, are each enriched and to a degree defined by the other. Whether the artistic aspects of a design guide *tekne*, or physical structure realizes *poesis* through its own development, both concepts are addressed and executed in architecture. What is necessary in this relationship is an appropriate integration of the two, as they should be realized symbiotically. In tectonic design, the aesthetic expression is
produced through the critical and sensitive resolution of technical considerations.

The relationship of *poesis* and *tekne* has been recognized and studied throughout the history of architecture, often as the paramount focus in the discipline. In recent history, the terms have been studied in the context of the *tectonic*. Eduard Sekler defined tectonics in “Structure, Construction, and Tectonics” as “a certain expressivity arising from the statical resistance of constructional form in such a way that the resultant expression could not be accounted for in terms of structure and construction alone” [Frampton, p.19]. Karl Botticher is credited with coining the term “tectonics” in his work, *The Tectonic of the Hellenes* [Peschken, p1]. “Karl Botticher would make the seminal contribution of distinguishing between the *Kernform* and the *Kunstform*; between the core form of the timber rafters in a Greek temple and the artistic representation of the same elements as petrified beam ends in the triglyphs and metopes of the classical entablature” [Frampton, p.4]. Frampton offers his definition of tectonics as “the poetics of construction” [Frampton, passim] in his 1995 work *Studies in Tectonic Culture*. All of these uses and definitions of the term imply an artistic expression out of a technical resolution. Frampton also uses the word more broadly in context throughout the study. While investigating certain architects’ tectonic works, Frampton invokes other senses the word, all of which support a wider
concept of tectonics as an integrated, intelligent process of design. He uses the word in several contexts:

- *Structural expressivity* in relation to Eduard Sekler [Frampton, p.19]
- Tendency towards *lightweight/efficient structure* as a polarity to the stereotomic or in reference to Gottfried Semper [Frampton, p.5]
- *Organic* as to the use of material in its strengths in relation to some of Frank Lloyd Wright’s concepts [Frampton, p.93]
- *Ordered organization* as is expressed in the buildings of Louis I Kahn [Frampton, p.209]
- Tectonics is a basis for *integrated design* and is therefore capable of incorporating other doctrines, such as avant-garde; as displayed by Mies van der Rohe [Frampton, p.159]
- The degree to which the *usefulness* of an artistic product has been achieved as per Adolf Heinrich Borbein [Frampton, p.4]
- Composed as an intelligent *integration of the artistic (kunstform) and technical forms (kernform)* as described by Karl Botticher [Frampton, p.4]

These concepts of the tectonic will be further explored throughout this work.
Structure, or the technical, as referred to in the above examples as *tekne*, work, and *kernform*, expresses the concept of the constructed, the work that allows the expressed world to be viewed. Utility, function and efficiency (or the degree of success, the how of success, and the minimization of the unnecessary) are all integrated into structural order. Art can simply be thought of as expression, in the concepts of *poesis*, world, and *kunstform*. Tectonics is the collaboration of aesthetic expression and technical practice producing an integrated design realization. Frampton explores many positions on tectonics from aesthetic analysis to efficient physical structure, but as he states, “In the last analysis, everything turns as much on exactly how something is realized as on an overt manifestation of its form. This is not to deny spatial ingenuity but rather to heighten its character through its precise realization” [Frampton, p.26]. Tectonics in this sense realizes the poetic resolution in collaboration with the technical resolution.

This concept will be explored in the following sections with respect to the problem that tectonics poses in architecture today, the background and history of the tectonic, and in historic and current precedents.
Tectonics is a concept which is greater than construction details, since these are necessary by-products of the tectonic process. In *Studies in Tectonic Culture*, Kenneth Frampton recognizes the studies of Italian architect and theorist Vittorio Gregotti with respect to detailing in architecture. It is Gregotti’s stance, and the position of this thesis, that detailing should not be assigned to architecture as an afterthought, lost in the design process of the image, only surfacing so that “the work happens to be realized” [Frampton, p.26]. The concept of tectonics is that the poetic expression can be produced by a cognitive or “thinking” technical practice of architecture. As Frampton continues to explore Gregotti, he poses that the tectonic approach allows for both the poetic and the cognitive aspects of a building’s substance to be expressed. Tectonics, as a technical process through which the poetic expression can be realized, is at very least worthy of consideration in design. The integration of the poetic expression within the technical practice and their relation to each other in the full process of design is the measure of tectonic success. The integrity of a building is ascertained by its integration. As Frampton states, “The tectonic stands in opposition to the current tendency to deprecate detailing in favor of the overall image” [Frampton, p.26]. The problem is the tendency in architecture to allow the poetic expression to take
precedence in design at the expense of the cognitive technical practice of architecture.

Cognitive technical practice refers not only to the physical reality of the building, but also to its functionality in use and purpose. Well-conceived tectonic design allows for the investigation of form and art through integrating technology and technical knowledge. In fact, in approaching the project from the technical perspective (and this infers the thinking technical perspective, and not the regurgitation of details and construction), artistic expression is inherent in the process of developing the technical approach. In fact, poesis can be realized through this investigation into tekne which is individualized by the specific criteria of a project. In other words, a poetic expression can be realized collaboratively with the process of creating a functional, economic, and technologically succinct order. Incorporating the tectonic approach from the beginning can produce integrity in building. “In the last analysis, everything turns as much on exactly how something is realized as on an overt manifestation of its form. This is not to deny spatial ingenuity but rather to heighten its character through its precise realization” [Frampton, p.26].

