

in search of the Organic
an unequivocal exploration into the principles of organic architecture

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in search of the Organic
Matthew Alexander Duncan

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State
University in partial fulfillment of the requirements for the degree of

Master of Architecture
in
Architecture

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organic, architecture, music, opera house

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ABSTRACT

“Before leaving the earth altogether, let us ask: How does Music stand with respect to its instruments, their pitches, the scales, modes, and rows, repeating themselves from octave to octave, the chords, harmonies, and tonalities, the beats, meters, and rhythms, the degrees of amplitude (pianissimo, piano, mezzo-piano, mezzo-forte, forte, fortissimo)? Though the majority go each day to the schools where these matters are taught, they read when time permits of Cape Canaveral, Ghana, and Seoul. And they’ve heard tell of the music synthesizer, magnetic tape. They take for granted the dials on radios and television sets. A tardy art, the art of Music. And why so slow? Is it because, once having learned a notation of pitches and durations, musicians will not give up their Greek? Children have been modern artists for years now. What is it about Music that sends not only the young, but adults too, as far into the past as they can conveniently go? The module? But our choices never reached around the globe, and in our laziness, when we changed over to the twelve-tone system, we just took the pitches of the previous music as though we were moving into a furnished apartment and had no time to even take the pictures off the walls. What excuse? That nowadays things are happening so quickly that we become thoughtless? Or we were clairvoyant and knew ahead of time that the need for furniture of any kind would disappear? The thing that was irrelevant to the structures we formerly made, and this was what kept us breathing, was what took place within them. Their emptiness we took for what it was - a place where anything could happen. That was one of the reasons we were able, when circumstances became inviting, to go outside, where breathing is child’s play: no walls, not even the glass ones which, though we could see through them, killed the birds while they were flying.”

— John Cage (Rhythm, Etc.)

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GENERAL AUDIENCE ABSTRACT

The architecture is a multi-venue performing arts complex consisting of a full-scale opera house, a mid-size open-air theater, a small recital salon, and an outdoor arena-style street-stage. The building is sited at Buzzard Point in Washington, DC at the terminus of South Capitol Street along the Anacostia River. The thesis is an exploration into the concept of organic architecture and a formal study of its application to the order, structure, and construction of a building.

...I am the divine Craftsman;
the Platonic Demiurge.

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inception
philosophical origins of organic architecture



How shall I begin?

Rather, how shall I define my architectural beginning? All things must arguably have a beginning and an end. Therefore, in order to demonstrate a reasonably poetic architecture, I must establish an origin upon which to begin. And further, in order to mathematically and geometrically proceed, this origin must be defined and fixed as absolute. Only after having established my architectural origin, can I continue.

"I will suppose, then, not that there is a supremely good God, the source of truth; but that there is an evil spirit, who is supremely powerful and intelligent, and does his utmost to deceive me. I will suppose that sky, air, earth, colors, shapes, sounds, and all external objects are mere delusive dreams, by means of which he lays snares for my credulity. I will consider myself as having no hands, no eyes, no flesh, no blood, no senses, but just having a false belief that I have all these things. I will remain firmly fixed in this meditation, and resolutely take care that, so far as in me lies, even if it is not in my power to know some truth, I may not assent to falsehood nor let myself be imposed upon by that deceiver, however powerful and intelligent he may be."

"I suppose, therefore, that whatever things I see are illusions; I believe that none of the things my lying memory represents to have happened really did so; I have no senses; body, shape, extension, motion, place are chimeras. What then is true? Perhaps only this one thing, that nothing is certain."

How do I know, however, that there is not something different from all the things I have mentioned, as to which there is not the least occasion of doubt? – is there a God (or whatever I call him) who gives me these very thoughts? But why, on the other hand, should I think so? Perhaps I myself may be the author of them. – Well, am I, at any rate, something? But I have already said I have no senses and no body. At this point I stick; what follows from this? Am I so bound to a body and its senses that without them I cannot exist? – But I have convinced myself that nothing in the world exists – no sky, no earth, no minds, no bodies; so am not I likewise non-existent? But if I did convince myself of anything, I must have existed. But there is some deceiver, supremely powerful supremely intelligent, who purposely deceives me, then again I undoubtedly exist; let him deceive me as much as he may, he will never bring it about that, at the time of thinking (quamdiu cogitabo) that I am something, I am in fact nothing. Thus I have now weighted all considerations enough and more than enough; and must at length conclude that this proposition 'I am,' 'I exist,' whenever I utter it or conceive it in my mind, is necessarily true."

-René Descartes

My only certainty is my own personal existence; I think, therefore I am (I am an entity capable of creating thought, therefore I must exist). My specific actuality is a foundation upon which I can establish and construct a structure of certainty. Only through removal of all that is questionable and elimination of doubt can I begin. Therefore it is from this point that I can initiate my journey. All of time and space must now be derived from and defined with reference to this single point. For the remainder of my thesis, this point will be referred to as my Cartesian origin.



To a painter, the base is a canvas, and the media is pigment.

To a philosopher, the base is the mind and the media is thought.

To an architect, the base is the earth, and the media is wood, steel, or concrete.

As a scholar, my base is my drawing board, and my media is graphite. So it is here that I establish my origin; an unmovable point on my desk from which I will create architecture. Through mathematical definition of this point as existing, I remove all doubt from its existence, and it (and only it) becomes known. Hypothetical exactness is then with reference to this origin, and precision to exactness. All that can be geometrically generated can establish certainty with reference to this Cartesian origin. Representation of an abstract mathematical point will never be exact. Therefore, there is no exactness to architecture, only approximate precision with reference to a representation of exactness. A line on paper is not a line, only a representation of a mathematical concept that cannot exist in our human actuality. As an architect, this is my physical origin.

How is a seed germinated?

...a cell divided?

...an idea conceived?

Through acts of repetition, rotation, and reflection with reference to a point of certainty, architecture can exist. Upon the removal of doubt, certainty can be defined. It is only after the establishment of *something* can there exist anything. From this point on, there is no architecture, there is no precedent; there is only what can be known and respectively demonstrated as truth.

“Number, the base of rhythm, begins from unity. It has beauty by equality and by similitude, and it has interconnection by order. All nature requires order. It seeks to be like itself, and it possesses its own safety and its own order, in spaces or in times or in bodily form, by methods of balance. We have to admit that in number and rhythm all, without exception and without limit, starting from the single origin of unity, is complete and secure, in a structure of equality and similitude and wealth of goodness, cohering from unity onwards in most intimate affection.”

-St. Augustine of Hippo

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investigation
preliminary exploration of organic forms and geometries



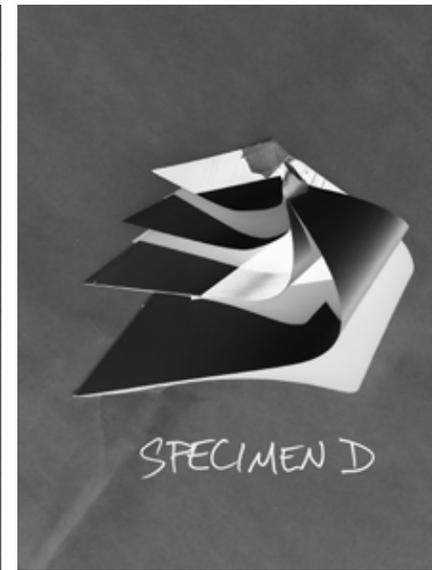
SPECIMEN A



SPECIMEN B



SPECIMEN C



SPECIMEN D

"It is more than probable that the first result of sending forth to the world this collection will be seriously to increase this dangerous tendency, and that many will be content to borrow from the past those forms of beauty which have not already been used up ad nauseam. It has been my desire to arrest this tendency, and to awaken a higher ambition."

-Owen Jones

What is *the Organic*?

In order to initiate a cautious and deliberate investigation into the topic of organic architecture, a set of universal definitions must first be established. This set of linguistic laws will serve as a launching point into a systematic examination of organic architecture, and become a series of definitive guidelines throughout the course of study. In order to begin to answer the question at hand, '*What is organic architecture?*,' a transcript must be recorded as to what is meant by the term 'organic,' and further, how does this eventually relate to architecture.

Organic (adj) -

Denoting a relation between elements of something such that they fit together harmoniously as necessary parts of a whole: 'the organic unity of the integral work of art.' (Oxford English Dictionary)

...as it relates to:

Organism (n) -

A whole with interdependent parts, likened to a living being. (Oxford English Dictionary)

That is not to say the Organic is necessarily a direct imitation or representation of an organism, but rather is inspired by the processes and mechanisms which can be considered of it's nature.

What is the nature of *the Organic*?

Upon intrinsic definition of the problem at hand, an additional set of measures begin to logically unfold:

Nature (n) -

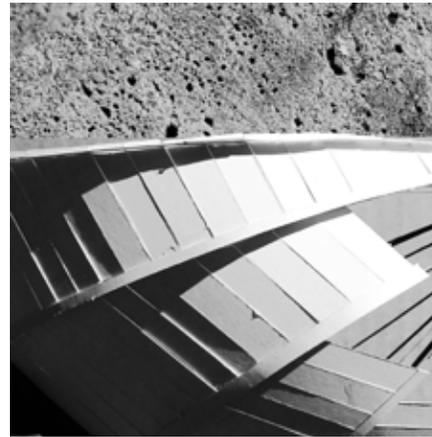
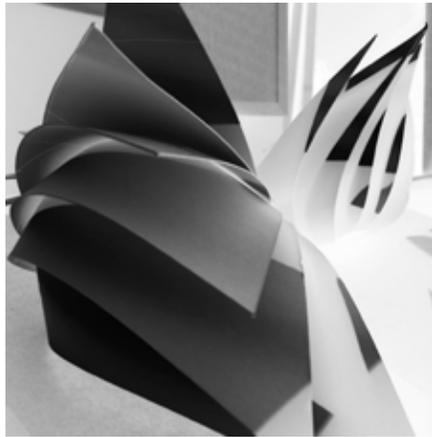
Primary: The basic or inherent features of something, especially when seen as characteristic of it

Secondary: The phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of earth. (Oxford English Dictionary)

Harmony (n) -

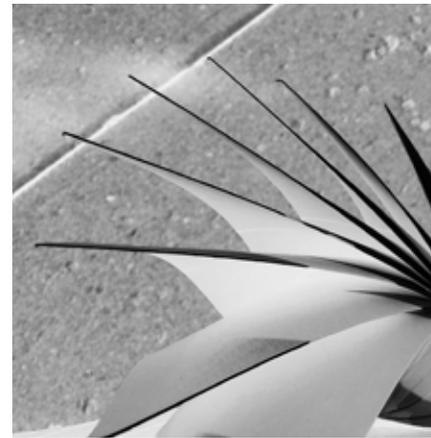
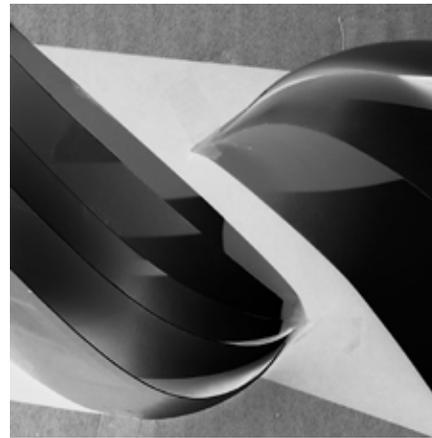
The quality of forming a pleasing and consistent whole. (Oxford English Dictionary)

Initially, it could be conceived that the Organic would hope to become like a fragment of nature and authorize itself as a so-called 'natural' entity within an established environment. However, for an architecture to be classified as organic, its nature must be like that of an organism. Assessed as a machine, organic architecture is a harmonious assemblage of parts that work to become a unified whole. In this sense, the harmonic synthesis of an organic architecture takes on the nature of an organism and is therefore organic by nature, not by emulation.



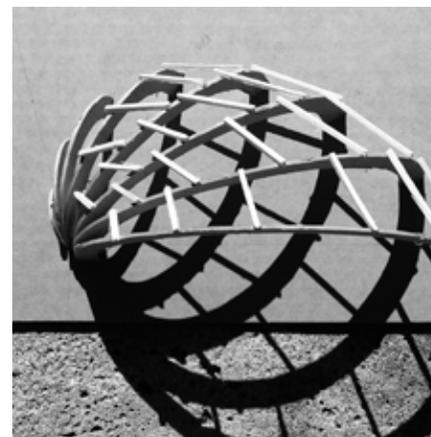
*"Beauty of form is produced by lines growing out one from the other in gradual undulations: there are no excrescences; nothing could be removed and leave the design equally good or better."
[Proposition 6]*

-Owen Jones



*"True beauty results from that repose which the mind feels when the eye, the intellect, and the affections, are satisfied from the absence of any want."
[Proposition 4]*

-Owen Jones



What is the form of the Organic?

Form (n) -

Arrangement of parts, configuration.

The essential nature of a species or thing, especially regarded as an abstract idea (in Plato's thought) that real things imitate or participate in. (Oxford English Dictionary)

Order (n) -

The arrangement or disposition of things in relation to each other according to a particular sequence, pattern, or method.

In biology: A principal taxonomic category that classifies organisms.

In mathematics: The degree of complexity of an equation or expression as denoted by an ordinal number.

(Oxford English Dictionary)

Structure (n) -

The arrangement of and relations between the parts or elements of something complex. (Oxford English Dictionary)

Only that which is of an organic order can be defined as formally organic. That is 'formally' in the sense that refers to the essential form of an entity; the nature of it. The form and order of the Organic should be of the nature of an organism. The structure of an organic architecture should not aim to mimic the structure of an organism, but rather define itself based on the ideal order of an organism. Growth and efficiency become the structural cause and effect of the Organic.

What is the construction of the Organic?

Construction (n) -

The creation or formation of an abstract entity. (Oxford English Dictionary)

Construct (v) -

To form (an idea or theory) by bringing together various conceptual elements.

In geometry: To draw or delineate (a geometric figure) accurately to given conditions. (Oxford English Dictionary)

Geometry (n) -

The shape and relative arrangement of the parts of something: 'the geometry of a spider's web.'

(Oxford English Dictionary)

Module (n) -

Each of a set of standardized parts or independent units that can be used to construct a more complex structure.

(Oxford English Dictionary)

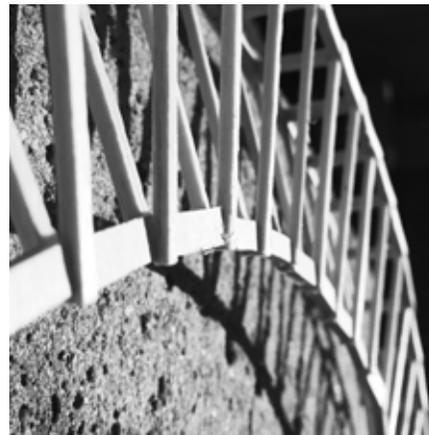
*"Harmony of form consists in the proper balancing, and contrast of, the straight, the inclined, and the curved."
[Proposition 10]*

-Owen Jones



*"In surface decoration all lines should flow out of a parent stem. Every ornament however distant, should be traced to its branch and root."
[Proposition 11]*

-Owen Jones



Heirarchy (n) -

An arrangement or classification of things according to relative importance or inclusiveness: 'a taxonomic hierarchy of phyla, classes, orders, families, genera, and species.' (Oxford English Dictionary)

Proportion (n) -

The correct, attractive, or ideal relationship in size or shape between one thing and another or between the parts of a whole: 'perceptions of color, form, harmony, and proportion.' (Oxford English Dictionary)

Symmetry (n) -

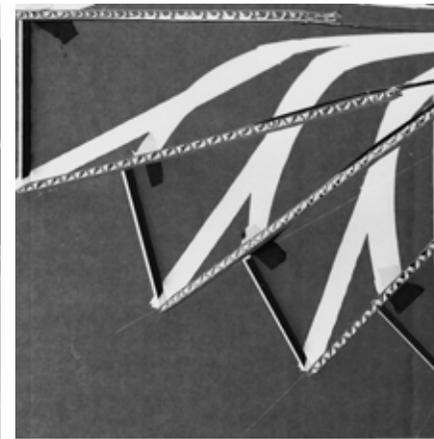
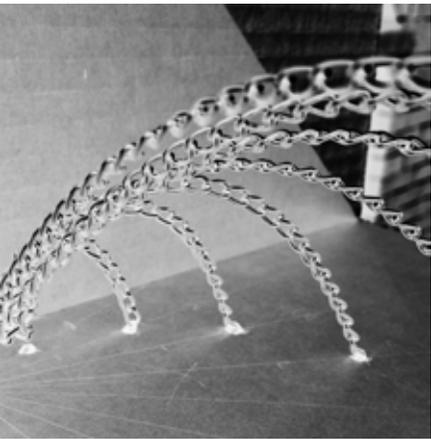
Correct or pleasing proportion of the parts of a thing. (Oxford English Dictionary)

Rhythm (n) -

A harmonious sequence or correlation of elements. (Oxford English Dictionary)

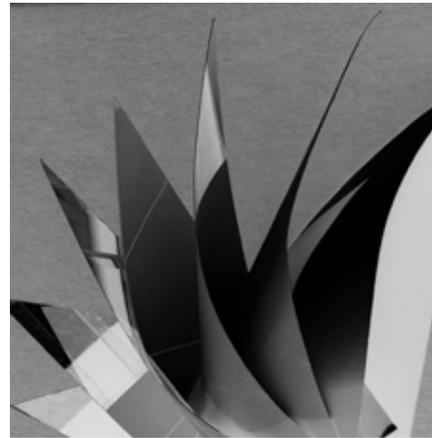
Only through acts of geometric formal construction can the Organic be defined. Reflection, rotation, and translation are fundamental geometric moves used in the creation of constructed forms. Using these three primary moves, a geometric order can express rhythm, symmetry, proportion, and hierarchy. As in the construction of a cellular organism, a module can be derived, manipulated, and multiplied to execute these geometric moves and guide the geometric construction of organic form and order.