In the study of the history of style and the history of the tectonic, it is necessary to discern that while the two aspects are not separated in practice, each may be observed, studied, and
appreciated individually. However, the two ideals have often been set at odds with each other. For example, the style of the Greek temples was of its time, and it has been this *style* aspect of the architecture that has continued in the instances of Corinthian columns, pediments and the like. However, many historians and theorists, including Karl Botticher, have criticized the style of classical Greek architecture from a tectonic perspective. Their argument was that the style was a result of the tectonic process worked through in earlier wood and reed construction well before the first iconic stone temple, and therefore is not of the building’s own tectonic design. Botticher distinguishes the poetic *kunstform* from the technical *kernform* in the Greek temple, according to Frampton. “Botticher interpreted the term tectonic as signifying a complete system binding all the parts of the Greek temple into a single whole [Frampton, p.4]. It is the craft of the period that truly makes the Parthenon great, such as the ability and decision to compensate for the trick that light plays on the eye by bending a straight plane in perspective [Fig.1]. The Greeks expressed an appreciation for an earlier *tekne* in the way in which a rafter would rest on a lintel and the triglyphs at the soffit would be detailed and accentuated even though they carried no load [Fig.2]. Botticher suggests that they were a carryover from wood construction in which the rafters would hang over the lintel for venting and the exposed face of the rafter would be decorated to hide the exposed grain, much the same as their fluted columns were an aesthetic attempt to
evoke the imagery of earlier construction with reeds bound together to support the spans of wooden structures [Frampton, p.4]. This accentuation of the structural order in triglyphs, which were unnecessary aesthetic touches born out of previous structural situations, results in the separation of tekne and poesis. While from the Botticher perspective the fluting of the stone columns was in fact an attempt to mimic the reed structure of columns from other cultures and locations, some contemporary examples of the use of fluting in metal columns (for example in steel lampposts), still used partly for aesthetic reasons, also strengthens the structural capacity of the post while shrinking its diameter [Fig.3,4]. From Botticher’s perspective the stone columns are fluted as kunstform in a mimicking of a kernform from a different structure, situation, and group of criteria altogether. Therefore, in this case, the Greeks themselves, widely exalted as progenitors of a classic architecture, committed a self-defeating act of structurally blind expression. It is therefore ironic that this architecture is reproduced in style and is regarded as the pinnacle or golden age, when it itself is untrue in this copying of style at the expense of the tectonic. It is untrue because the style was of a time and place in which it had a tectonic relation, and a new time and place needs its own thought and tectonic resolution. The borrowers sought the beauty of the vertically enhanced aesthetic of reed-mimicking stone structure. However, as they employed the visual character without the inherent material, they ended up with a structurally blind
expression that was the classical style. In this sense, the traditional classical approach to architecture seeks the tectonic subconsciously but fails when it attempts to mesh the classic aesthetic with modern technology. In other words, the original reed hut was clear in its structure and did not attempt to resemble other construction methods, but when the classical Greek column mimics the earlier reed column, or steel construction is covered in plaster mimicking the Greek temple, the truth of the structure is clouded. The structure should manifest cleanly and truthfully. The romanticized aesthetic that is sought in the classic style is visually pleasing because of its original tectonic manifestation, while the regurgitation of this aesthetic result into other circumstances, be they classic Greek temples or modern day construction, results in an amalgamation of antithetical parts.

Contemporary examples of tectonic architecture must seek contemporary construction resolutions and the poetic expressions produced with them. The appliqué of antiquated tectonic elements to contemporary construction methods is as anti-tectonic today as it was when the Parthenon was built [Fig.5]. The craft of Greek buildings such as the Parthenon is to be admired and not borrowed but furthered. It is perhaps impossible to realize a truly new thought or form without a conscious or unconscious influence from the past. However, ideals can be carried throughout history and innovated rather than copied. Copying is the folly of style, a borrowing of the
poetic expression from specific project to specific project regardless of time, material, location, without the same regard to tekne. Design should not be conceived of as an aesthetic style, but rather as an intelligent process through which integration of the poetic and the technical is achieved. This process, which produces a poetry heightened by its integration and exact realization, is what designers looking to copy are actually seeking when they borrow previously conceived elements and standards, from Botticher’s perspective. The tectonic approach explores tekne and poesis collaboratively to construct sound technical resolutions and create poetics in building.
Tectonic concepts are ancient, though the word itself is a relatively contemporary term. Though not used in all instances in history in precisely the same manner as outlined in this document, the tectonic ideal evolved out of the discourse in architectural theory between the beauty of poetic inception and the technical resolutions of rational building. Early aspects of the tectonic ideal are evident throughout this historical discourse, whether as a general acknowledgment of both sides, or as extreme claims for either the poetic or the technical.

Frampton declares the ultimate beginning of what he calls the “Greco-Gothic ideal” was Claude Perrault’s renunciation of the mythic proportions of the Renaissance and the divine status of the five Orders. In this claim, Perrault outlines two sides of beauty, positive, and arbitrary. The late 17th century world of architecture in which Perrault did his work was characterized by an academic argument between the Ancients and the Moderns. The Ancients were those who felt that there were absolute truths in architecture, in particular, universal, divine proportions and orders. They believed these truths were ordained to man by God through ancient works leading back to the theories of Vitruvius and possibly back to Solomon’s Temple. They called for a movement back to the “golden age of architecture.” The Ancients felt that the rules and monuments of the classical
golden age were perfect, and that their lessons were being lost in the modern, Baroque style of architecture. Perrault was a Modern who sought new doctrines for architecture through a rethinking of order and proportion based on actual experience and not blindly accepting the authority of the past.

This concept of the modern was guided by empirical reason, out of which a useful order could be established. Perrault’s method of study was a hands-on endeavor. He felt that experience should be the foundation of the modern. One cannot avoid the modern; every man has lived in modern times. Perrault felt that the Ancients relied too heavily on rules that they thought were transcendental. Perrault categorized these concepts of beauty based on prejudice from custom and association of what has come before as arbitrary beauty. Rules should be based on experienced reality, leading to his definition of positive beauty, which included richness of materials, size and magnificence, precision and cleanliness of execution, and axial symmetry. “I call beauties based on convincing reasons those whose presence in works is bound to please everyone, so easily apprehended are their value and quality.” [Perrault, p.50] This statement approaches the concept of tekne insomuch as a well ordered and thought-out process produces pleasant qualities in poesis.

In Precis of the Lectures on Architecture, J.N.L. Durand wrote of beauty as a result of an appropriate approach to architecture, and
not as the goal [Durand, passim]. He worked in the early 19th century and is often discussed in relation to the Abbé Marc-Antoine Laugier, as they both responded to Perrault’s critique. Laugier felt that Baroque architects had corrupted the classical principles and that in order to re-comprehend them one must return to the simple primitive hut, derived from nature and reason [Fig. 6]. From this concept of the primitive hut as the first shelter he derived the essential elements of architecture: column, lintel, and pediment [Frampton, p.30-31,85]. Contrarily, Durand extended Perrault’s tentative empiricism in a view of architecture based on utility; the hut and human proportion have nothing to do with it. Based on his exercise in logic, Laugier reasoned that the rules of nature were paramount and indisputable. The sources of Durand’s emphasis on utility included post-Napoleonic improvements in technology and commerce and the utilitarian moral philosophy of Jeremy Bentham and John Stuart Mill [Frampton, p.35-37]. They viewed utility as a moral quality as it was the use of reason in an effort to improve the struggle of mankind. In this sense the Utilitarians felt that the worth of public institutions should be valued by their degree of usefulness. Bentham’s Panopticon is an example of the benefits of utility [Fig.7,8]. As a building based on the control of its subjects, the guard position is in the center with the inmates separated and surrounding. In this manner, the fewest number of guards can maintain the greatest number of inmates [Frampton, p.36].
Durand saw two principles of utility: appropriateness and economy. He felt that focusing on beauty as the goal of architecture is nonsense; rather he felt that the process of developing a project would produce beauty through rules that were appropriate for the specific circumstance. Appropriateness to Durand meant that if buildings were designed with their specific use in mind, then the result would unavoidably be pleasurable. From this view, he felt that pleasure as the goal of architecture was folly, as pleasure was inherent in the design of utilitarian architecture. Economy from Durand’s perspective emphasizes that art in architecture is misdirected [Fig.9]. From his perspective economy in architecture sought to avoid unnecessary frivolities [Frampton, p.41,75,79-80]. Durand’s overall concepts of appropriateness and economy within the larger function of utility can be compared with tekne. Of his three types of form based on nature, custom, and simplicity, form from nature can most closely be compared to poesis. Durand’s concept of natural forms as being derived from use is similar to the case Heidegger makes that an ax is the form it is in order to most effectively embody its use [Heidegger1, p.171], and is related to Perrault’s concept of positive beauty as derived out of experienced reality. Similarly, the forms directed by custom share a relation to the arbitrary beauty that Perrault criticized. Durand’s simplicity is similar to the elementary bodies extolled by Étienne-Louis Boullée, who explained this universal preference as being the result of these bodies’ relation
to our own organism [Boullee, p.194-196]. For Durand, the nature of a material suggested its use. For example, a brick is strong in compression and weak in tension and should therefore be utilized in compressive stacking. Nature dictates a form configured for a specific use. From Durand’s perspective, the forms of all things in nature are developed out of utility, as is the beauty inherent in nature [Durand, p.87-88]. This concept is closely linked to tectonic ideals. The poetic expression is most true and meaningful when developed thoughtfully in collaboration with the technical and programmatic requirements.

Durand’s view of beauty being a result of architecture and not a goal can be related to the discourse between the Gothic proponents Eugene-Emmanuel Viollet-le-Duc and John Ruskin some 60 to 80 years later. Viollet’s Lectures on Architecture aligned with Durand’s work, A Collection of Parallels of Every Building Type, in that both called for an empirical evaluation of architecture. Viollet had a positivist view as opposed to the romanticist view that Ruskin supported. Ruskin saw the middle ages as a golden time in architecture, similar to the Ancients’ views of Classical Greek architecture. In “The Lamp of Life” Ruskin called for the preservation of the ideals of the Middle Ages and advocated building Gothic architecture in the contemporary setting, under the pretense that it was done with enjoyment [Ruskin, passim]. Viollet reasoned that architecture could learn solid principles from the past, but he also felt that
these principles could be furthered rather than followed. Viollet’s restoration perspective allowed for the evolution of architecture rather than the stagnation inherent in the preservation advocated by Ruskin [Viollet, p.447-448].

An interesting example of the relation of past to present architecture was the availability of iron structural elements, which were used in construction from the mid 1800’s. Ruskin argued against the use of iron as structure because its smaller diameters in columns and supports contradicted our historical sense of proper proportions in traditional masonry and wood architecture. In The Seven Lamps of Architecture, Ruskin depicts the three “deceits” in architecture: structural, surface, and operative. A structural deceit is the expression of a structural element other than the true one. In the instance of surface deceit, Ruskin was referring to a deception such as painting wood to look like marble. However, gold leaf applied to a substrate was not untruthful as he felt that common sense would inform the observer that the member was not solid gold. Operative deceit referred to the practice of substituting machined or cast work for various elements of architecture such as capitals which he believed should be created by hand. He felt that an architect’s use of any of the three of these suggested an intention to deceive the world [Ruskin, p.35].
To refuse iron and its new properties would be false to architecture. His position on Gothic architecture was that its appearance resulted from structure. This construction truth was in line with his rationale that Gothic designs followed a natural method. In this sense, all aspects of architecture—structure, proportion, geometry and ornament—created a natural unity that strengthened the overall design as a whole. The integration of parts, creating a stronger and more complete whole, was Viollet’s perception of unity in architecture [Viollet, p.449-457].