The following is a preliminary study of the aforementioned terminologies as foundational principles of formally organic construction.



"Man appears everywhere impressed with the beauties of Nature which surround him, and seeks to imitate to the extent of his power the works of the Creator."

-Owen Jones



*"As Architecture, so all works of the decorative Arts, should possess fitness, proportion, harmony, the result of all which is repose."
[Proposition 3]*

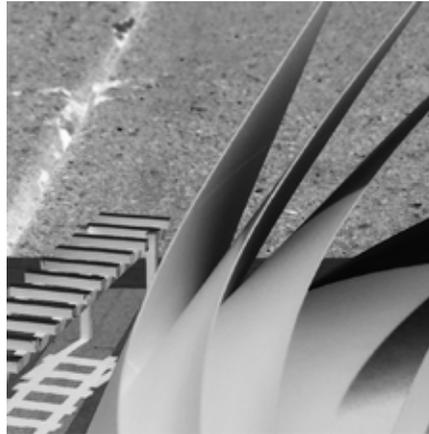
-Owen Jones





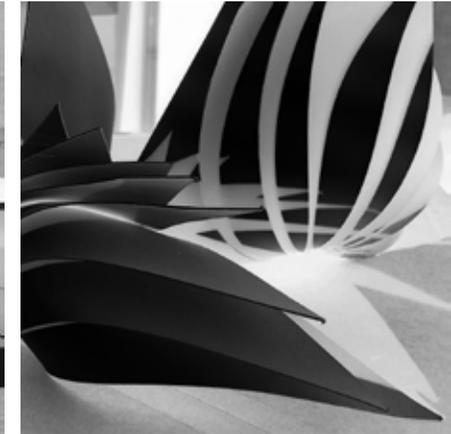
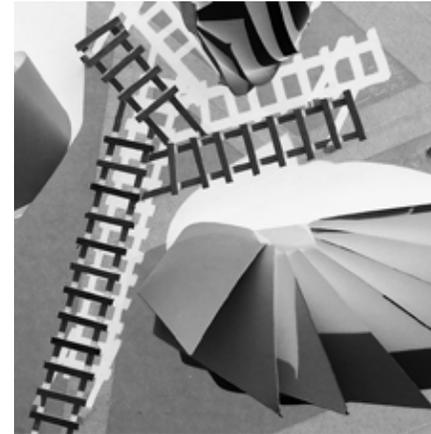
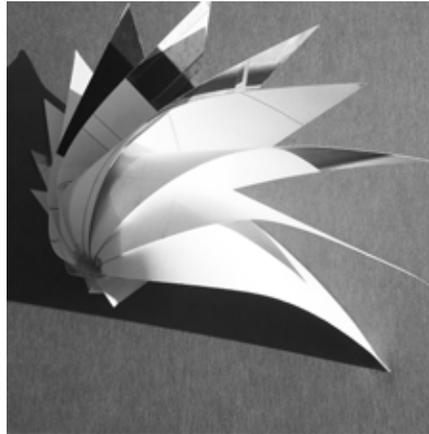
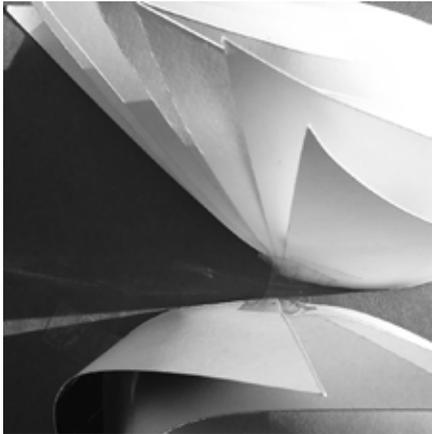
"Architecture is the material expression of the wants, the faculties, and the sentiments, of the age in which it is created." [Proposition 2]

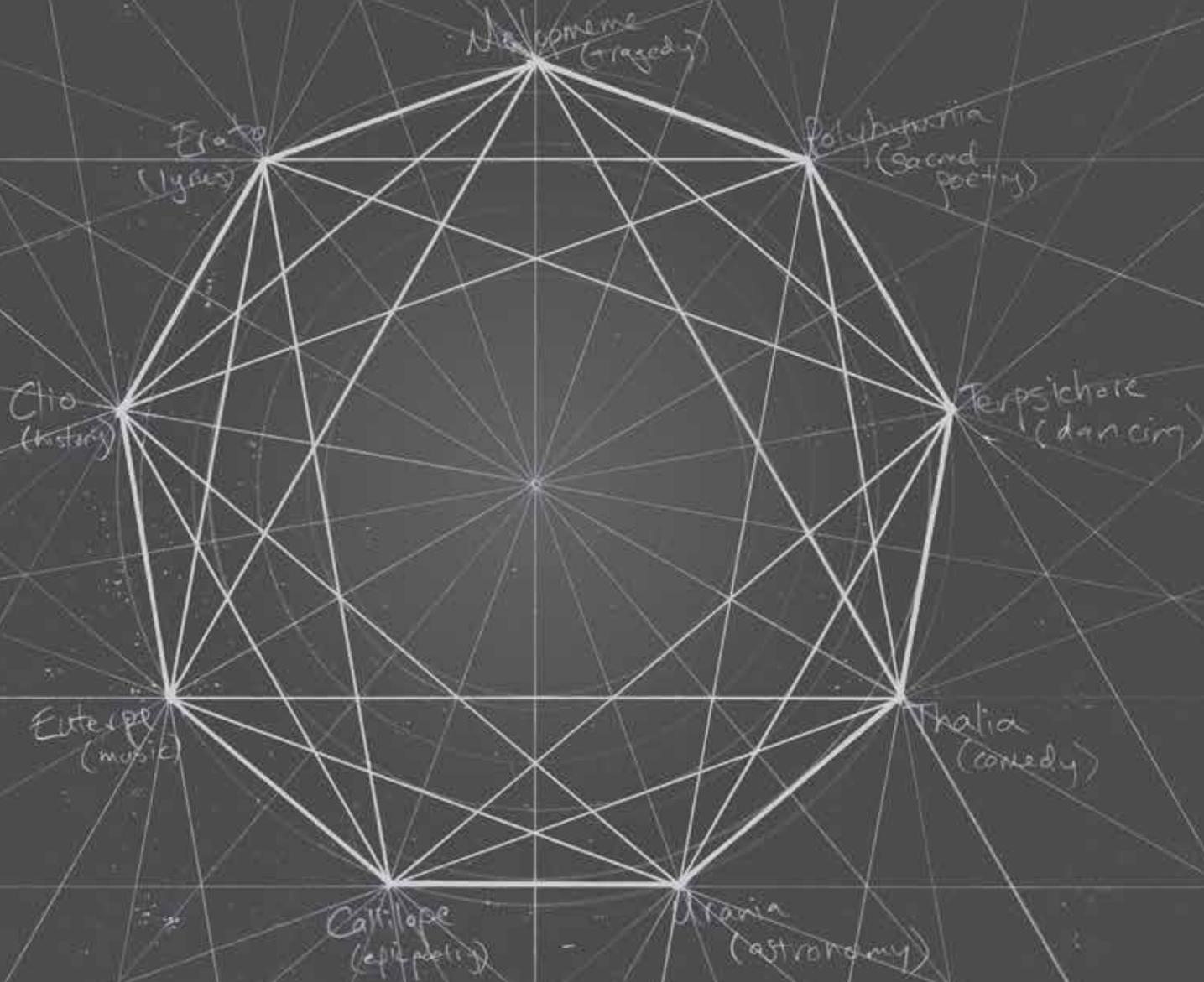
-Owen Jones



"Construction should be decorated. Decoration should never be purposely constructed. (That which is beautiful is true; that which is true must be beautiful.)" [Proposition 5]

-Owen Jones





Equilateral triangles

9 muses:
 Inspiration

nine muses
nine prescriptive principles of organic architecture

Caktraven
- amadi 16

Bunaleshi dome

the octavarium

- fluted inter round
- "arena" style spiderweb? bowl? dome
- welcome to thunder dome

operable
retractable
opening

lens or tubes?

De launatic
nest?

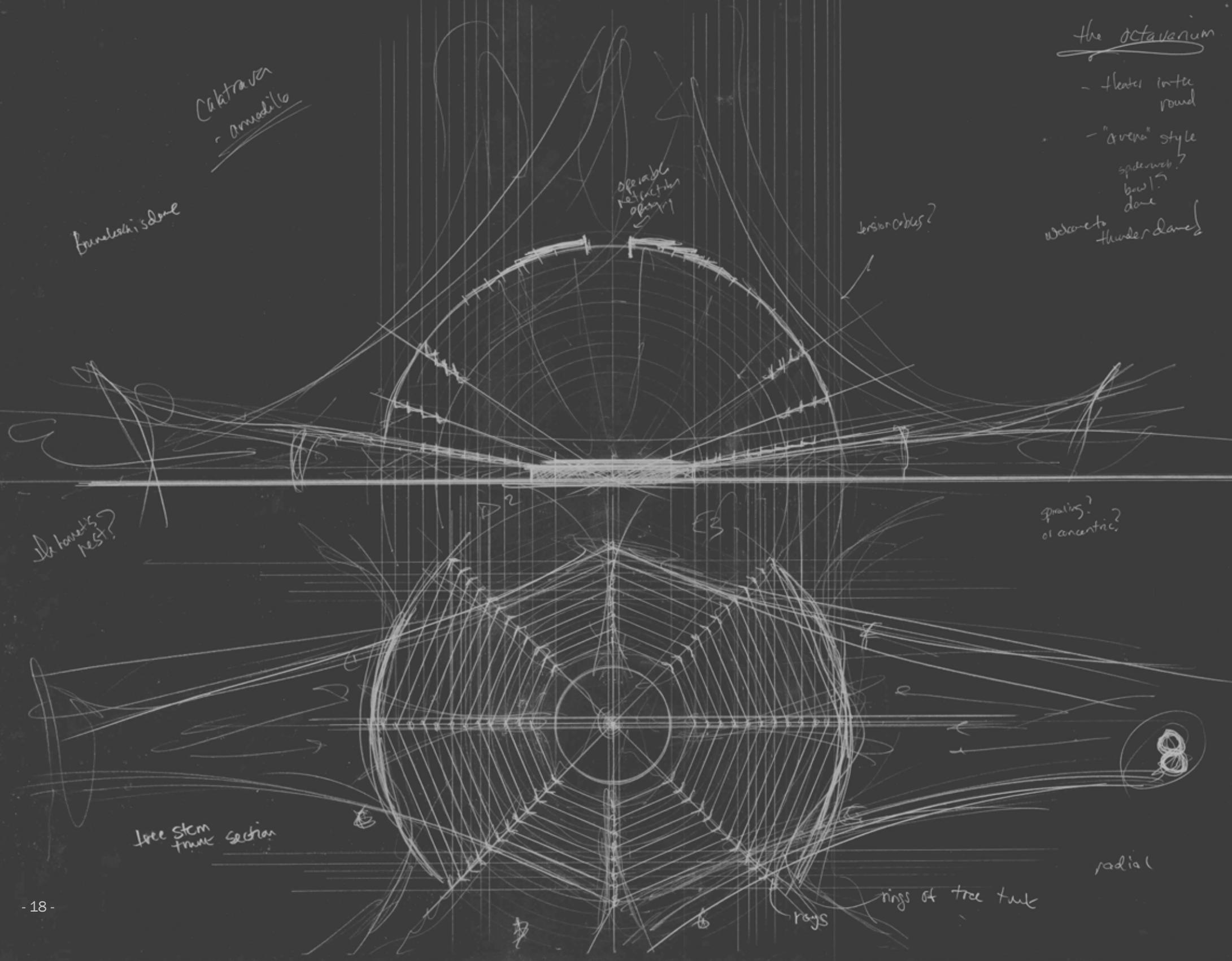
priming?
of anantia?

tree stem
trunk section

radial

rings of tree trunk

rays



1. CENTRIFUGALITY

The Organic has an insatiable desire toward centrifugal growth.

Centrifugal (adj) -

Moving or tending to move away from a center. (Oxford English Dictionary)

Centripetal (adj) -

Moving toward or tending to move toward a center. (Oxford English Dictionary)

In order to demonstrate a reasonably poetic architecture, I must establish an origin upon which to begin. And further, in order to mathematically and geometrically proceed, this origin must be defined and fixed as absolute. Only after having established my architectural origin, can I continue. It is in physical construction that this point serves as a surveyable origin of plan and section. It is in theoretical construction that this point serves as a formal center, from which rhythm, structure, proportion, and order begin.

“A crystal, a flower, or a shell stands out from the usual disorder that characterizes most perceptible things. They are privileged forms that are more intelligible for the eye, even though more mysterious for the mind, than all the others we see indistinctly.”

-Paul Valéry (Bachelard)

acoustic performance hall
recital salon

ooble
"shell"

The ellipse
the "egg"
cable
the orb
pod

section

offh upod
immitate animal
w/ skeleton,
skeletal body

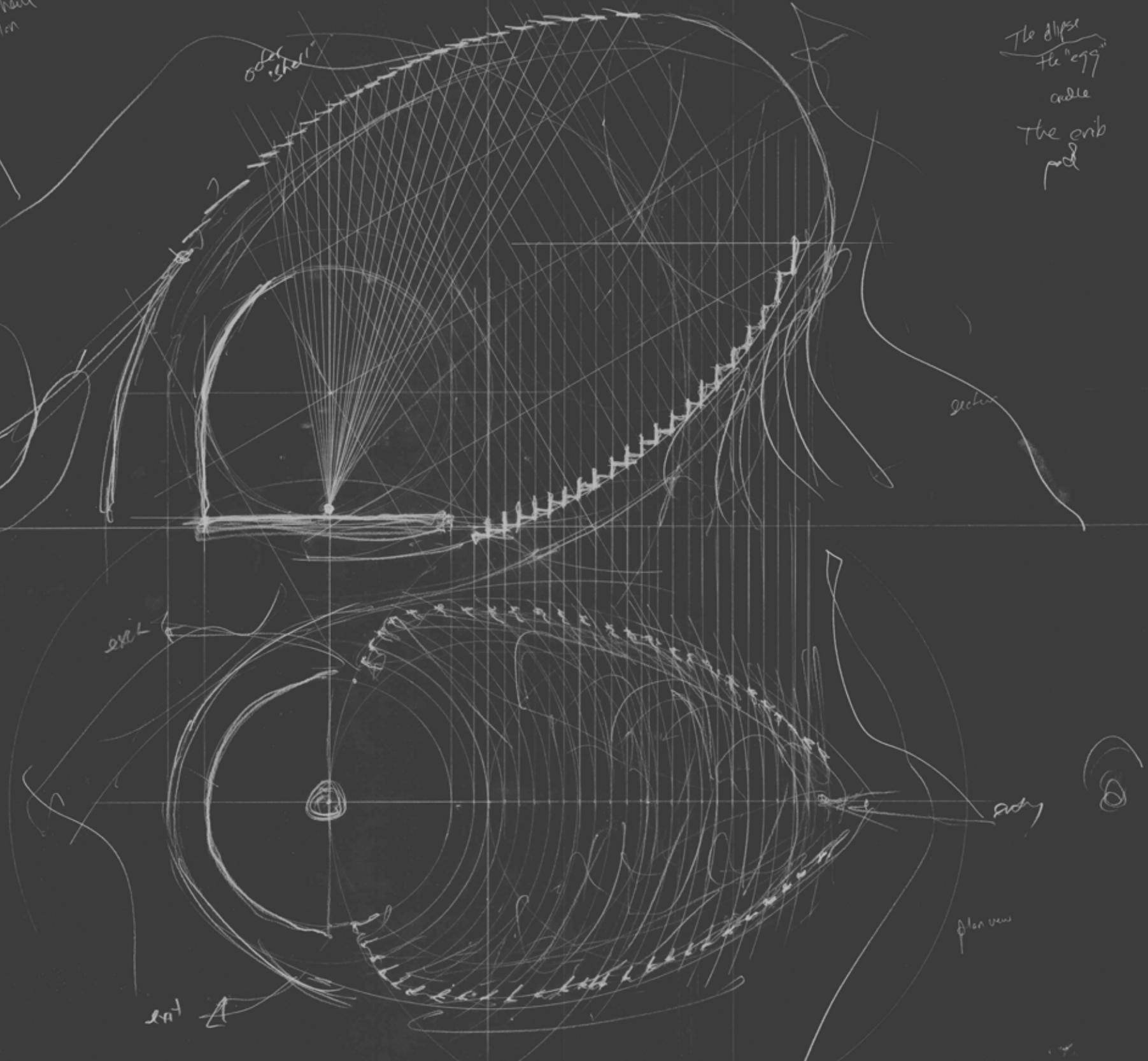
eye

rich

plan view

ent A

oblong
oval



There are 4 centers to be considered in dealing with organic inception. These centers serve as theoretical and physical beginnings for their respective principles, rather than centers of mass or volume.

The primary center, or *Cartesian center* is of mathematical order. Through removal of all that can be questioned, absolute can exist. The Cartesian center is the absolute mathematical origin in space and time of the Organic (0,0,0,0).

The secondary center, or *formal center* is of geometric order. All geometric form is derived through constructive means. There is no geometry without an origin on which to construct.

The tertiary center, or *center of growth* is of biological order. This is the seed from which a plant grows; the node from which root, stem, branch, and leaf originate. There can be one or multiple centers of growth in an organic machine.

The quaternary center, or *epicenter* is of physical order. In physics, this is the beginning of a light or sound wave that is distributed away from its source by act of force. There can be one or multiple epicenters in an organic machine.

"The actual mechanical energy accompanying life obeys physical laws just as surely as its material substance obeys chemical laws.

I. A growing, expanding system, containing, therefore, moving particles; in which

II. Growth energy is being introduced from a central "growing-point"; and

III. A construction which as expressed in the transverse component of the formation of lateral members, has been put forward as implying primarily the geometrical properties of orthogonal trajectories.