Conversely, Ruskin saw ornament as the distinguishing factor between architecture and mere building. For him ornament was a functionally and technically “unnecessary” embellishment that could raise building to a fine art [Ruskin, p.8,9]. Viollet believed in the use of principles from the past and, much like Perrault, felt that the use of modern theory and technology was necessary and a responsibility of architecture, both to the present and to the future. He was a proponent of the use of iron and recognized it as the technological progression of architecture. Viollet maintained that architecture should follow the rational construction of the Gothic, and should adapt this approach to the modern situation [Viollet, p.446-447,456].

Louis Sullivan agreed with Viollet in his appreciation of the expressivity of the structure in Gothic architecture. Sullivan sought an “organic” architecture as conveyed in his article “The Tall Office Building Artistically Considered.” Organicism
dictated that ornament and form should both grow out of the construction. Within this work, Sullivan stated the true immovable nature of architecture: an entity is signified by its natural form, life is recognizable in its form, and form follows function. For him, mass composition was the more profound expression of life, while ornament was the more intense expression. The lower floors of his tall buildings would be the thickest as they carried the load of every floor above. He felt that every problem contained and suggested its own solution [Sullivan, p.308]. This perspective parallels the tectonic concept. The poetry of architecture can be derived from the order originated by the functional and technical resolutions of the building.

Perrault, Durand, Viollet, and Sullivan all advanced the doctrines that would spawn the tectonic approach to architecture. This is not to say that these theorists were tectonic designers, but rather that their concepts contributed positively to the tectonic approach.
In “The Origin of the Work of Art,” Martin Heidegger explores the world of the work of art. He states that it conveys the experience of that world [Heidegger1, passim]. As Frampton observes of Adolf Heinrich Borbein’s 1982 philological study, “Tectonic becomes the art of joinings. ‘Art’ here is to be understood as encompassing tekne, and therefore indicates tectonic as assemblage not only of building parts but also of objects, indeed of artworks in a narrower sense” [Frampton, p.4].

Poesis is the world of art that the artwork conveys. Tekne is the technical know-how necessary to produce a work. Poesis and tekne therefore, are symbiotically linked. Each individual term carries with it a portion of the other. The why and the how are necessarily related to, and distinguished from, each other.

Heidegger proposes that art consists of world and work. World refers to the expression portrayed by the work. Heidegger examines at great length the world of the peasant as expressed in Van Gogh’s 1886 painting A Pair of Shoes [Fig.10]. The shoes depicted are worn and tattered and convey the sense that a great deal of labor has been performed by their user. The work (i.e. the actual painting - paint, canvas, and frame construction) is the physical realization of the intended expression from the world of the subject. The work is what allows this world of the peasant to be glimpsed [Heidegger1, p.37]. The artist is defined by the art
relationship between world and work [Fig.11]. This triad as applied to architecture defines the architect by the symbiotic relationship of poetic imagery and technical resolution that is tectonics [Fig.12]. The poetry is expressed through the manifestation of the technical, just as the world is glimpsed through the physical realization of the work.

The written work, *Studies in Tectonic Culture*, by Kenneth Frampton, is a theoretical look at the works of the past in relation to construction. This in-depth study into the tectonic explores
various theorists’ positions in the discourse. Frampton begins his study by reflecting on the scope of the tectonic and defining the terms which are used throughout the investigation. These principles are topos (site), typos (type), and the tectonic. As Frampton poses, “We may claim that the built invariably comes into existence out of the constantly evolving interplay of the three convergent vectors, the topos, the typos, and the tectonic. And while the tectonic does not necessarily favor any particular style, it does, (in conjunction with site and program), serve to counter the present tendency for architecture to derive its legitimacy from some other discourse” [Frampton, p.2]. This statement lends credibility to the tectonic, insomuch as it is a fundamental building block, and not simply style or randomly generated conception. Tectonic design seeks out both topos (site) and typos (program) in a truly integrated work.

Martin Heidegger explores poesis and tekne within the context of the tectonic in his essay, “The Question Concerning Technology.” “We must observe two things with respect to the meaning of this word. One is that tekne is the name not only for the activities of the craftsman, but also for the arts of the mind and the fine arts. Tekne belongs to bringing-forth, to poesis; it is something poetic” [Frampton, p.23]. Heidegger expresses the symbiotic relationship of poesis and tekne, following the ancient Greeks.
Frampton explored the roots of the word tectonic back to the language of ancient Greece. In this earliest use of the root word is tekton, the act of carpentry. Craft and design are both critical to the carpenter. The finished product, whether it is a stool or an armoire, is wholly dependent on the craft (care in production) and the design. The design is important to the craft because of the joinery of the work. In general in carpentry, a design that is ornate but does not integrate piece to piece in a clean and sturdy manner results in a shoddy finished product. Alternatively, a piece with clean connections and simple transitions results in a stable and enduring finished product, but can result in a lackluster aesthetic. The master carpenter seeks the best of both craft and design, with an aesthetically pleasing yet finely crafted finished product as the continual goal. So too is the necessity for tectonics alive in architecture. Rather than overindulgence in architecture as space, Frampton feels that this carpentry attitude applied to architecture will allow for a responsible approach to design beyond style or seemingly random conception [Frampton, passim].

Frampton depicts poesis as consisting of the intention to create beyond what is actual or finite. Tekne relates to art in terms of assemblage, that is, creating or building in the sense that materials are artworks themselves and can express greater ideas [Frampton, p.4]. Art is commonly held to be the conscious use of skill and creative imagination especially in the production of
aesthetic objects [Merriam-Webster Online]. So, art at its simplest is expression and realization. Both are involved in creation and both depend on the other. For instance, the expression can be conceptualized, but it cannot be conveyed unless it is realized. Likewise, the thingly nature of the realization is empty without the expression portrayed within.

Frampton teaches that the term tekne is “derived from the Greek verb tikto meaning “to produce.” This term means the simultaneous existence of both art and craft, the Greeks failing to distinguish between the two” [Frampton, p.4]. This supports the concept that through the reasoning and logical development of a project from the tekne perspective, art is inherent, as it was to the Greeks, who did not define the terms separately. Frampton continues, “It also implies knowledge, in the sense of revealing what is latent within a work; that is to say it implies aletheia, or knowing in the sense of an ontological revealing” [Frampton, p.18]. A revealing of being is what the artist attempts to convey in the world of the work of art he creates. As is the case for many of Frampton’s subjects, art is inseparable from the design process of tectonics. Craft in the making process is completed with care and is an expression of the relationship between the creator and the created.

Karl Botticher explored the tectonic in his work, *The Tectonic of the Hellenes*, in which he utilizes the German words kunstform,
or symbolic art form, and *kernform*, or core form [Frampton, p.4]. As was pointed out earlier in the present document, these terms are closely related to *poesis* and *tekne* respectively, and have a similarly symbiotic relationship. In fact, the pairs of terms are all but interchangeable: *kunstform* realization is possible only through the thingly existence of *kernform*. Kunstform relies on kernform. This relationship is expressed in the concept that *poesis* is of *tekne*, that the art is reliant on the craft. However, is *tekne* reliant on *poesis*? Frampton investigates the symbiosis within the microcosm of “humanists” and “technologists.” “Trapped in the impossible situation of adapting the syllabus to the now insufficient teaching time available, faculties today are divided between ‘humanists’ and ‘technologists,’ with each group endeavoring to exclude the other… ‘When I am to choose between A or B,’ [Louis-Hubert] Lyautey is supposed to have said, ‘I assuredly should choose A + B’” [Frampton, p.379]. This is from a different context, but the reasoning unavoidably applies. The greatest strength, the greatest integrity is derived from the combined capacities of *tekne* and *poesis*.

Frampton cites Eduard Sekler’s work, *Structure, Construction, and Tectonics*. He says Sekler defined the tectonic as “a certain expressivity arising from the statical resistance of constructional form in such a way that the resultant expression could not be accounted for in terms of structure and construction alone”
In other words, structure is something greater than the simple carrying of loads. Sekler clarifies this concept, only he does it inversely as he refers to the atectonic. “‘Atectonic’ is used here to describe a manner in which the expressive interaction of load and support in architecture is visually neglected or obscured” [Frampton, p.20].

Sekler defines the tectonic in terms of static force resistance and constructional form. The final expression of the form is such however that it is more than the resistance of static forces. In other words, the tectonic approaches design from the perspective of technical construction; and in this creation process, art is infused in the expression of building. This is not to say ornament is added to joinery, rather that the artistic expression is integrated with the structure (technical resolution) and is responsible for carrying the static loads. The load is carried in each connection (or organ) in a manner more indicative of the fully functional organism of the building, and it is possible for the organism as a whole to receive its form from its structure and connections [Frampton, p.19-21].

Frampton refers to Gottfried Semper’s *Four Elements of Architecture* as an “epoch-making theoretical departure from the Vitruvian triad of *utilitas, fermitas,* and *venustas* [or utility, strength, and grace]” [Frampton, p.4]. Semper posited building as composed from the beginning of four basic elements: the
mound, the hearth, framework, and the enclosure [Frampton, p.5]. Frampton observes, “On the basis of this taxonomy Semper would classify the building crafts into two fundamental procedures: the \textit{tectonics} of the frame, in which lightweight, linear components are assembled so as to encompass a spatial matrix, and the \textit{stereotomics} of the earthwork, wherein mass and volume are conjointly formed through the repetitious piling up of heavyweight elements” [Frampton, p.5]. Semper viewed load bearing masonry construction as the contemporary continuation of the earthen mound, which fit into his conceptualization of stereotomic. Frampton utilizes stereotomic, as a term, more in terms of sculptural or “cut-away from” form as in the examples of mud huts or sod houses in which, “stereotomic walls are extended horizontally to become floors and roofs, made up of the same material although reinforced with brushwork or basketwork” [Frampton, p.7] [Fig.13]. While Semper and Frampton use stereotomic in relatively sympathetic manners, where they differ is that Frampton’s use of stereotomic can be applied to such contemporary works as Frank Gehry’s University of Minnesota’s Frederick R. Weisman Art Museum. Semper’s definition of stereotomic does not apply to the UMAM as a sculptural and separately supported building form [Fig.14].

Frampton poses that the domination of space is a misstep of contemporary architecture. He hopes to redirect studies towards tectonics or the poetics of construction. He takes a step in a
different direction in this regard from other theorists. Rather than focusing on and interpreting the immaterial characteristics of architecture, he examines the basic truth that architecture is essentially construction. He attributes the skewed course of focusing on space, be it material or immaterial, to maligned interpretations of Mies and Kahn.

According to Frampton, Mies van der Rohe created space via tectonics: space was the product and tectonics the means. This can be misinterpreted as Mies unwarrantedly over-emphasizing the creation of space, when in fact his theories were technically ordered and rational. He sought to combine order and poetics in clearly stated construction. Mies, who has referred to his works as “almost nothing,” saw structure as a concept, something to be worked through in the mind to establish the functional order of a building. Space was a necessary and pleasant complement to the expressivity of construction [Frampton, p.159-208].