...

In other words, the paths of the construction forces are centrifugal, and not, as the induction theory would suggest, centripetal."

-A.H. Church

Mean light section

the oculus

ply ten

ternally principal

use variation of fat fossie air Plan

Crescent Stage

Sight by eyeball

Opera house

light

light line

Good name - eyeball

6.6m

1:8
1:16

Section view

5
3,2

2,358

optic zone

Plan view

Left Place!

“In the equiangular spiral of the Nautilus or the snail-shell, the whorls continually increase in breadth, and do so in a steady unchanging ratio. Or definition is as follows: ‘If, instead of traveling with a uniform velocity, our point move along the radius vector with a velocity increasing as its distance from the pole, then the path described is called an equiangular spiral.’ Each whorl which the radius vector intersects will be broader than its predecessor in a definite ratio; the radius vector will increase in length in geometrical progression.

...

In the growth of a shell, we can conceive no simpler law than this, namely, that it shall widen and lengthen in the same unvarying proportions: and this simplest of laws is that which Nature tends to follow. The shell, like the creature within it, grows in size but does not change its shape; and the existence of this constant relativity of growth, or constant similarity of form, is of the essence, and may be made the basis of a definition, of the equiangular spiral.

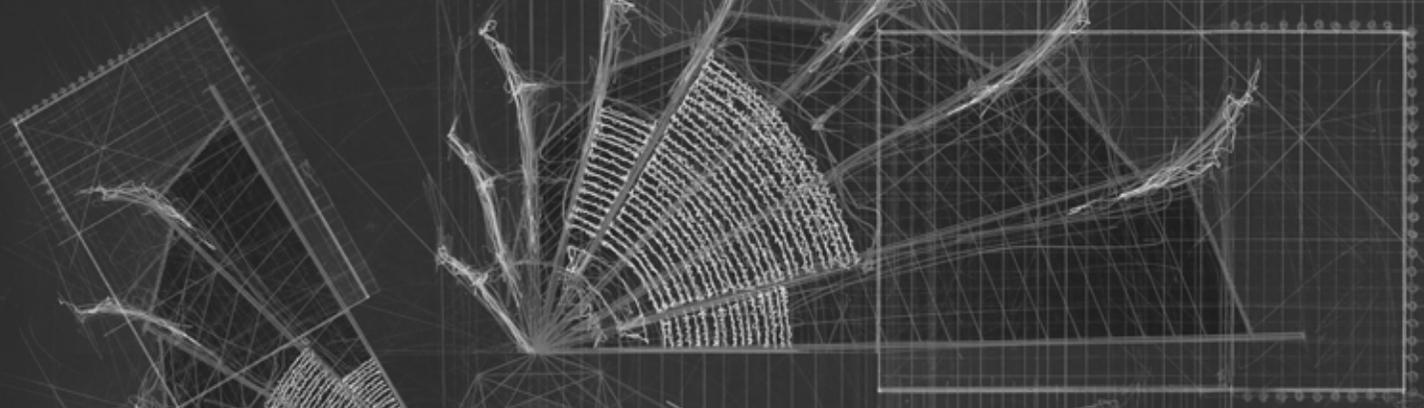
...

In mathematical language it would run as follows: ‘Any [plane curve proceeding from a fixed point (which is called the pole), and such that the arc intercepted between any two radii at a given angle to one another is always similar to itself, is called an equiangular, or logarithmic spiral.

...

In this definition, we have the most fundamental and ‘intrinsic’ property of the curve, namely the property of continual similarity, and the very property by reason of which it is associated with organic growth in such structures as the horn or the shell. For it is peculiarly characteristic of the spiral shell, for instance, that it does not alter as it grows; each increment is similar to its predecessor, and the whole, after every spurt of growth, is just like what it was before. We feel no surprise when the animal which secretes the shell, or any other animal whatsoever, grows by such symmetrical expansion as to preserve its form unchanged.”

-D.W. Thompson



What is the impact of
height
Subsidiary space

subordinate
structure

primary
structure
secondary
structure
tertiary
structure

secondary
structure
this structure - suspended (rests/hung)
primary structure

- Separation of structural hierarchy
- Primary - support
- Secondary - reinforcing / bracing → supported by primary
- Tertiary - sheathing → envelope
- primary structure ⊥ to each other

2. HIERARCHY OF STRUCTURE

“Form follows structure.”

-Eugene Emmanuel Viollet-le-Duc

The Organic conveys a clarity of structure that demonstrates the intention of its form. In doing so the function of an organic machine is made evident by way of its structure and form.

“It is said that one of the most impressive things about the music of Johann Sebastian Bach is its “architecture.” Its construction seems clear and transparent. It is possible to pursue the details of the melodic, harmonic, and rhythmical elements without losing the feeling for the composition as a whole – the whole that makes sense of the details.”

-Peter Zumthor



Structural members and mechanisms of an organic machine demonstrate a hierarchy of architectural order that is reflective of natural order. This concept is called *anatomic construction*, or less eloquently, biomimicry. Each specific member serves a unique purpose in a machine, and therefore is constructed in a manner such that it can harmonically serve its function. The members reflect the mechanics of an organism thus maximizing material capabilities and increasing efficiency. A structural member's thickness is a direct result of the amount of external stress imposed upon it and accordingly the internal stresses of the material. By modeling the hierarchical anatomy of a plant or bone structure, efficiency is maximized, material volume is reduced, and a natural delicacy to structure is obtained; *ethereality of structure*.

“Arboreal growth is a kind of continuously articulated network akin to the structures applicable in building construction, circulation planning, and urban design. Although in architecture and planning the elements used are biologically dead, the design, as humanly confected, can have the pulse of life it foresees, permits, and directs growth, without at the same time invalidating the structure.”

-Lawrence B. Anderson (Kepes)

“So when I’m working, I keep reminding myself that my buildings are bodies and need to be built accordingly: as anatomy and skin, as mass and membrane, as fabric, shell, velvet, silk, and glossy steel.”

-Peter Zumthor



“Dreams apart, numerical precision is the very soul of science, and its attainment affords the best, perhaps the only criterion of the truth of theories and the correctness of experiments.”

-Sir John Herschel

“In mechanical structures, curvature is essentially a mechanical phenomenon. It is found in flexible structures as the result of bending or it may be introduced into the construction for the purpose of resisting such a bending-moment. But neither shell nor tooth nor claw are flexible structures; they have not been bent into their peculiar curvature, they have grown into it... ‘The organism is the telos, or final cause, of its own processes of generation and development.’ (Aristotle)”

-D.W. Thompson

“The architect is not bound to exhibit structure; nor are we to complain of him for concealing it, any more than we should regret that the outer surfaces of the human frame conceal much of its anatomy; nevertheless, that building will generally be the noblest, which to an intelligent eye discovers the great secrets of its structure, as an animal form does.”

-John Ruskin



3. MODULE AND RHYTHM

Rhythm and harmony are fundamental to the organic machine. Naturally occurring rhythmic modules exist at all scales in nature; limbs of a tree, vertebrae of a spine, digits of a hand, scales of a snake, cells of an organism. Not all modules seek to identify themselves as precise equals, but are of the nature of their function to synthesize an organic whole.

“The essence of rhythm is the fusion of sameness and novelty; so that the whole never loses the essential unity of the pattern, while the parts exhibit the contrast arising from the novelty of their detail. A mere recurrence kills rhythm as surely as does a mere confusion of differences. A crystal lacks rhythm from excessive pattern, while a fog is unrhythmic in that it exhibits a patternless confusion of detail.”

-Alfred North Whitehead (Kepes)



A centrifugal organism bears a tendency to expand. The nature of an organic structure is that of a hierarchically structured organism. *Modulation is the means by which centrifugality and hierarchy are constructed in the physical world.*

Having established a critical origin and hierarchical nature of structure, rhythm becomes a constructive element in the physicality of the Organic. The ordering of parts in a rhythmic sequence that emphasizes structure and centrifugality will enforce the nature and function of the machine.

Within entirety exists simplicity. Through repetition, translation, and reflection of simplistic modular elements, complexity emerges. Modular dependency and interaction dictates a harmonic rhythm of parts that synthesize a whole. Modular growth by way of these constructive geometric movements is a foundation of the anatomically Organic.

"The modular subdivision of a surface is a powerful visual device for emphasizing the geometry and defining the size of architectural forms. Its mere presence intensifies the "there-ness" of surface."

-Lawrence B. Anderson (Kepes)

Cadence of simplicity yields intricacy. Tempo of surface creates rhythmic depth of light and shadow. Dynamic of volume creates contrast of mass and void. Fluid manipulation of modular elements can establish rhythmic order and reinforce significance of structure.



“We must not deny to rhythm which is concerned with our penal mortality its inclusion within the works of the Divine fabrication, for such rhythm is within its own kind beautiful. But we must not love such rhythm as if it could make us blessed. We must treat it as we would a plank amid the waves of the sea, not casting it away as a burden, but not embracing it and clinging to it as if we imagined it firmly fixed. We must use such rhythm well, so that eventually we may dispense with it.

...

Our rhythmic or metric art, which is used by makers of verses, comprises certain rhythmical measurements, numeri, according to which they make the verses. The measurements, that is, the rhythm, remain when the verses stop or pass. The verse or rhythm which passes is really manufactured, fabricari, by the rhythm which remains. The art is an active conformation, affection, of the mind, animus, of the artist.”

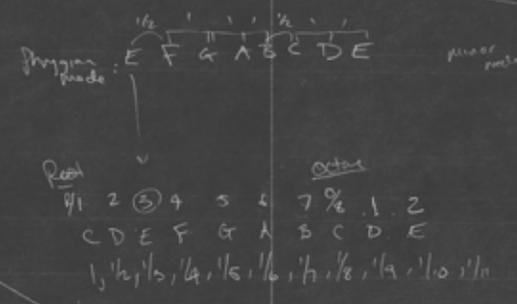
-Augustine

“What is it that attracts the eyes of those to whom a beautiful object is presented, and calls them, lures them, towards it, and fills them with joy at the sight? If we possess ourselves of this, we have at once a standpoint for the wider survey... Almost everyone declares that the symmetry of parts towards each other and towards a whole, with, besides, a certain charm of color, constitutes the beauty recognized by the eye, that in visible things, as indeed in all else, universally, the beautiful thing is essentially symmetrical, patterned... Only a compound can be beautiful, never anything devoid of parts; and only a whole; the several parts will have beauty, not in themselves, but only as working together to give a comely total. Yet beauty in an aggregate demands beauty in details: it cannot be constructed out of ugliness; its law must run throughout... But where the Ideal-Form has entered, it has grouped and coordinated what from a diversity of parts was to become unity: it has rallied confusion into cooperation: it has made the sum one harmonious coherence: for the Idea is a unity and what it molds must come to unity as far as multiplicity may.”

-Plotinus

- 0
- I Ionian
- II Dorian
- * III Phrygian ←
- IV Lydian
- V Mixolydian
- VI Aeolian
- VII Locrian

20° intervals
→ mit dem Terzen



4. DYNAMIC SYMMETRY AND PROPORTION

“Dynamic symmetry in nature is the type of orderly arrangement of members of an organism such as we find in a shell or the adjustment of leaves on a plant. There is a great difference between this and the static type. The dynamic is a symmetry suggestive of life and movement.”

-Jay Hambidge

In growth, the Organic seeks order that is symmetrical by nature, such that each of the parts is a resultant of the previous and in its formation is a resultant of its environmental stresses. The organic machine is an integration of these proportionally defined parts, functioning harmonically in a manner that obtains maximum efficiency.

“An example of a simple curve occurring in nature is the shell of the nautilus. The mathematical expression for this shell is a logarithmic spiral, not because the nautilus is magically expert in the use of logarithms, but because the rate of growth of the shell of the nautilus obeys physical laws that happen to generate a logarithmic spiral.”

-Arthur L. Loeb

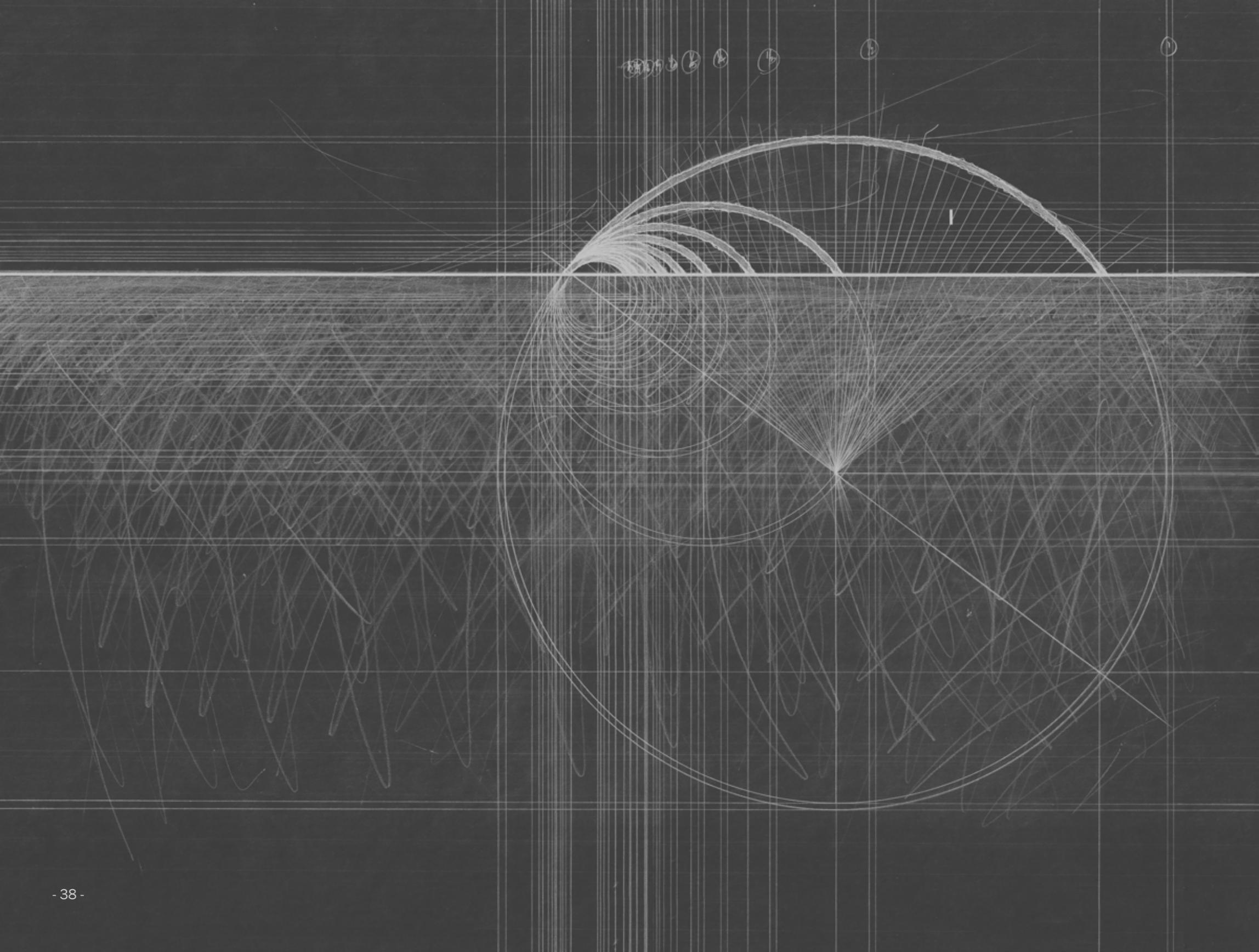
“In general terms, a spiral is a curve which starting from a point of origin, continually diminishes in curvature as it recedes from that point, or in other words, whose radius of curvature continually increases.”

-D.W. Thompson

In order to demonstrate a reasonably poetic architecture, I must establish an origin upon which to begin. And further, in order to mathematically and geometrically proceed, this origin must be defined and fixed as absolute. Only after having established my architectural origin and defining a sequential pattern of growth, can I continue.

“The world is full of beings and phenomena which reflect the harmonic principle of dynamic symmetry present in the musical proportion... If geometrical principles actually shape the phenomena of nature, why not use those same geometrical forms to illustrate the harmonies and symmetries which exist between natural phenomena? This is no doubt the reasoning behind this symbolic usage of number and geometry, and its appeal seems firmly rooted in the human imagination.”

-K.S. Guthrie



Generation of form is a direct outcome of stresses acting upon an organic machine. Intrinsic form is a result of physical material necessity and order of parts. Structure and order are explicitly proportioned elements that seek to solve an organic function by way of efficiency and necessity.

The spiral is the purest naturally occurring form, clearly demonstrating its organic function.

"We want to see how, in some cases at least, the forms of living things, and of the parts of living things, can be explained by physical considerations, and to realize that in general no organic forms exist save such as are in conformity with physical and mathematical laws. ...

The form, then, of any portion of matter, whether it be living or dead, and the changes of form which are apparent in its movements and growth, may in all cases alike be described as due to the action of force. In short, the form of an object is a diagram of forces, in this sense, at least, that from it we can judge of or deduce the forces that are acting or have acted upon it. ...

If we tried building ships, palaces, or temples of enormous size, yards beams and blots would cease to hold together; nor can nature grow a tree nor construct an animal beyond a certain size, while retaining the proportions and employing the materials which suffice in the case of a smaller structure. The thing will fall to pieces of its own weight unless we either change its relative proportions, which will at length cause it to become clumsy, monstrous and inefficient, or else we must find new material, harder and stronger than was used before. ...

The strength of a muscle, like that of a rope or girder, varies with its cross-section; and the resistance of a bone to a crushing stress varies, again like our girder, with its cross-section... Even among very simple organisms, such as diatoms, radiolarians, foraminifera or sponges, the skeleton displays extraordinary variety and beauty, whether by reason of the intrinsic form of its elementary constituents or the geometric symmetry with which these are interconnected and arranged. ...