Louis I. Kahn similarly sought design through comprehension of assemblage. Kahn generated space through structure, an inherently tectonic concept, as Frampton explores in his study of the Richards Medical Laboratories [Fig.15]. The later period of Kahn’s career is widely viewed as monumentality in architecture. As Frampton observes, “Kahn’s unique contribution in this regard [to monumental form] stems from his conviction that tectonic structure, rather than mass form or type,
must be pursued as the first condition of monumental form” [Frampton, p.209]. Kahn’s tectonic approach permeated well beyond monumentality to include material and structural rationalism and also mechanical services. Frampton reacts to Kahn’s personal writings: “He [Kahn] becomes preoccupied with the idea that services should be accorded the same tectonic status as structural form.” Frampton continues, “Centralized air-conditioning imposed a quantum leap…Kahn could not accept the suspended ceiling as a normative method for the accommodation of ducts…largely because a false ceiling inevitably conceals the basic floor structure…the fundamental structure of a building had to be made manifest both inside and out” [Frampton, p.216]. The order of a Kahn building required an integrated tectonic solution for services which did not obstruct the visibility of the structure. This is evident in the second version designs for the Salk Institute Laboratories in La Jolla, California [Fig.16,17]. This version, which was eventually revised to shorten the construction period and save money, fully integrated the specialized services for the building within a structural scheme. This design followed “the precepts of structural rationalism, with interstitial man-height service spaces being integrated within the depth of the 100-foot box-truss girders. This triangular-sectioned space would occupy the depth of 50-foot prestressed folded plates spanning the opposite dimension” [Frampton, p.236]. This is indicative of Kahn, who in addition to tectonic monumentality, sought a fully integrated
tectonic solution to his projects [Frampton, p.209-246].

August Perret, according to Frampton, facilitated the tectonic in an expressed structural skeleton, seeking an ordered concept in his works. Perret also reinterpreted vernacular elements of architecture, seeking to re-approach them from an intelligent design perspective through the tectonic. This affinity for the concepts of the tectonic was also evident in Perret’s exploration of the joint, in his tendency towards separation of materials, and in evidencing the hierarchy of spaces, such as in his work at 25 bis rue Franklin in Paris [Frampton, p.121-158] [Fig.18].

Jorn Utzon was primarily concerned with the expressivity of structure and construction. Frampton discusses the Sydney Opera House as an exemplar of these principles [Fig.19]. Frampton observed a tendency for clear spans in Utzon’s works, “he has…consistently displayed a preference for column-free public volumes covered by folded slabs or shell roofs, that is to say, for works in which the basic character derives from structural articulation of the sectional form” [Frampton, p.248]. The shell plates infer structural strength, but as Frampton notes, the tectonic concept does not always result in structurally rational products. However, in the case of the Sydney Opera House, Utzon designed the shells with the interrelated principles of tectonic form and an ordered geometry which produced a clear structurally expressive result [Frampton, p.251].
Carlo Scarpa’s work condenses the tectonic into every aspect of design detail. The joint in all of its scales and relationships is inherent in the coming together of a Scarpa design. As Frampton states, “The joint is treated as a kind of tectonic condensation; as an intersection embodying the whole in the part, irrespective of whether the connection in question is an articulation or a bearing or even an altogether larger linking component such as a stair or a bridge” [Frampton, p.299]. The joint was treated as a microcosm of a project, and as Scarpa’s works configured themselves not as a whole but as collaborations of intensely meaningful parts, this served as a unifying thread teasing the perception of an obtainable whole. In Scarpa’s work, “There was only the ‘nearness of things’ and their unfolding progression from part to part and joint to joint…[he] saw such cryptic, microtectonic inscriptions as somehow capable of transcending the ruinations of time” [Frampton, p.333]. This adoration is how his works become simplified as an intense observance of the joint, exemplified in Scarpa’s Brion Cemetery [Fig.20,21].

Frampton’s primary intention in his book is the redirection of focus in the design process. He seeks to proceed towards tectonic order rather than to contribute to the current trends of imbalanced architecture which dominate the current discourse. These trends focus too much on the expression of architecture without paying attention to the true reality that is tectonics. “[Vittorio] Gregotti maintains that detailing should never be
regarded as an insignificant technical means by which the work happens to be realized. The full tectonic potential of any building stems from its capacity to articulate both the poetic and the cognitive aspects of its substance... The tectonic stands in opposition to the current tendency to deprecate detailing in favor of the overall image... In the last analysis, everything turns as much on exactly how something is realized as on an overt manifestation of its form. This is not to deny spatial ingenuity but rather to heighten its character through its precise realization” [Frampton, p.26]. Tectonics in this sense seeks truth and honesty; it seeks to realize the poetic through the technical.
-5- PRECEDENTS

In tectonic design the aesthetic expression is produced through the resolution of technical considerations. The following precedents study the relationship of art and physical structure in museum design, as art museums are themselves macrocosms of this relationship in that they are technical solutions to housing works of poetic expression. Therefore the building as a museum must be an expression in itself. This section analyzes museums by Wright, Kahn, Gehry, Calatrava, and Hadid in terms of the thesis ideas of the merging of art and structure, art and architecture, expression and function.

Frank Lloyd Wright’s Guggenheim museum in New York opened in 1959 [Fig.22,23]. A spiraling progression of exhibits, the plan sought a fluid and uninterrupted procession through its works. Wright remarked on his design, “Here for the first time architecture appears plastic, one floor flowing into another (more like sculpture) instead of the usual superposition of stratified layers cutting and butting into each other by way of post and beam” [Dean, p.16]. Wright was experimenting outside of tectonics in the sense of joinery, but the design was very tectonic in that the spiral shape was conceived of as an aesthetic resolution of the technical consideration of traffic flow. This was a concept that Charles-Edouard Jeanneret-Gris, known as Le Corbusier, worked with in his theoretical design for an
“endlessly growing museum” [Fig.24]. Here the use for the spiral was obviously an attempt to allow the museum to accept additions seamlessly, without disjointing the dream walk through the exhibits. This idea for an uninterrupted procession is refined in the Guggenheim. “With its spiral shape formed by a grand cantilevered ramp curving unbroken for 100 feet to its dome, the museum was a culmination of Wright’s lifelong attempt to liberate space so that it could move without horizontal or vertical impediment within its structure and be fully integrated with its structure” [Dean, p.16]. The building was to be experienced in a continuous walk around and around, constantly exposing the user to the art displayed on the walls. Dean recognizes that throughout this procession in a “surpassingly beautiful space, its backward inclining walls, which visitors had to view from an opposing incline, its lack of scale and absence of verticals and horizontals made it a curator’s nightmare” [Dean, p.16]. The building met with further negative reviews. “The pictures disfigure the building and the building disfigures the pictures,” wrote John Calladay of the New York Times. He saw a “war between architecture and painting in which both came out badly maimed” [Dean, p.15]. Wright’s Guggenheim was credited as a success as an abstract composition of interior space by Lewis Mumford, who considered it a failure in all other regards of architecture [Dean, p.16]. The processional conceptualization of the building must be praised, but the lack of integration of building and user is problematic. Aesthetic expression in
tectonic architecture must result from the resolution of the relationship between exhibit, housing, user, procession, and experience.