The I or the H-girder or rail is designed to resist bending in one particular direction, but if, as in a tall pillar, it be necessary to resist bending in all directions alike, it is obvious that the tubular or cylindrical construction best meets the case... In the case of the tibia, the bone is somewhat widened out above, and its hollow shaft is capped by an almost flattened roof, on which the weight of the body directly rests... Nature was strengthening the bone in precisely the manner and direction in which strength was required"

-D.W. Thompson

For every action there is an equal and opposite reaction. An adequately proportioned organic machine holds material in locations that directly counter external stresses. Organic members are bound in a manner that resembles the joining of skeletal elements or limbs of a plant.



5. CONNECTION TO SITE

*The fountains mingle with the river
And the rivers with the ocean,
The winds of heaven mix for ever
With a sweet emotion;
Nothing in the world is single;
All things by a law divine
In one spirit meet and mingle.
Why not I with thine?—*

(Percy Bysshe Shelley)

An organic architecture arises from its site; it grows. It emerges as if a direct result of the entire variety of elemental and communal forces. Like the sun dictates the tree line atop a mountain range, or the angle of a plant's stem shifts to find the light, or the leaves of a flower rotate in diurnal sequence with the sun's path; a building's placement, orientation, and organs are a beautiful resultant of its environment.

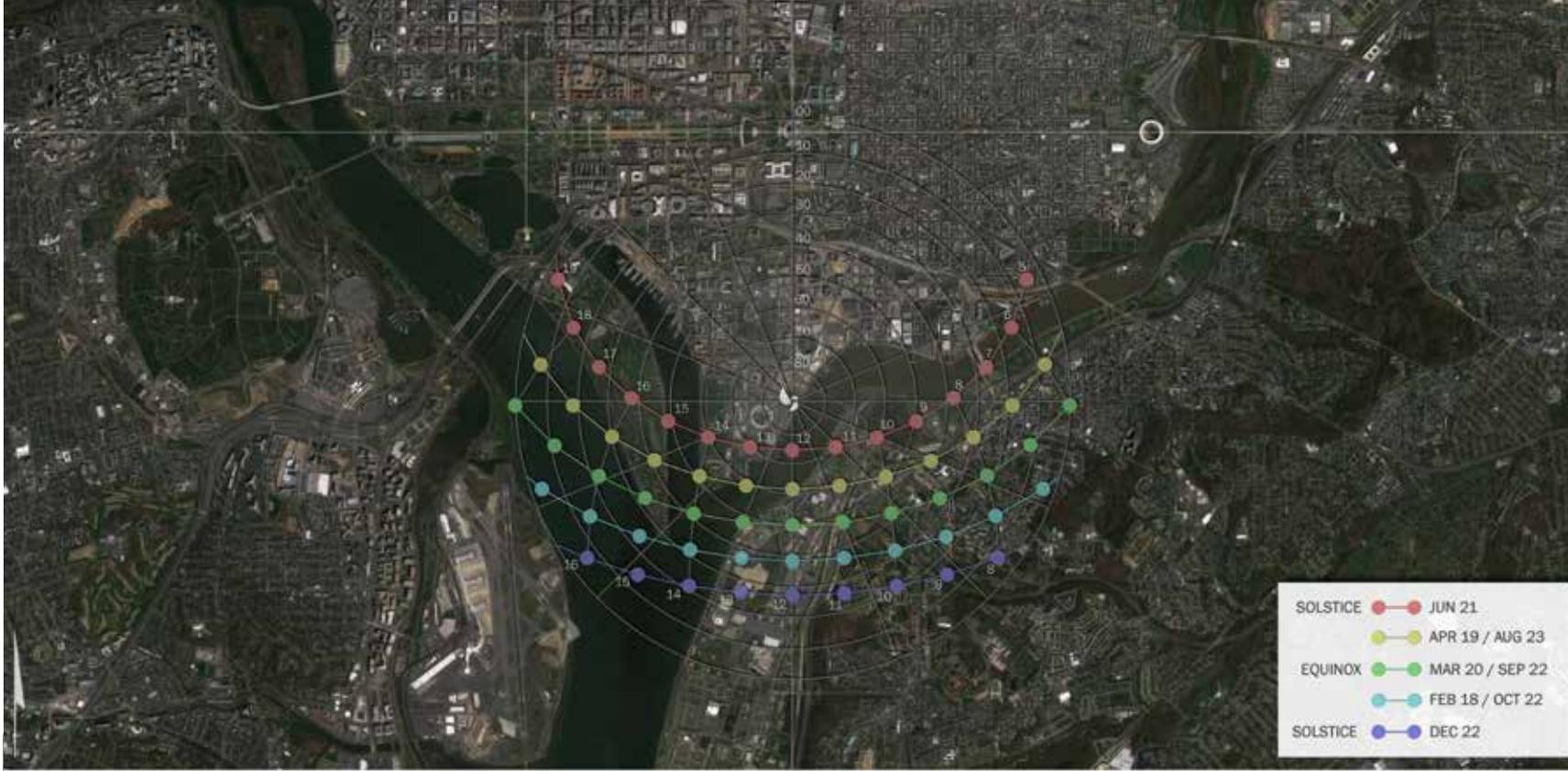
In a good and proper biophilic architecture, a connection to site and surroundings can be felt and considered to be 'natural' if performed delicately. A view of nature where possible and interaction with natural elements is prodigious. Sun, water, wind, and terrain are the primary elements to be considered as environmental influences in this sense (Fire, Water, Air, and Earth).

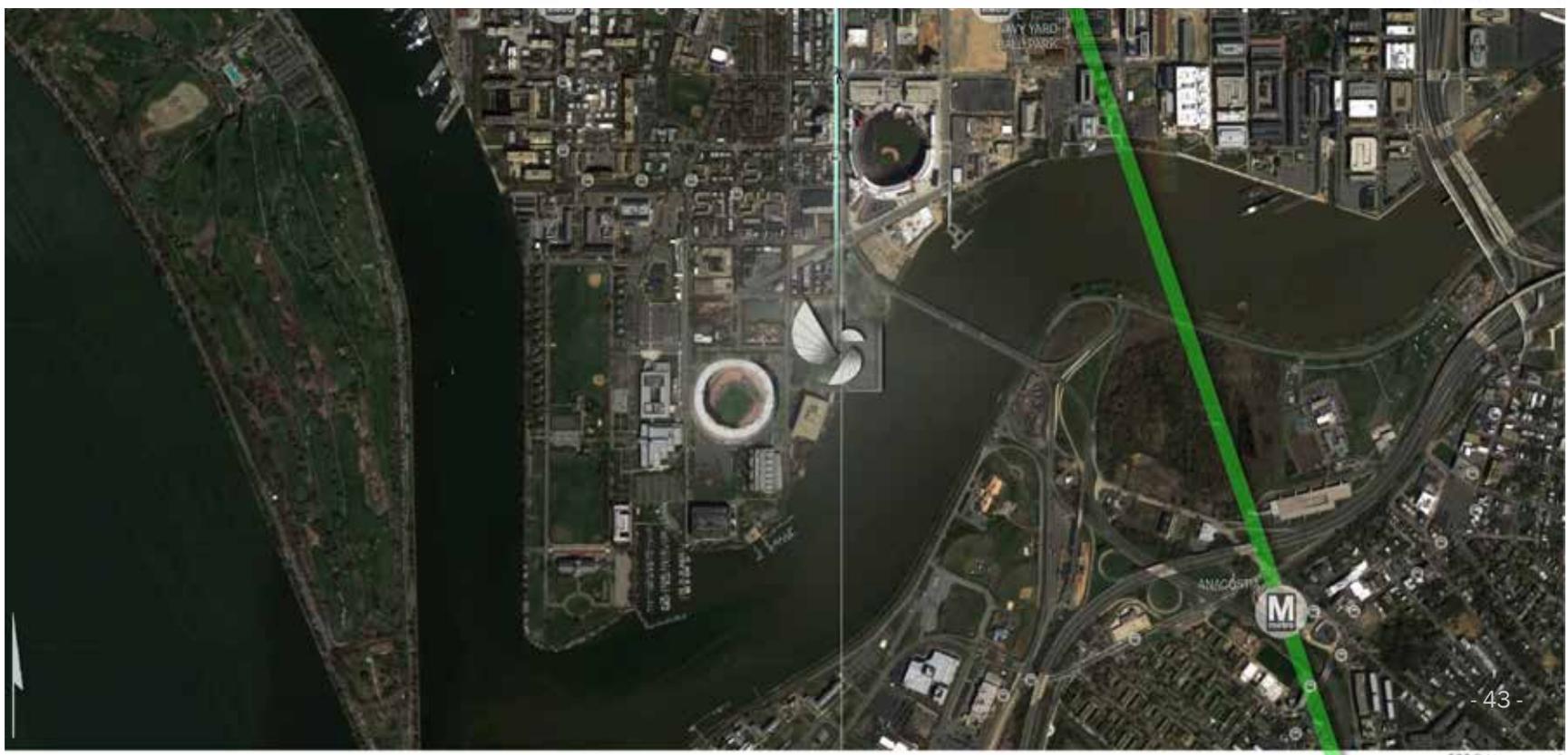
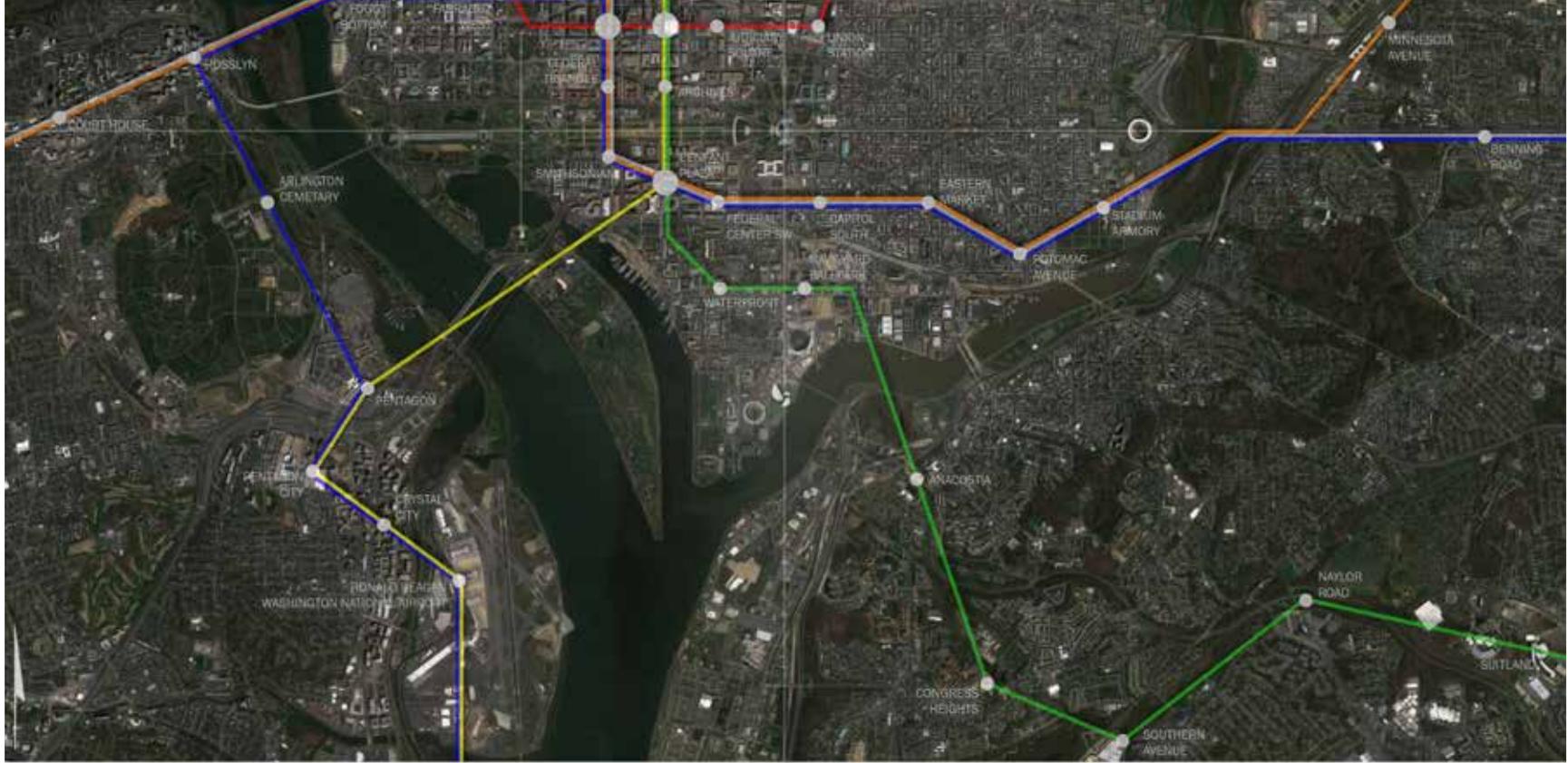
Fire; The sun is the primary catalyst of life and energy of the Organic. It provides warmth and comfort; generates vibrance and contrast. "The sun never knew how great it was until it hit the side of a building." (Kahn)

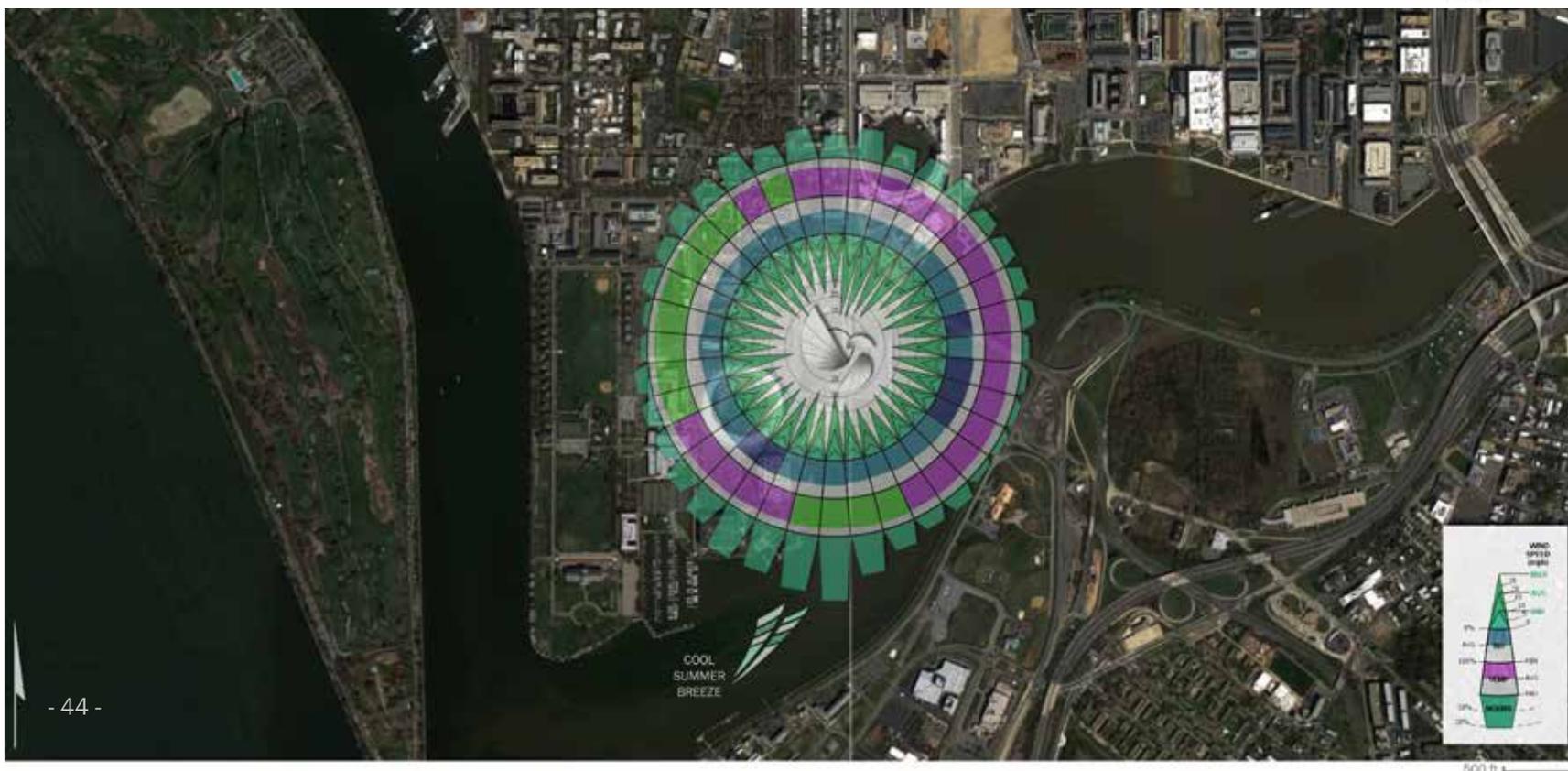
Water; Rain is an essential reagent to reaction of the Organic. Proximity to a body of water creates an emotional bond to the earthen foundation and oneness with the environment. "[Biophilia] is the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature" (Wilson)

Air; Wind, or passive air movement, is a multi-sensory, perceptive trigger that evokes a sensation of comfort and being in an environment; air is a necessary reactant of organic life. "A life in harmony with nature, the love of truth and of virtue, will purge the eyes to understand her text. By degrees we may come to know the primitive sense of the permanent objects of nature, so that the world shall be to us an open book, and every form significant of its hidden life and final cause." (Emerson)

Earth; Terrain is the foundation that cradles the Organic. The nature of the manmade is inherently artificial, but when substantially rooted to the earth an organic architecture can support life. A view of terrain or a hill can visually articulate this sensation. "Architects spend an entire life with this unreasonable idea that you can fight against gravity." (Piano) Rather than attempting to combat gravity, the Organic embraces gravity as a substantial earthly force and conquers it through understanding and articulation. "The health of the eye seems to demand a horizon. We are never tired, so long as we can see far enough." (Emerson)









Wind Analysis - Winter



"Have you never felt a sort of fear in the face of the ageless, a fear that in that room you might lose all consciousness of the passage of time, that untold years might pass and upon emerging you should find you had grown old and gray?"

-Jun'ichirō Tanizaki

6. MATERIAL INTEGRITY

“The country between Madison and Janesville, near Taliesin my home and workshop, is the bed of an ancient glacier drift. Vast busy gravel pits abound there, exposing heaps of yellow aggregate once and still everywhere near, sleeping beneath the green fields. Great heaps, clean and golden, are always waiting there in the sun. And I never pass on my way to and from Chicago without an emotion, a vision of the long dust-whitened stretches of the cement mills grinding to impalpable fineness the magic powder that would ‘set’ my vision all to shape; I wish both mill and gravel endlessly subject to my will. Nor do I ever come to a lumber yard with its city-like, graduated masses of fresh shingles, boards and timbers, without taking a deep breath of its fragrance, seeing the forest laid low in it by processes that cut and shaped it to the architect’s scale of feet and inches, coveting it all.

The rock ledges of a stone quarry are a story and a longing to me. There is a suggestion in the strata, and character in the formation. I like to sit and feel the stone as it is there. Often I have thought, were monumental great buildings ever given me to build I would go to the Grand Canyon of Arizona to ponder them...

The architect must again begin at the very beginning. Proceeding according to Nature now he must sensibly go through with whatever material may be in hand for his purpose according to the methods and sensibilities of a man in this age... all materials may be beautiful, their beauty much or entirely depending upon how well they are used by the Architect.

Great repose – serenity, a new tranquility - is the reward for proper use of each or any material in the true forms of which each is naturally most capable... To use one material wrongly is to abuse the integrity of the whole design.”

-F.L. Wright

All material begins with the earth, elemental in its natural form. To build organically is to understand a material’s elemental form and formation; to understand its physical construction and coming to be. The Organic seeks integrity of material.

How do you make wood more like wood? How do you make any material more like itself?

...Wood is alive...

A wood structure is of a colossal debt to time. Each wood member was formerly a small tree in a young forest, conceived from a seed which against all odds managed to escape the harsh seasons. Fighting decades for the sky, the young tree then emerged as grown. Within wood this precious life exists. In each beam... each column... each joist... there exists a rebirth of a once beautiful creature now taking new root in architecture. Every wood member was once its own elegant living structure. To build organically with wood is to understand its birth, acknowledge its life cycle, appreciate its struggle, and in return utilize its poetic physique. As a young tree reaches to the sky, so does a wood structure. Each leaf and branch is supported by its hierarchical predecessor, through its trunk to the root system; from beam to column to foundation. In death arises this warm new life.



"Space. The continual becoming: invisible fountain from which all rhythms flow and to which they must pass. Beyond time or infinity."

-F.L.Wright

...Wood is patient...

Wood is not a eulogy to a dead tree, but rather an extension on its upward existence. It desires growth and demands upward force, as did its living counterpart. Yet it does not exceed its structural limitations, but rather understands the gravity of its own situation. As a tree grows vertically it proportionally thickens, giving it strength through age. It takes time for a tree to fully mature and to reach its potential. Only then can it be dried, sculpted, and utilized. To be patient is to be “able to accept or tolerate delays, problems, or suffering without becoming annoyed or anxious.” ...Wood is certainly not anxious.

...Wood is synergy...

Alone, a 2x4 is weak. Positioned vertically it will fall at the slightest external force. Positioned horizontally it ceases to exist architecturally. In compression it will bend, and in tension it will crack. And grain strength is only as strong as its species. However when coupled with perpendicular 2x4s, the vertical board becomes a column. When arranged with purpose, studs become walls; planks become joists; and timber becomes a beam; and harmony is achieved. Synergy is “the interaction or cooperation of two or more organizations, substances, or other agents to produce a combined effect greater than the sum of their separate effects.” Through composition wood becomes structure. Through order wood becomes architecture.

...Wood is gravity...

How do you make wood more like wood? To this question one could answer: How do you defy gravity? Or rather... how do you acknowledge gravity as a significant power, but overcome it. Simply put, as a tree trunk supports a branch, a column should support a beam. Not a nail. Not a screw. Only the weight of the wood structure and gravity can create wood structure. Gravity then becomes the essence of the wood frame, the metaphorical glue and nails. And the nails become a method of holding the wood on itself rather than holding the wood up. To hold a joist with a nail is to eliminate its architectural honesty, to defy the wood. But to support it with a beam places the wood at peace. There is no architecture in subverting the natural properties of wood.

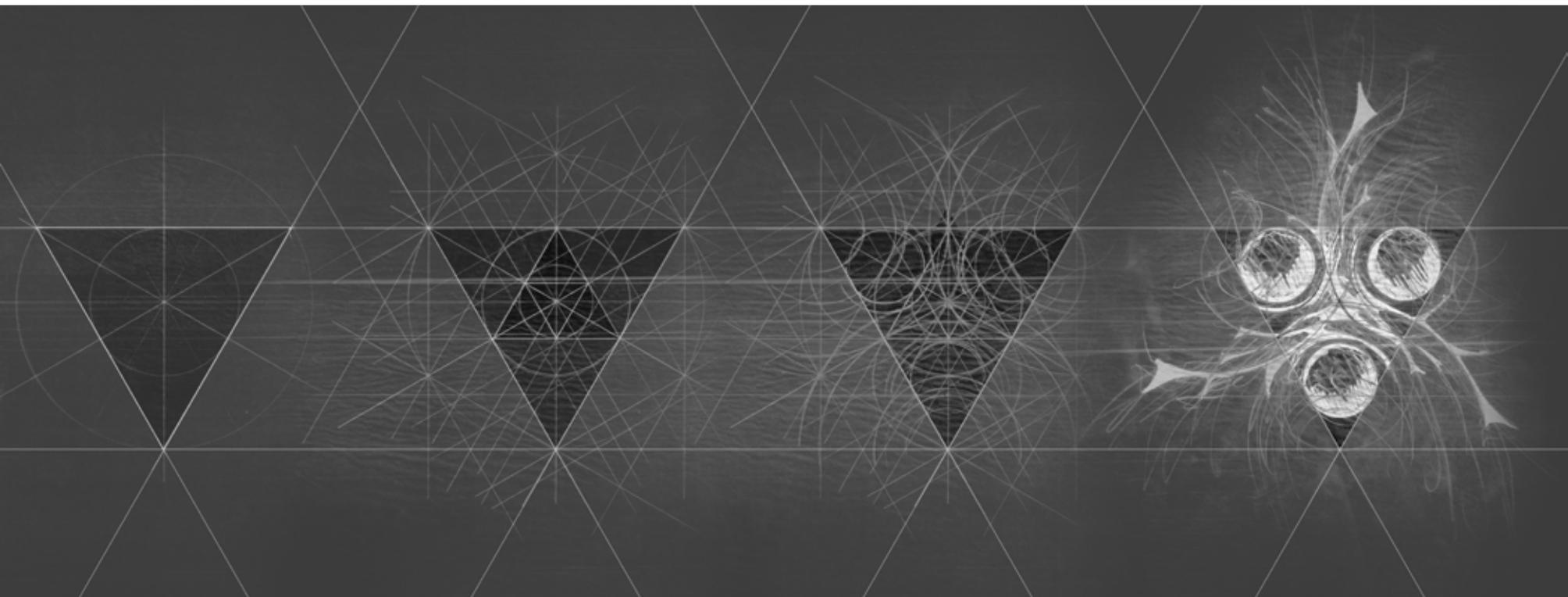
Why wood?

Only architecture can determine its material necessity; with masonry, the measurable weight and depth; with steel, the outstanding structural capacity; and with concrete, the compressive strength and plastic form. However, in wood construction there is only the beauty of gravity. Nay, the beautiful mastery of gravity; the graceful command of gravity.

Material is where architecture begins. It is the cause and effect of architecture, and makes structure possible. Material is texture, smell, temperature, taste, color, composition, stiffness, and most importantly, integrity. Integrity... meaning honesty of use and of wholeness of function; unity. A harmonious architecture utilizes a material in its most appropriate possible application that is integral to the whole of the machine. The Organic seeks a harmony of material and structure through understanding of the elemental properties and formative nature of the material.

Whenever any style of ornament commands universal admiration, it will always be found to be in accordance with the laws which regulate the distribution of form in nature.

-Owen Jones



7. CONSTRUCTED ORNAMENT

“True ornament is not a matter of prettifying externals. It is organic with the structure, it adorns, whether a person, a building, or a park. At its best it is an emphasis of structure, a realization in graceful terms of the nature of that which is ornamented. Above all, it should possess fitness, proportion, harmony; the result of all of which is repose. So it is that the structure should be decorated.

Decoration should never be purposely constructed. True beauty results from that repose which the mind feels when the eye, the intellect, the affections, are satisfied from the absence of any want – in other words, when we take joy in the thing..

This conventional representation must always be worked out in harmony with the nature of the materials used, to develop, if possible, some beauty peculiar to this material. Hence one must know materials and apprehend their nature before one can judge an ornament...

Ornament, if organic, is never on the thing but of it.”

-F.L. Wright

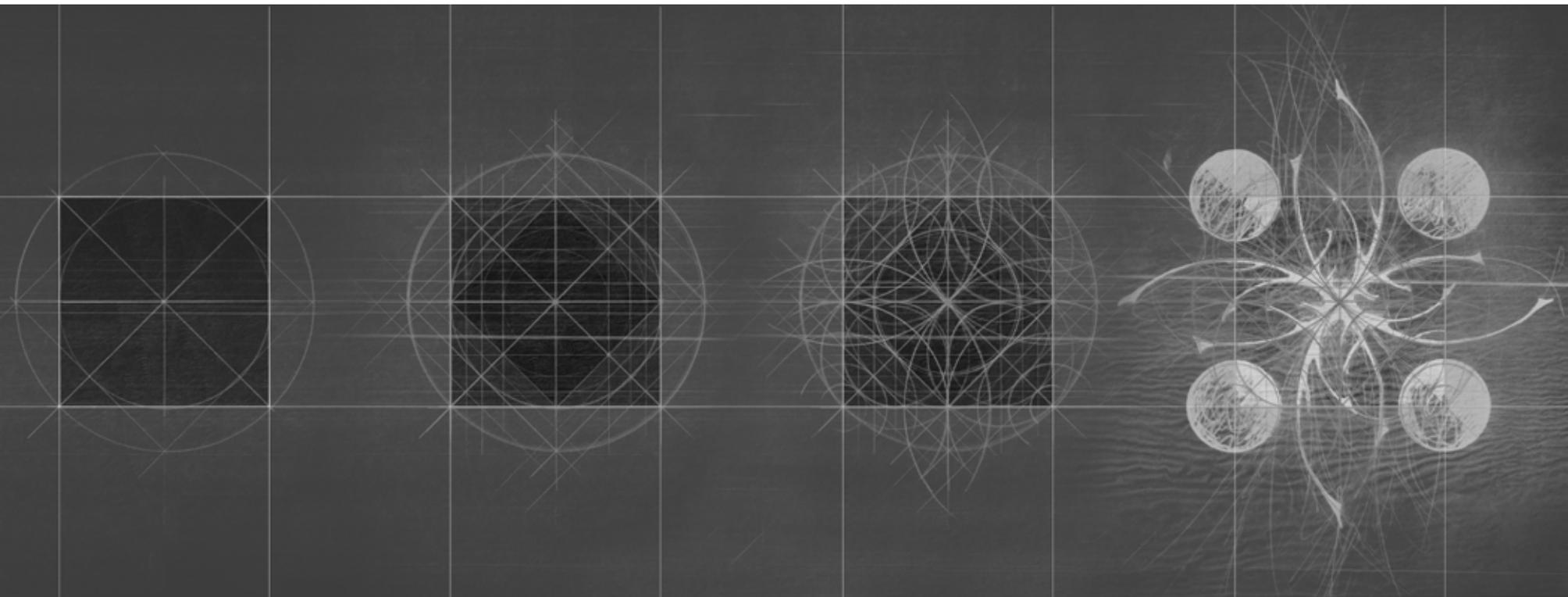
Ornament is integral construction derived from structure. It is a physical geometric extraction and abstraction of the nature of a structure. An organic ornament seeks a necessity and absolution to the whole that is the building. An organic architecture would be void of fulfillment without it.

“But the problem becomes more complicated for a phenomenologist of the imagination constantly confronted with the strangeness of the world. And what is more, the imagination, by virtue of its freshness and its own peculiar activity, can make what is familiar into what is strange. With a single poetic detail, the imagination confronts us with a new world. From then on, the detail takes precedence over the panorama, and the simple image, if it is new, will open up an entire world.”

-Gaston Bachelard

"All junctions of curved lines with curved or of curved lines with straight should be tangential to each other." [Proposition 12]

-Owen Jones



By construction of ornament simultaneous to construction of hierarchical structure, the whole of the Organic takes on new and deeper meaning. The part is integral to the whole and vice versa. An organic ornament is of the nature of the organic machine; like a scale is to a snake, or a petal to a rose. Graining of wood and veining of stone become patterning of ornament and reinforce the intention of the construction. In construction exists a multitude of beauty derived from the singularity of the organic mechanism.

“A building which is truly a work of art is in its nature, essence, and physical being an emotional expression... it must have, almost literally, a life. It follows from this living principle that an ornamented structure should be characterized by this quality, namely, that the same emotional impulse shall flow throughout harmoniously into its varied forms of expression...”

An excellent and beautiful building may be designed that shall bear no ornament whatsoever; but I believe just as firmly that a decorated structure, harmoniously conceived, well considered, cannot be stripped of its system of ornament without destroying its individuality...

It follows then, by the logic of growth, that a certain kind of ornament should appear on a certain kind of structure, just as a certain kind of ornament should appear on a certain kind of tree. An elm leaf would not “look well” on a pine-tree – a pine needle seems more ‘in keeping.’”

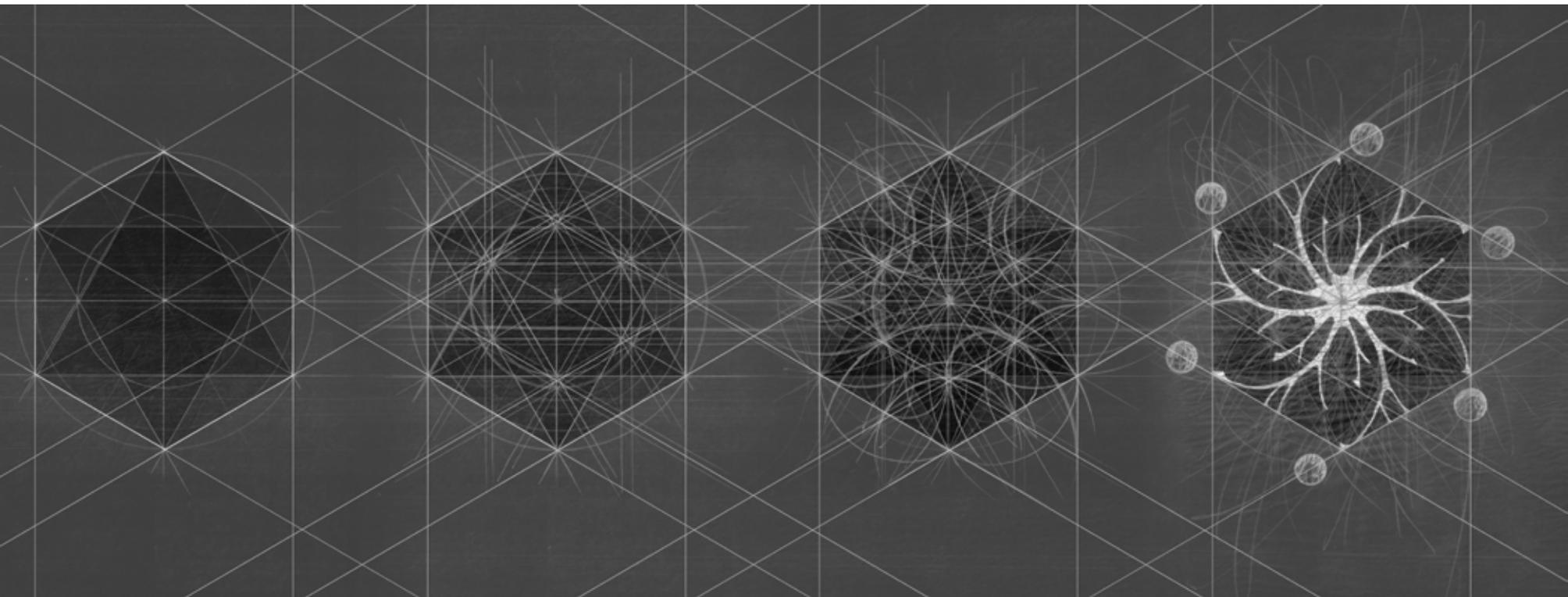
-Louis Sullivan

“Although ornament is most properly only an accessory to architecture, and should never be allowed to usurp the place of structural features, or to overload or to disguise them, it is in all cases the very soul of an architectural monument.”

-Owen Jones

“As in every perfect work of Architecture a true proportion will be found to reign between all the members which compose it, so throughout the Decorative Arts every assemblage of forms should be provided on certain definite proportions; the whole and each particular member should be a multiple of some simple unit.” [Proposition 9]

-Owen Jones



Material and ornament are coexistent. Material dictates structure as does structure dictate material. Ornament is therefore constructed by nature of structure and material; harmonious in formation and integral to the entirety of the organic machine.

“So every living thing bears innate witness to the need for love, expressing the poetic principle by what we call pattern: visible in all organism. Creation as eye-music is no less expressive than ear-music because it too is heart-music, appealing too, to human life at the very core. Both melody and ornament reach us by way of the soul of all Creation and as we are made we respond.”