Louis I. Kahn’s Kimbell Art Museum in Fort Worth, Texas “contain[s] 120,000 square feet… It consists of sixteen parallel, 100 x 20-foot lead-roofed vaults of architectural concrete, cast in place. These are massed as tripartite units of six, four, and six, separated by two sections, each three feet wide. Each vault is supported on four corner columns, each of these two square feet” [Bellinelli, p.13]. Lighting was Kahn’s first concern when designing the Kimbell, as early sketches illustrate. Day-lighting was important to client as owner as both felt it was the best manner in which to view art which was created and originally viewed in such conditions. The variation of natural light not only conveys the “comforting feeling of knowing the time of day” [Kahn] but also complements the viewing of older works, as does the presence of foliage, water, sun and sky at the entrance. The “natural light fixtures” as Kahn referred to the reflectors, served to spread daylight upon the underside of the shell and resulted in the roof structure of cycloid barrel shells acting as giant continuous and even lighting for the spaces.

The museum draws upon imagery that is conjectured to be of local influence [Fig.25,26] and from “historical allusions that conjure images of Ostia, Pompeii, Hadrian’s villa, and Egyptian
tombs” [Speck, p.36]. Locals saw the vaulted imagery as drawn from Fort Worth grain elevators or the barrel forms of the stockyards [Speck, p.39] [Fig.27]. The signature vaulted order of the museum derived from such imagery is nevertheless a tectonic stance by Kahn, down to the decision to break the vault at its apex for a light well [Fig.28]. As Speck states, the vaults “are the essence of the building—the inspiration for the design as well as its taskmaster. It is the vaults that give the building its loftiness as well as its intimacy; the vaults that light the space with their silvery, luminescent glow; the vaults that make the ‘rooms’ of the building while at the same time providing the flexibility of uninterrupted clear spans [Figs.29,30,31] It is the non-hierarchical vaults that give the building its order and its rhythm, injecting character into an otherwise undistinguished massing and solving the problems of the fifth façade, the roof, which is visible from the hill above” [Speck, p.40]. The cycloid shape acts structurally as beam. “Dischinger discovered, in particular, that barrel shells with a vertical tangent near the longitudinal edge area, as found in both elliptical and cycloid shapes, do not require a thrust corresponding to these edges, since the whole load rests on both ends. Their behavior is thus completely different from that of a vault, and resembles more that of a beam” [Bellinelli, p.105].

Kahn’s building is tectonic in its use of the vault as a structural form. The universally serene expression of the building engages...
the user with the world of art as one proceeds through the building. The tectonic order capitalizes on the imagery of this serenity and results in a “work of great beauty and charm. It is powerful, awesome, and inspiring. It is sincere, warm, and humane” [Speck, p.36]. The rhythm and form of the cycloid vaults integrate the service cores of the building as well as disperse light within [Fig.32,33,34,35]. There is flexibility as each shell is supported by four columns, and the movable wall panels carry no structural load. As Richard Brown, the director of the museum, commented, “This is what every museum man has been looking for ever since museums come into existence: an uninterrupted floor, perfect lighting, total freedom and flexibility to use the space and install art exactly the way you want” [Bellinelli, p.19].

Frank Gehry’s design of the University of Minnesota’s Frederick R. Weisman Art Museum is more stereotomic by definition than tectonic [Fig.36]. Frampton’s use of stereotomic connotes sculptural or “cut-away from” form. The sculptural shape of the building seems carved from a larger mass rather than constructed from technical considerations of interior space. In fact, the interior of the building, unlike the skin of the exterior, is mostly orthogonal with large light wells [Fig.37]. The wells are again carved out of the resulting mass that fills in the space between the metallic skin and the orthogonal interior walls and floors. “This open poche manifests the architect’s conception of
architecture as sculpture, and sculpture as place” [Bierman, p.92]

In this regard, the building is not tectonic because of two aspects:
the sculptural curvilinear forms of the exterior do not pervade
through the building and exemplify their relation to the structure;
the interior manifests itself in an orthogonal manner to allow it to
function as an art museum; and these forms themselves are not
structural but in fact hide the structure [Bierman, passim]
[Fig.38]. A tectonic resolution in the spirit of the aesthetic of the
building may have been realized by using independently
structural sweeping shapes which tie into the orthogonal interior
all the while transferring load efficiently in an integrated system.

Regardless of the fact that the building is not designed
tectonically, it nevertheless is concerned with expression and
technical resolutions. The dissimilarities of the exterior and
interior allow for the artworks to maintain their prominence
inside while the exterior metal shimmers as artistic expression
itself and lures users inside. “Gehry’s differentiation between
metal frontispiece and brick warehouse therefore epitomizes
Robert Venturi’s idea of a decorated shed: The museum is
wrapped with a chameleon that screams, ‘I am a monument,’”
[Bierman, p.89]. A sculptural work of aesthetic art in itself, the
UM Art Museum’s steel exterior plays in light and reflection.
“Gehry’s steel-coated structure is a chameleon of many moods.
Under a gray winter sky, its west face appears as cold and
impenetrable as a block of Minnesota ice; while in the summer
dusk, it glints and refracts sunlight, blinding its admirers and critics as its sculptural masses dissolve into a metaphorical burst of flames” [Bierman, p.85] [Fig.39]. This is the success of the building as a museum, in that it is itself a work of art, though its technical cohesion to the exhibitions may be limited.