-F. L. Wright

“The general proportions of the building may be good, the mouldings may be more or less accurately copied from the most approved models; but the very instant that ornament is attempted, we see how far the architect is at the same time the artist. It is the best measure of the care and refinement bestowed upon the work.”

-Owen Jones

8. BIOLOGICAL SYSTEMS

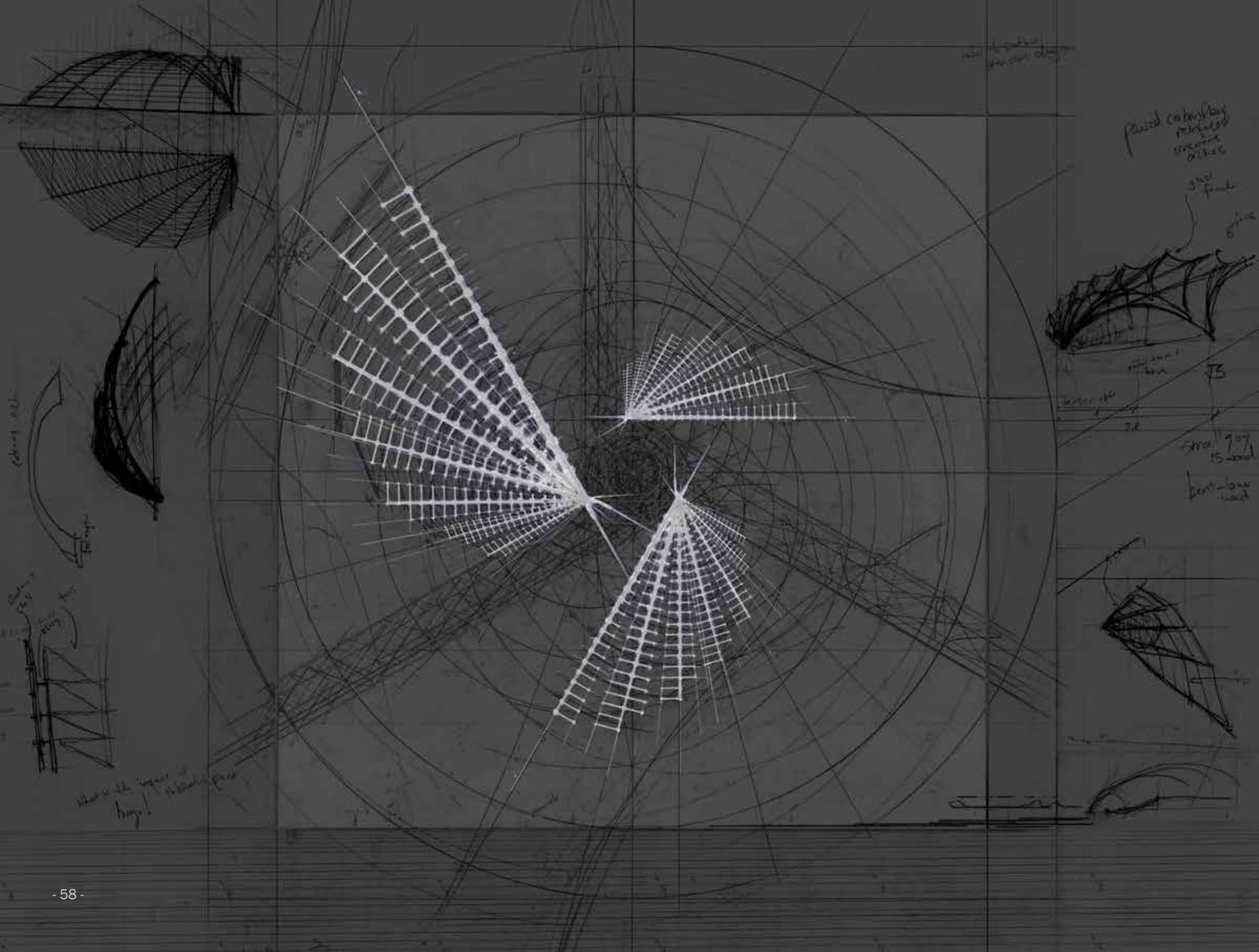
“The ideal of an organic architecture forms the origin and source, the strength and, fundamentally, the significance of everything ever worthy the name of architecture...”

[The organic form] is innate, it shapes as it develops itself from within, and the fullness of its development is one and the same with the perfection of its outward Form. Such is the Life, such is the form...

When the whole is to the part as the part is to the whole, harmony will result and “the nature of the entire performance becomes clear as necessity.”

-F.L. Wright

The Organic is a complex musical composition of independently moving systems; each with its own unique patterns and sequences, and performing its own fundamental tasks. An organism has a skeletal and muscular system; an organic machine has structure and bracing. An organism has a respiratory system; an organic machine has passive and active mechanical systems. An organism has a nervous system; an organic machine has electrical wiring and communications. An organism has a circulatory and digestive system; an organic machine has piping and sewage systems. An organism has an integumentary system (skin); an organic machine has an envelope to protect the other systems.



with...
model clay

Placed on top of
ribbed
structure

3rd
floor

JB

5th
floor

1st
floor

What is the impact of
height?

The control center or origin of each biological system of an organism (ie: the heart, lungs, brain) can be found at the control centers of an organic machine (ie: pump room, mechanical units, and electrical panels, etc.). Simulating the biological processes of a plant, sunlight and wind can be harnessed and converted to energy and promote air flow. To consider architectural systems in a manner that is biological by nature is to design organically. An organic machine is a biological musical composition built of intrinsic parts that are integral to the realization of the whole.

“All that is single, singular, must have some central place, so that equality may be preserved in the intervals extending to the central individual part from either side...”

...it is from some deeply abstruse numerical system in them that [all growing things] put forth their reproductive power... All is due to the supreme eternal presidency of numerical rhythm, similitude, equality, and order. If this presidency of mathematical structure is taken from the earth, nothing remains. Clearly God in the beginning made earth out of nothing at all....

we only like what has a beginning harmoniously woven on to the middle part, and a middle part harmoniously woven on to the end.”

-Augustine

“Beautiful buildings are more than scientific. They are true organisms, spiritually conceived; works of art, using the best technology by inspiration rather than the idiosyncrasies of mere taste or anything averaging by the committee mind.”

-F. L. Wright

9. THE ENIGMATIC

“Of things constituted by nature some are un-generated, imperishable, and eternal, while others are subject to generation and decay. The former are excellent beyond compare and divine, but less accessible to knowledge. The evidence that might throw light on them, and on the problems which we long to solve respecting them, is furnished but scantily by sensation... Both departments, however, have their special charm. The scanty conceptions to which we can attain of celestial things give us, from their excellence, more pleasure than all our knowledge of the world in which we live; just as a half glimpse of persons that we love is more delightful than a leisurely view of other things, whatever their number and dimensions. On the other hand, in certitude and in completeness our knowledge of terrestrial things has the advantage. Moreover, their greater nearness and affinity to us balances somewhat the loftier interest of the heavenly things that are the objects of the higher philosophy. Having already treated of the celestial world, as far as our conjectures could reach, we proceed to treat of animals, without omitting, to the best of our ability, any member of the kingdom, however ignoble. For if some have no graces to charm the sense, yet even these, by disclosing to intellectual perception the artistic spirit that designed them, give immense pleasure to all who can trace links of causation, and are inclined to philosophy. Indeed, it would be strange if mimic representations of them were attractive, because they disclose the mimetic skill of the painter or sculptor, and the original realities themselves were not more interesting, to all at any rate who have eyes to discern the reasons that determined their formation. We therefore must not recoil with childish aversion from the examination of the humbler animals. Every realm of nature is marvelous... so we should venture on the study of every kind of animal without distaste; for each and all will reveal to us something natural and something beautiful. Absence of haphazard and conduciveness of everything to an end are to be found in Nature’s works in the highest degree, and the resultant end of her generations and combinations is a form of the beautiful.

...no one can look at the primordia of the human frame-blood, flesh, bones, vessels, and the like-without much repugnance. Moreover, when any one of the parts or structures, be it which it may, is under discussion, it must not be supposed that it is its material composition to which attention is being directed or which is the object of the discussion, but the relation of such part to the total form. Similarly, the true object of architecture is not bricks, mortar, or timber, but the house; and so the principal object of natural philosophy is not the material elements, but their composition, and the totality of the form, independently of which they have no existence...

As every instrument and every bodily member sub-serves some partial end, that is to say, some special action, so the whole body must be destined to minister to some Plenary sphere of action. Thus the saw is made for sawing, for sawing is a function, and not sawing for the saw. Similarly, the body too must somehow or other be made for the soul, and each part of it for some subordinate function, to which it is adapted.”

-Aristotle, On the Parts of Animals

The Organic serves a purpose exceptional to itself; a higher aim, a divine reason. The ethereal nature of the Organic is extrasensory: intangible, phenomenological, and mysterious. Inexplicable to our physical world exists a soul, a reason, that gives purpose to musical proportioning, poetic lighting, sublime ornamentation, and romantic intention. It is the symbolically surreal, the masterfully mythological, the poetically Platonic.

*“Going where I list, my own master, total absolute,
listening to others, considering well what they say,
pausing, searching, receiving, contemplating,
gently, but with undeniable will, divesting myself of the holds that
would hold me.*

*I inhale great draughts of space.
The east and the west are mine, and the north and the south are mine...*

*Beware of the moral ripening of nature.
Beware what precedes the decay of the ruggedness of states and men.
Beware of civilization.*

-Walt Whitman

“...The causes concerned in the generation of the works of nature are, as we see, more than one. There is the final cause and there is the motor cause. Now we must decide which of these two causes comes first, which second. Plainly, however, that cause is the first which we call the final one. For this is the Reason, and the Reason forms the starting-point, alike in the works of art and in works of nature. For consider how the physician or how the builder sets about his work. He starts by forming for himself a definite picture, in the one case perceptible to mind, in the other to sense, of his end – the physician of health, the builder of a house – and this he holds forward as the reason and explanation of each subsequent step that he takes, and of his acting in this or that way as the case may be.”

-Aristotle

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architectural site
an environment to implement organic principles

SITE PLAN

- 1 ANACOSTIA RIVER WALK
- 2 DOCKS
- 3 ARENA
- 4 TERRACE
- 5 NATIONALS STADIUM
- 6 DC UNITED STADIUM
- 7 FREDERICK DOUGLASS MEMORIAL BRIDGE
- 8 PARKING



SITE PLAN

- 1 ANACOSTIA RIVER WALK
- 2 DOCKS
- 3 ARENA
- 4 TERRACE



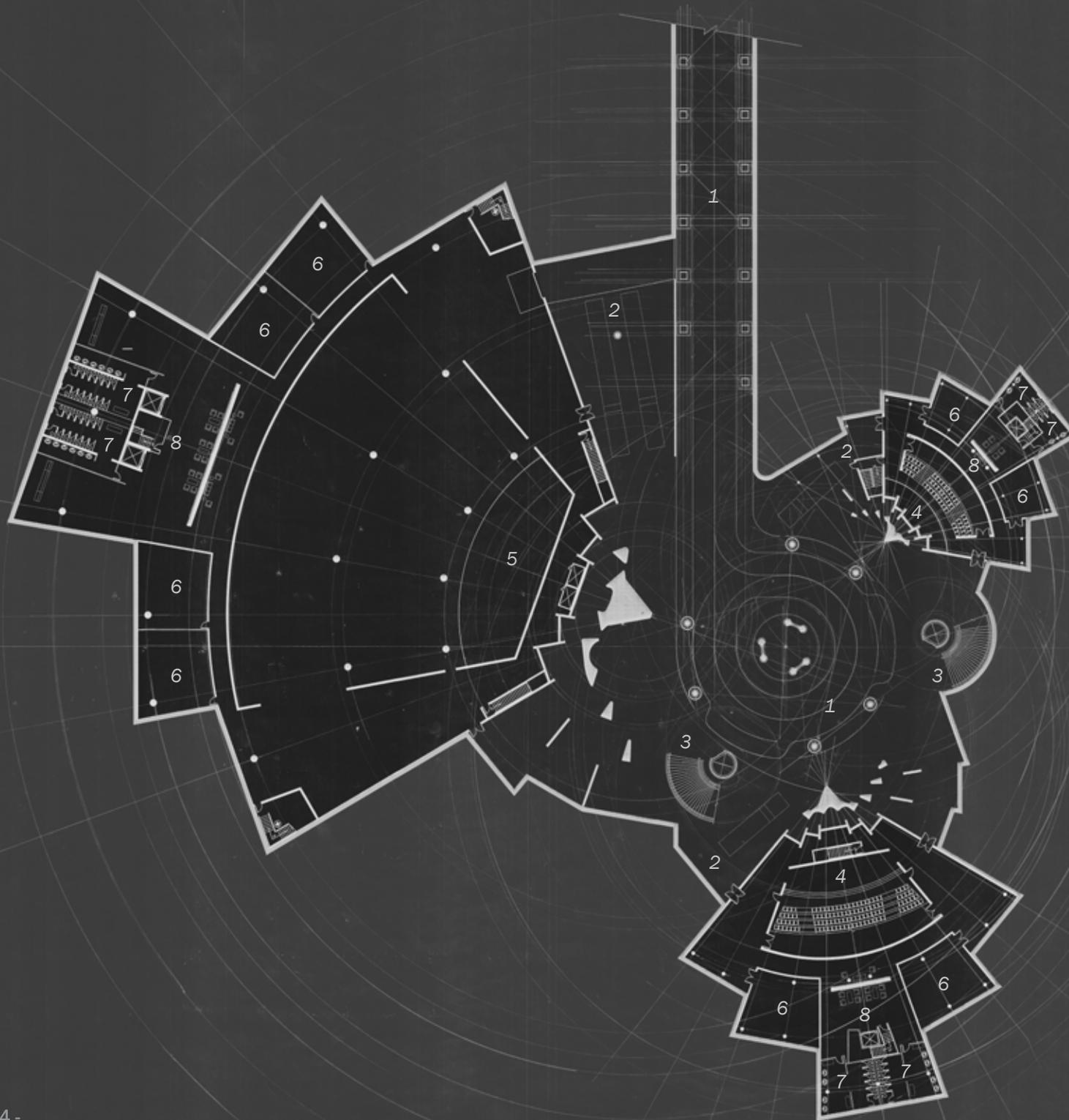






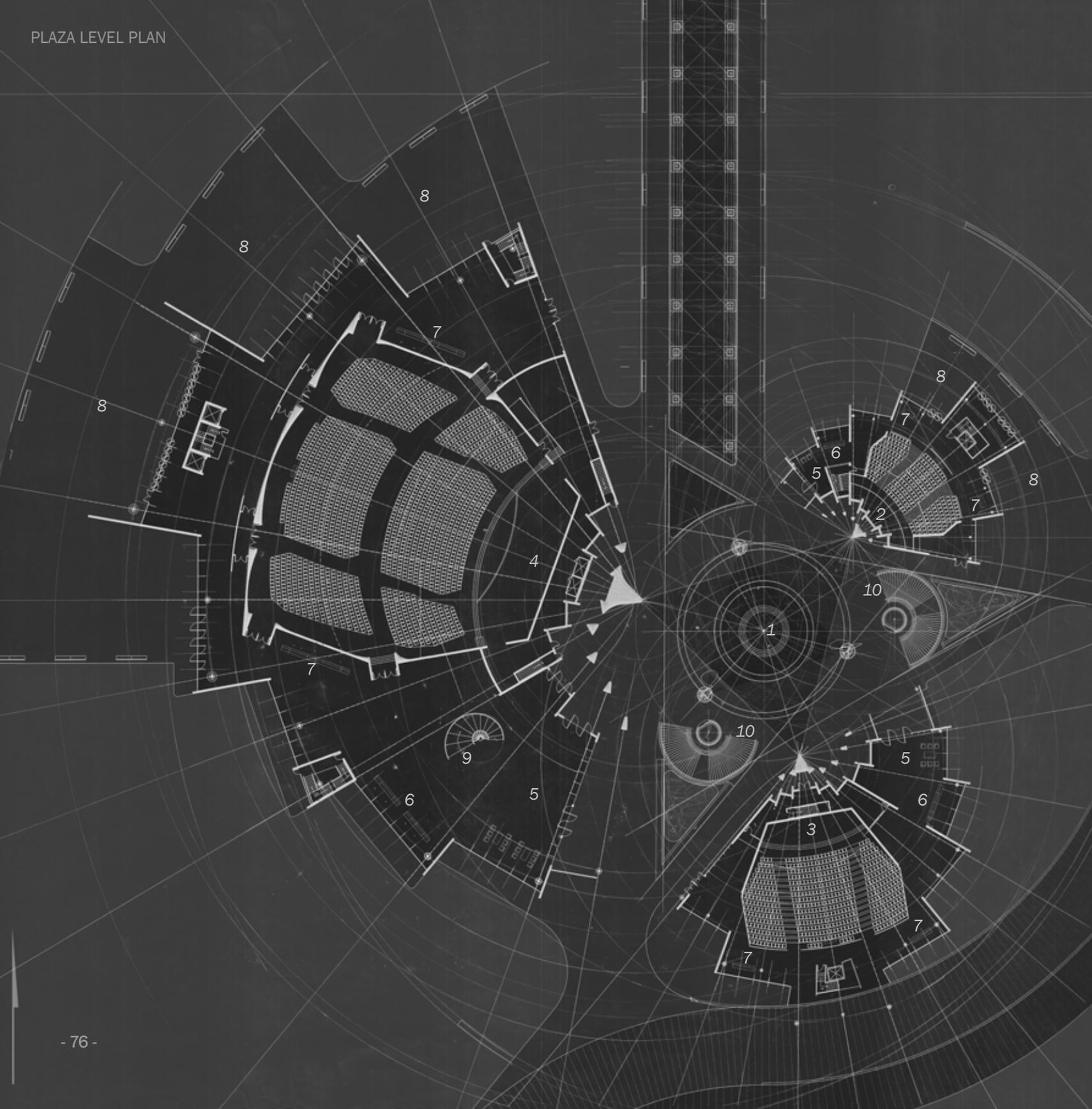
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architecture
physical execution of an organic architecture on a chosen site



BASEMENT LEVEL PLAN

- 1 VEHICULAR ENTRY & VALET CIRCLE
- 2 LOADING
- 3 STAIR TO ARENA
- 4 STAGE
- 5 HYDRAULIC STAGE LIFT AREA
- 6 GREEN ROOM & REHEARSAL SPACE
- 7 RESTROOM
- 8 LOUNGE



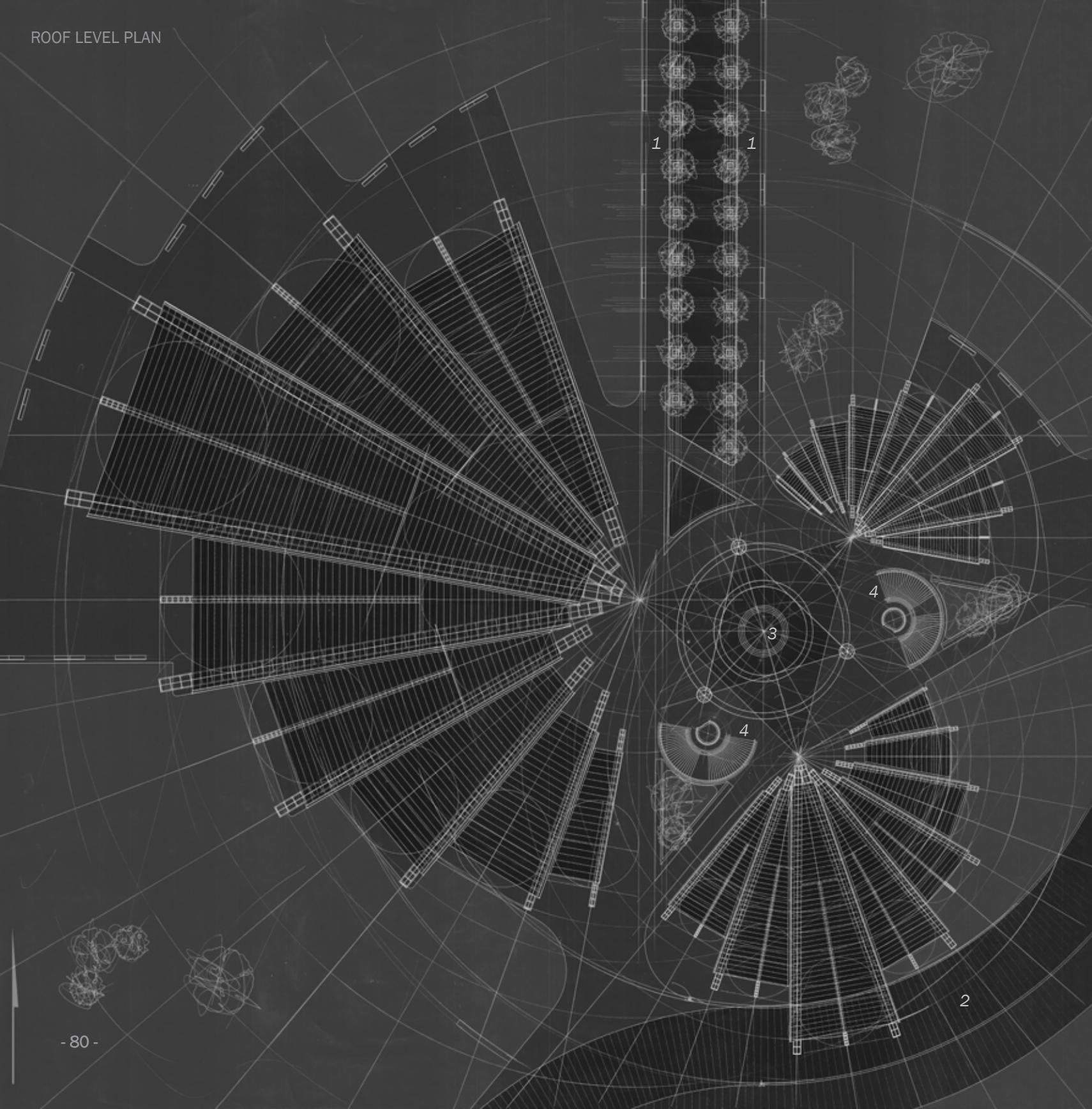
PLAZAL LEVEL PLAN

- 1 ARENA STAGE (STANDING ROOM FOR ~300)
- 2 FIRE STAGE (SEATS ~215)
- 3 WATER STAGE (SEATS ~530)
- 4 EARTH STAGE (SEATS ~3700)
- 5 VESTIBULE & WAITING
- 6 TICKETING & COAT CHECK
- 7 REFRESHMENTS
- 8 TERRACE
- 9 STAIR TO MEZZANINE LEVEL
- 10 STAIR TO BASEMENT LEVEL



MEZZANINE LEVEL PLAN

- 1 STAIR TO PLAZA LEVEL
- 2 REFRESHMENTS
- 3 BALCONY TERRACE



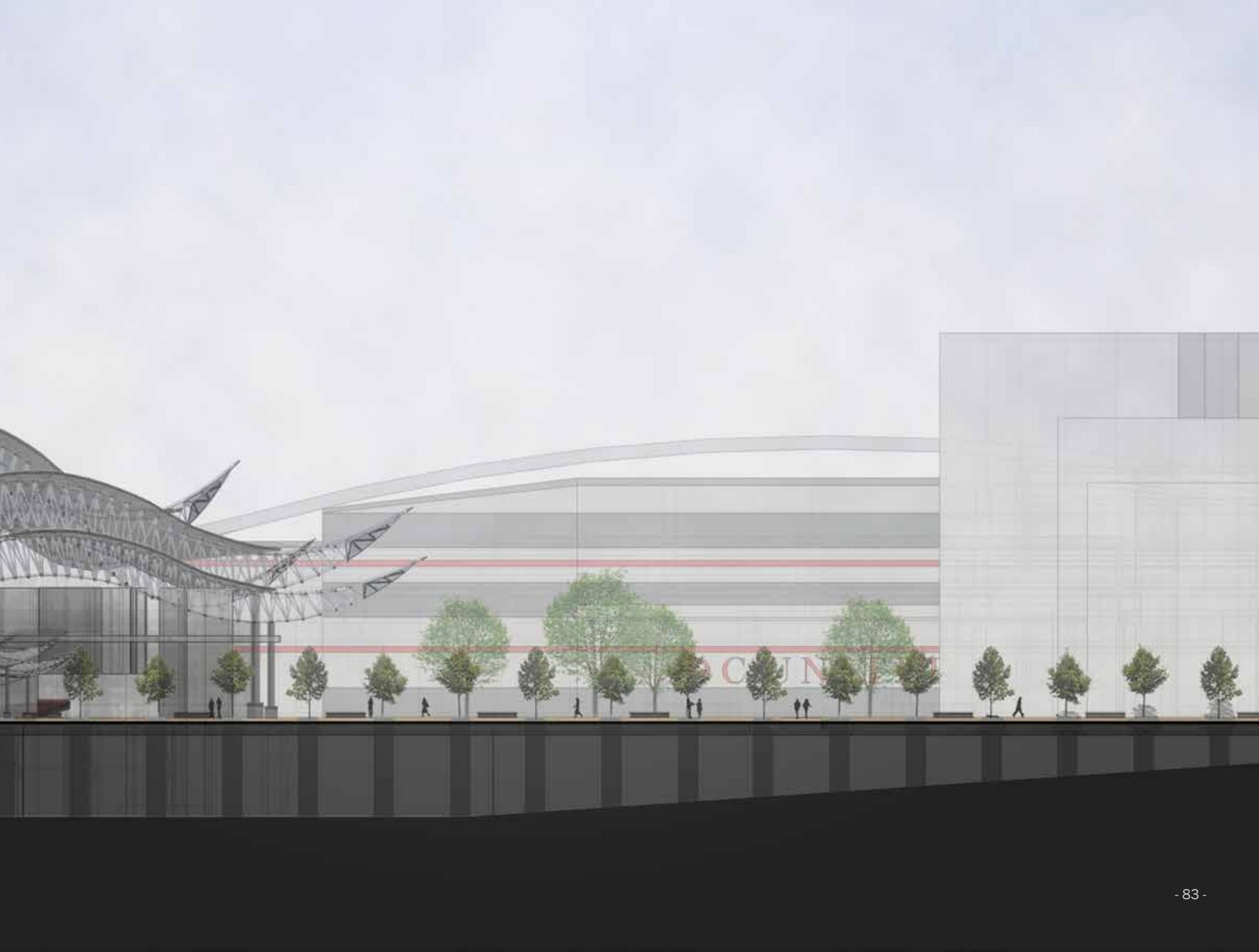
ROOF LEVEL PLAN

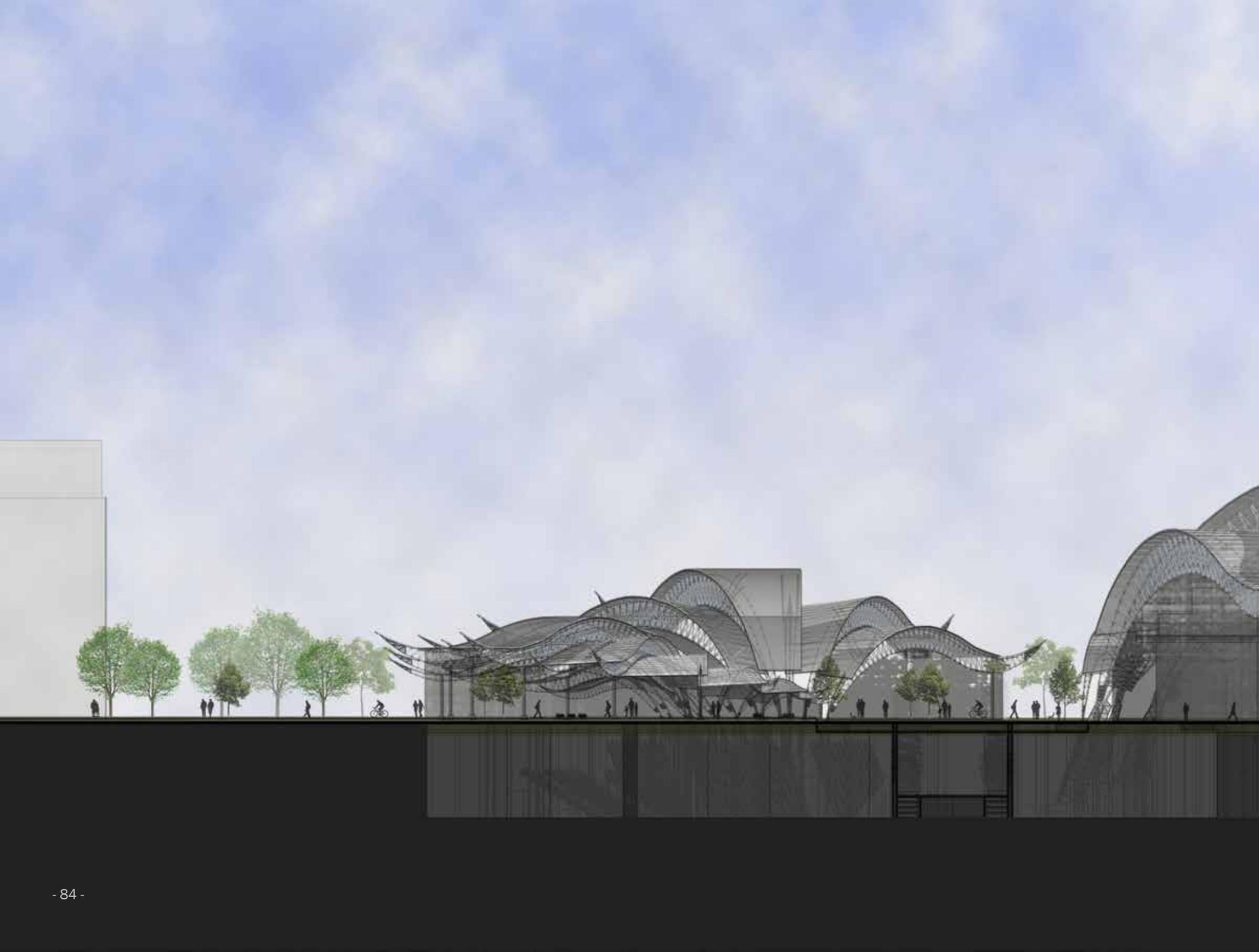
- 1 PEDESTRIAN STREET ENTRY
- 2 ANACOSTIA RIVERWALK
- 3 ARENA STAGE
- 4 STAIR TO BASEMENT LEVEL