In Santiago Calatrava’s Milwaukee Art Museum, the artistic expression is realized in its structural vocabulary [Fig.40,41]. “Calatrava is at pains to reveal a building’s bones, making them the centerpiece of his baroque visual drama. Although his Milwaukee addition is not without faults, it nevertheless has real significance because it reasserts and refreshes the age-old premise that architecture is a building art” [Kamin, p.100]. This distinguishes the building from the UM Art Museum which is designed from the premise that architecture is primarily art, as Bierman observed. This distinction is one of construction realization. Whereas the UM Art Museum is sculpture, the MAM is structural sculpture [Fig.42]. In this sense both examples are strong in identity. Kamin comments, “While visitors may flock to the addition to glimpse the birdlike brise-soleil, they are likely to come away realizing that the device is not an isolated gimmick, but simply the most visible part of an inspired, carefully conceived whole. What makes the building fly is Calatrava’s singular fusion of sculpture and structure” [Kamin, p.95]. While this fusion of sculpture and structure
approaches the tectonic, it stretches beyond it and results in pure structural eclecticism.

The building’s allotment of floor space for art exhibition is also limited. Only 12,000 of the 142,000 square feet is gallery space. The addition to two existing portions of the museum was done more to redefine the building’s inner workings and create identity rather than to add an abundance of gallery space.

According to Suzanne Stevens, “[Zaha] Hadid’s temporary art galleries [in the Cincinnati Contemporary Arts Center] aren’t meant to compete [on the level of art and architecture mutually reinforcing each other]…With changing shows and inconsistent quality of art, it’s better to evaluate the museum as a tourist magnet introducing people to the experience of ‘Architecture’” [Stephens, p.91]. The concept of the museum as an expression in itself is taken a step further in Hadid’s CAC [Fig.43,44]. Rather than a self-expression which more often than not ends up competing with the exhibits, the CAC separates itself from the works and explores “Architecture.” This confrontational notion is appropriate in theory to the contemporary art it houses, as it seeks to stir controversy by removing the patron from the trance-like state of everyday routine through emotional discomfort via unorthodox forms and exhibits. The circulation path of the building does this in its skewed stairways, each separated from the next [Fig.45]. The circulation rectifies the concerns about
physical comfort in Wright’s Guggenheim, which linked circulation and installation space in what was intended to be an unconscious spiral procession for the patron in which they may get lost in the art. Conversely, the CAC “atrium circulation is kept distinctly separate from the art installation, although the visitors…follow a defined trajectory” [Stephens, p.91]. The formal spiral of Wright did not do this, as the angled walls restricted the user to a constantly physically uncomfortable viewing stance [Dean, p.16]. The circulation is physically comfortable while simultaneously causing uneasiness spatially. This is the success of CAC. However, the circulation is made conscious to the user through the skewed stairways and halls that lead to dead ends forcing the patrons to retrace their steps. The building does not follow the ideals of tectonic design, as forms such as the “urban peel” are employed for structural expression alone rather than from technical considerations [Fig.46]. In this manner, similar to Gehry’s U of M Museum of Art, the CAC can best be defined as stereotomic in the discourse of tectonic architecture. It is its own Contemporary Art entity which happens to house contemporary artwork as well.

The preceding works sought circulation, form, art, integration. The tectonic ideal seeks the integration of all subjects in a cohesive and expressive manner. The goal being an intricate and functional resolution, expounded in the thesis proposition section.
As observed in the Literature Review chapter, Eduard Sekler defined tectonics in “Structure, Construction, and Tectonics” as “a certain expressivity arising from the statical resistance of constructional form in such a way that the resultant expression could not be accounted for in terms of structure and construction alone” [Frampton, p.19]. The “resultant expression” in tectonics invokes *poesis*. Making as *poesis* denotes an intended expression which is innately part of making. The term “tectonics” might be thought of solely as technical resolution. To use the word in only this sense is to rob it of a greater significance. *Tekne* and *poesis* are created together in tectonic design. Therefore, tectonics always involves *poesis*.

Within the context of architecture as the art of building, this thesis proposes that the poetic expression is most true and meaningful when developed thoughtfully in collaboration with the technical and programmatic requirements. This proposition of a tectonic approach is based on concepts from theoretical writings and built precedents, and is based on the interaction and interdependence of poesis and tekne.

Tectonics seeks integration; it seeks to realize the poetic through the technical. Three design principles will contribute to tectonic order in this project.
Perret advocated truth in structure through expression of the structural skeleton of a building. Calatrava’s Milwaukee Art Museum offers its structural eclecticism as its image [Fig.42].

1) Integrate materials, details, and structure expressively and truthfully. All will function in a concise and apparent manner.

The order of a Kahn building required an integrated tectonic solution for services which did not obstruct the visibility of the structure [Fig.28]. This concept strengthens the integrity of a project that is designed to perform its responsibilities in an efficient manner.

2) Integrate heating and cooling considerations, sustainability, and lighting. All will function in a concise and apparent manner.

Procession through a building and especially through a museum forms the experience of the patron. Corbu designed with a spiral shape in circulation in his exploration of the “endlessly growing museum” [Fig.24]. Wright surpassed Corbu’s orthogonal design with his true spiral Guggenheim circulation scheme [Fig.23]. The goal for Wright was a museum in which one could lose himself in the art.

3) Integrate the orders of circulation and exhibition systems. All will function in a concise and apparent manner.
These principles are indicative of the tectonic which seeks truth and honesty; it seeks to realize the poetic through the technical. Each is relevant to museum design as each corresponds to the discussion of the poetic and the technical, poesis and tekne, kunstform and kernform, world and work, art and structure.

Fig. 23 – Wright’s Guggenheim Museum 2
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