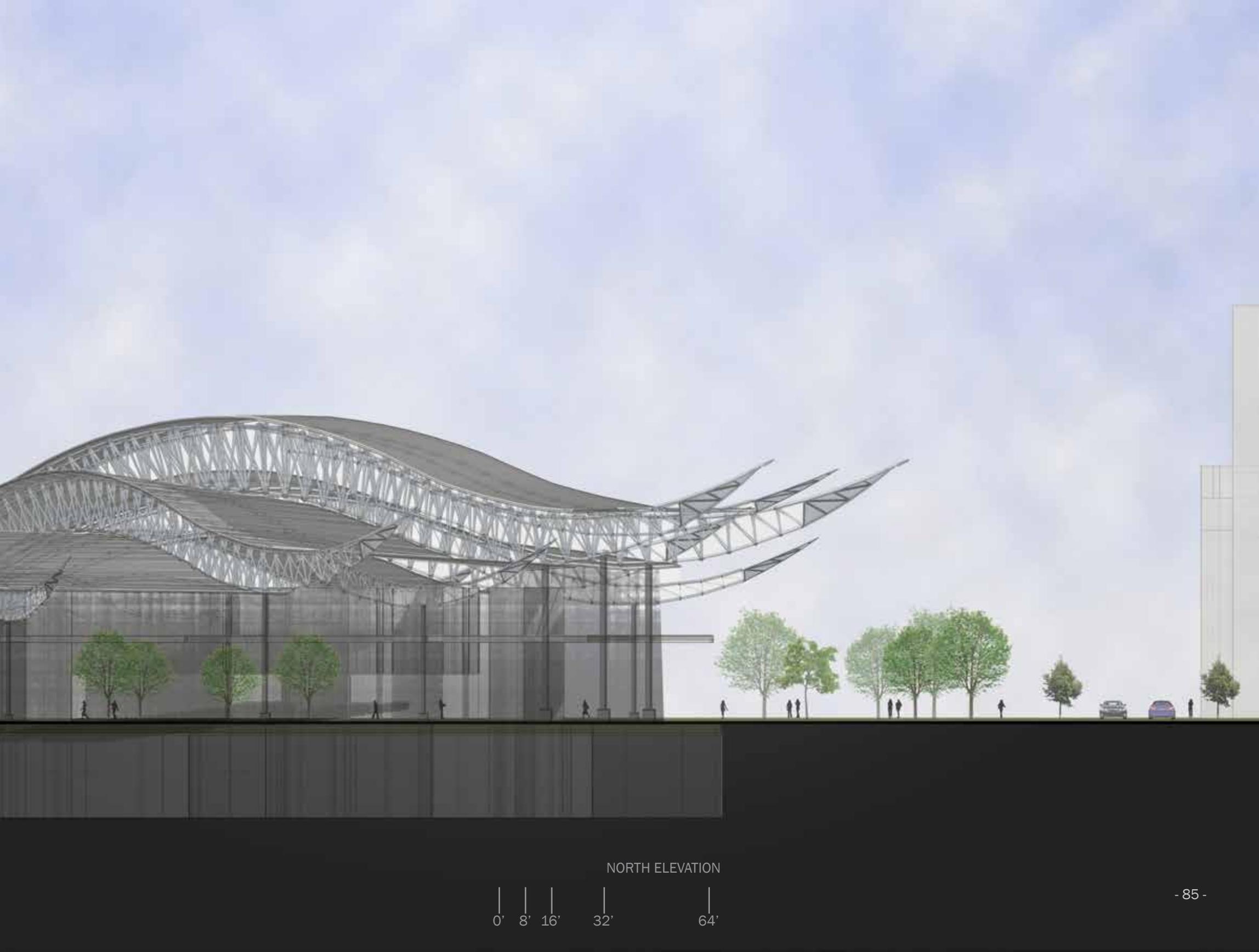


EAST ELEVATION



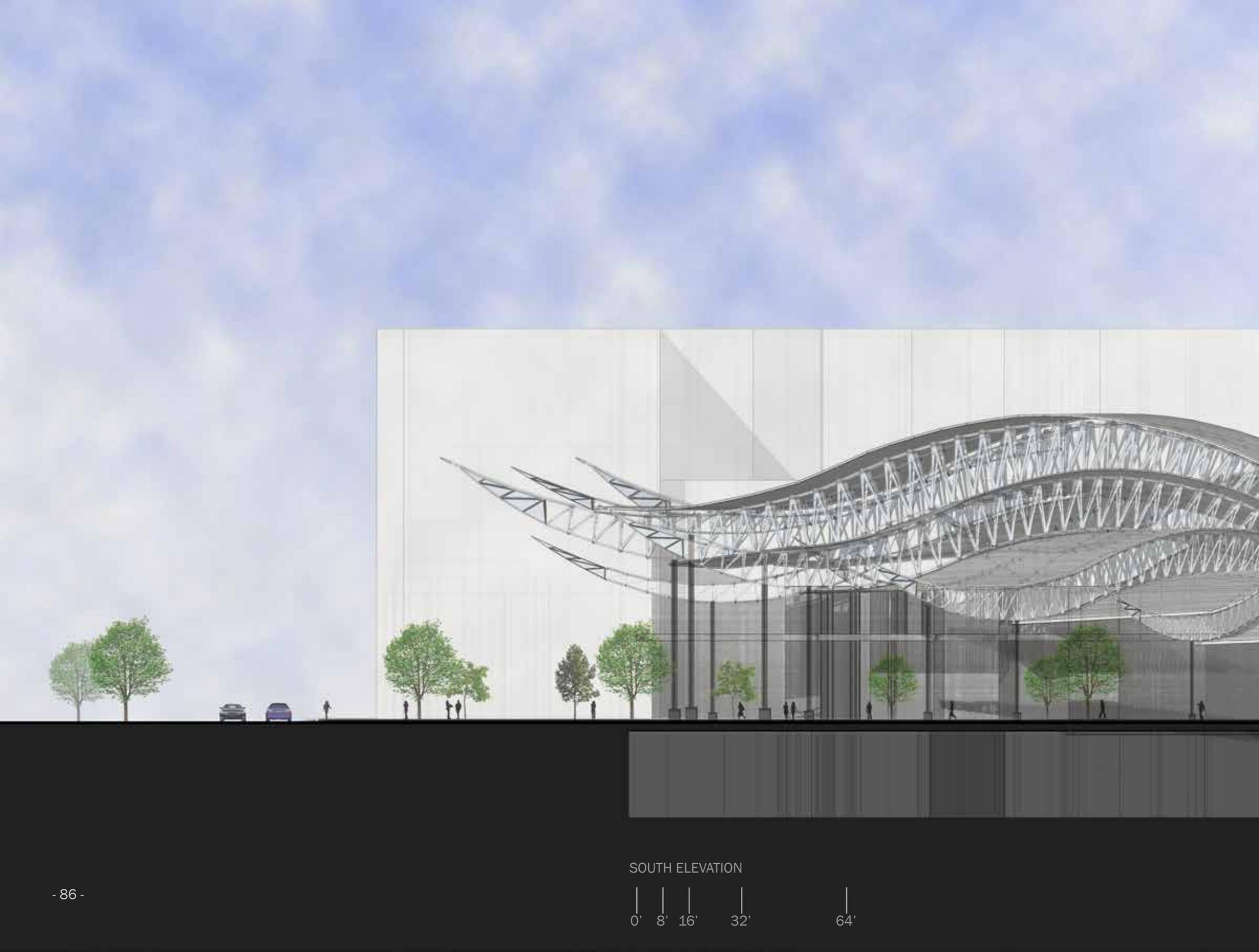






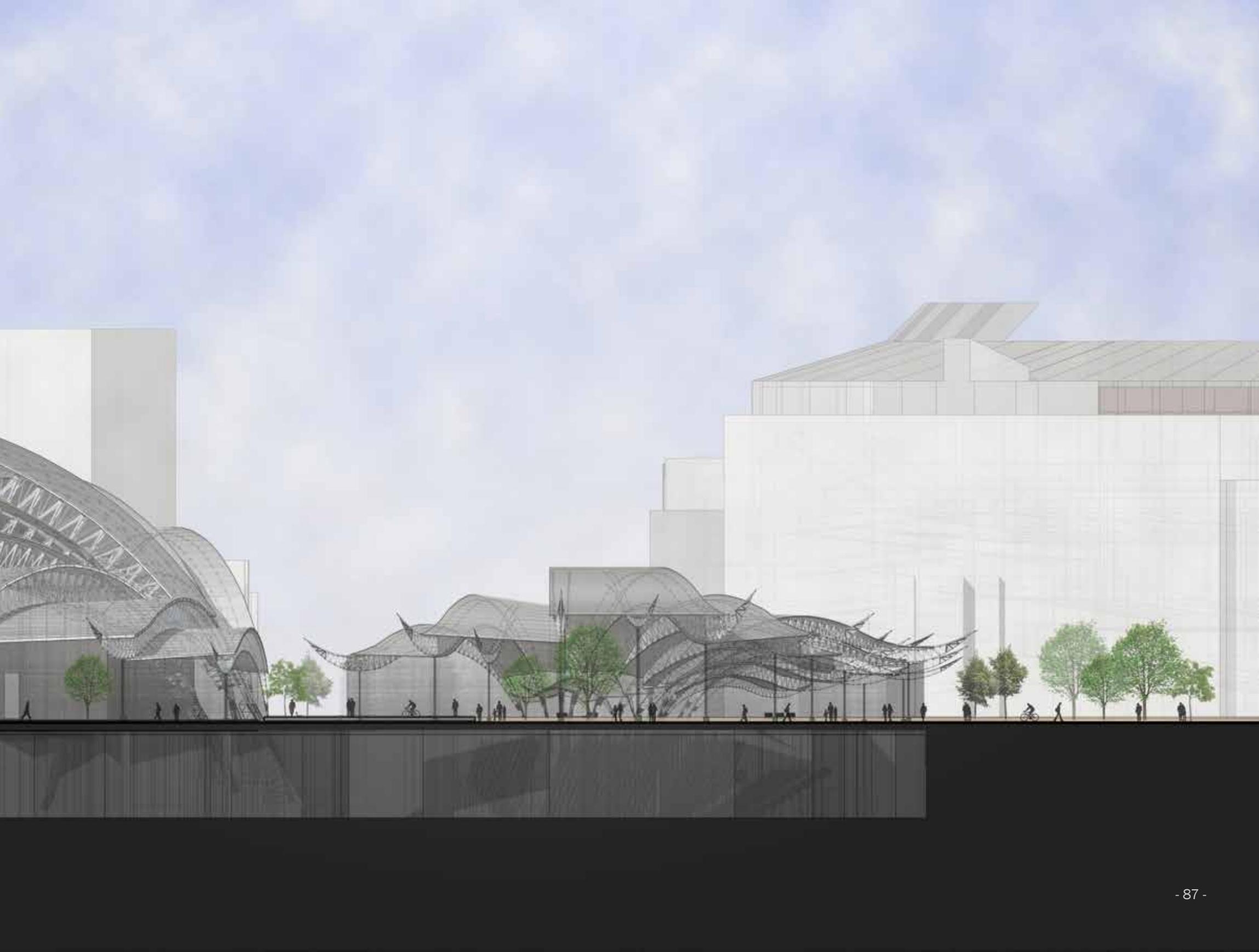
NORTH ELEVATION



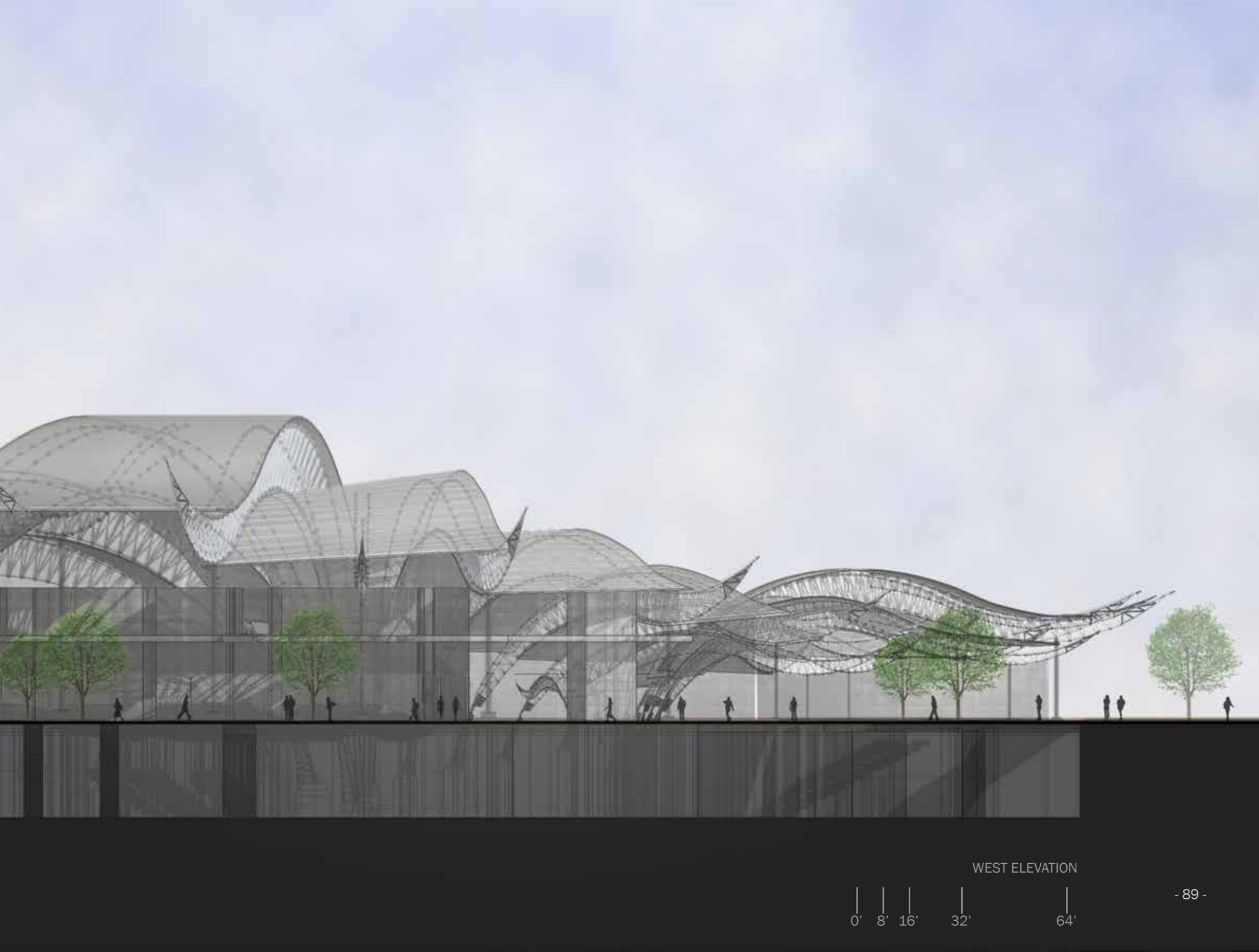


SOUTH ELEVATION



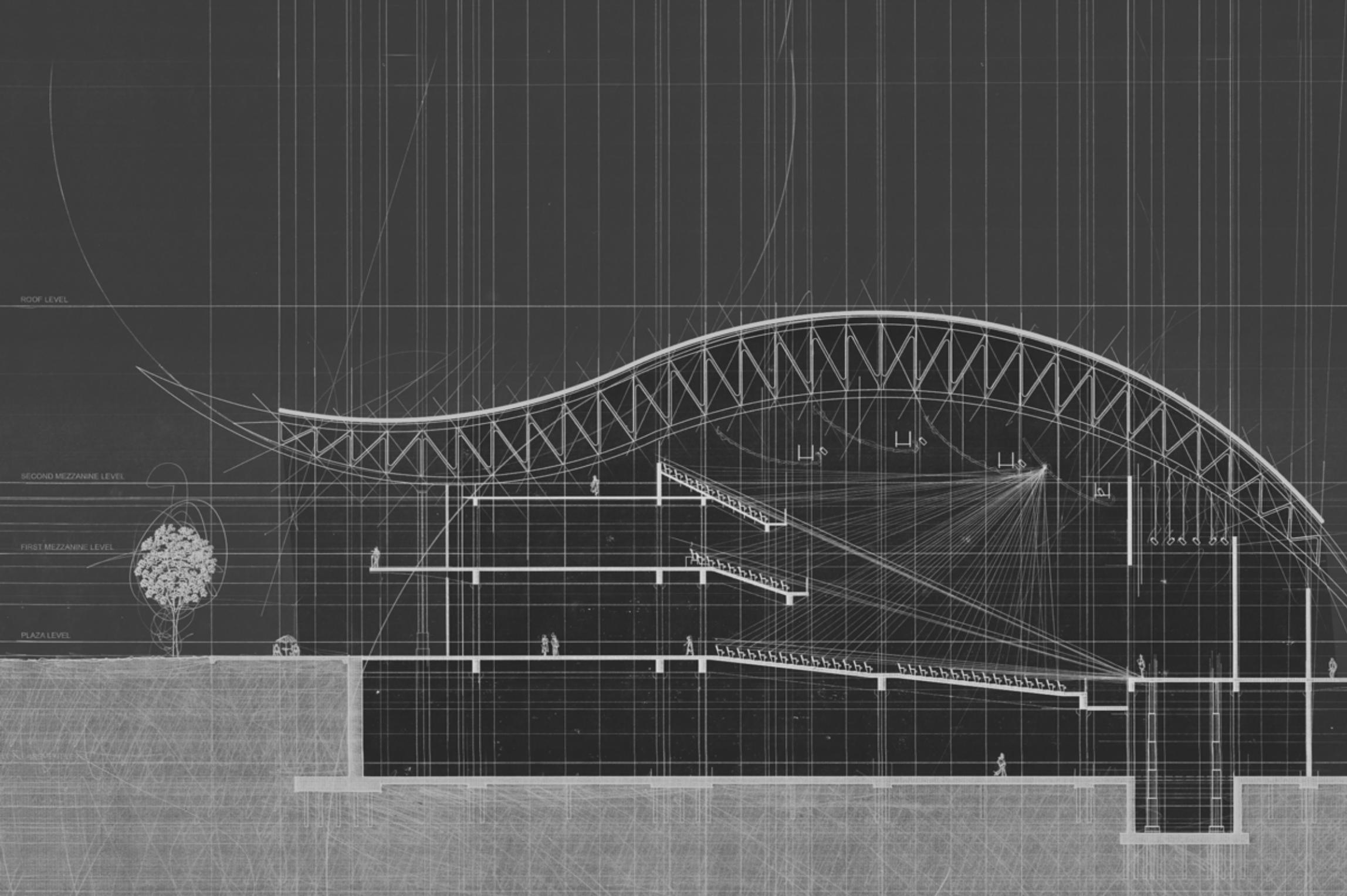






WEST ELEVATION

0' 8' 16' 32' 64'



ROOF LEVEL

SECOND MEZZANINE LEVEL

FIRST MEZZANINE LEVEL

PLAZA LEVEL

EARTH THEATRE SECTION

0' 8' 16' 32' 64'

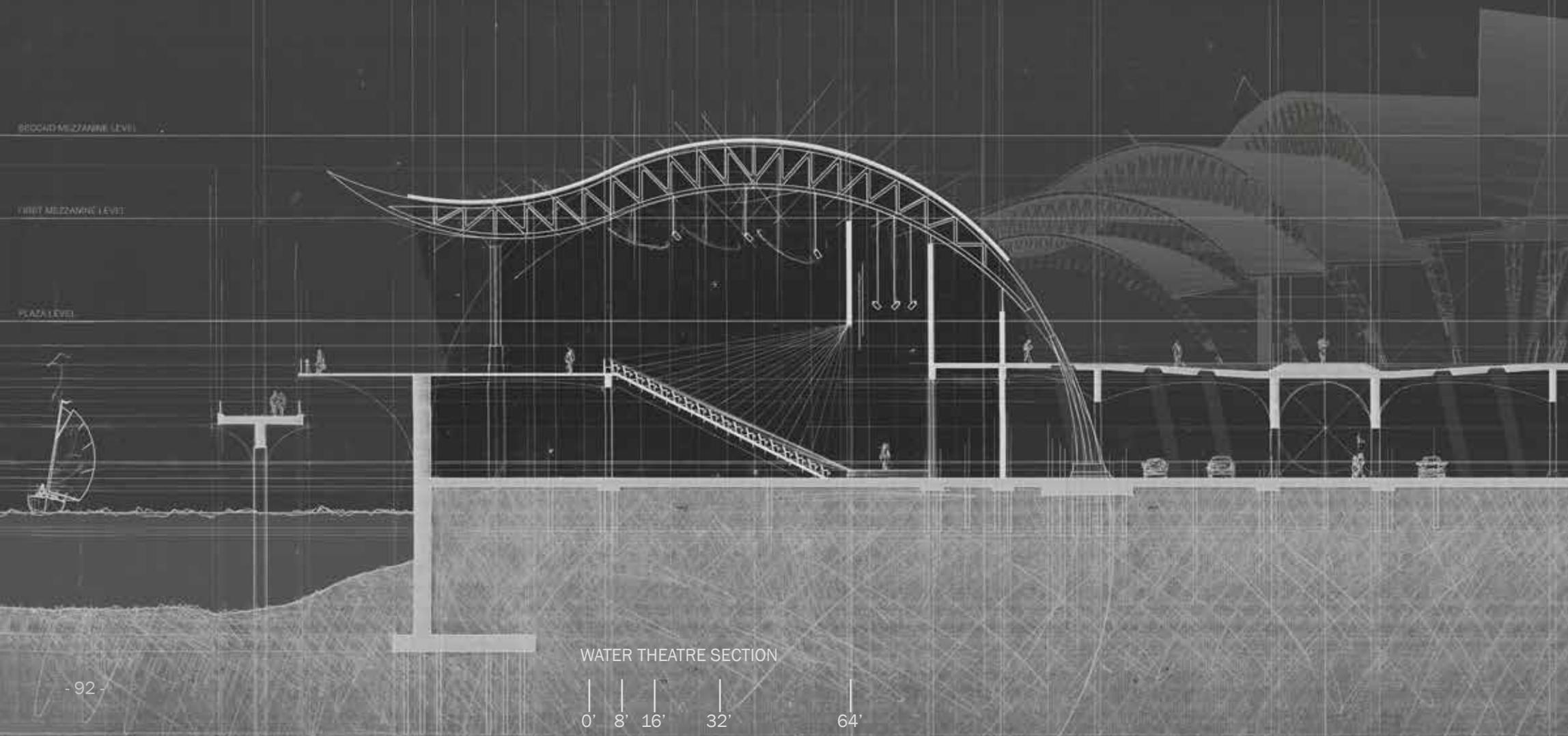
Project No.

ROOF LEVEL

BROCADE MEZZANINE LEVEL

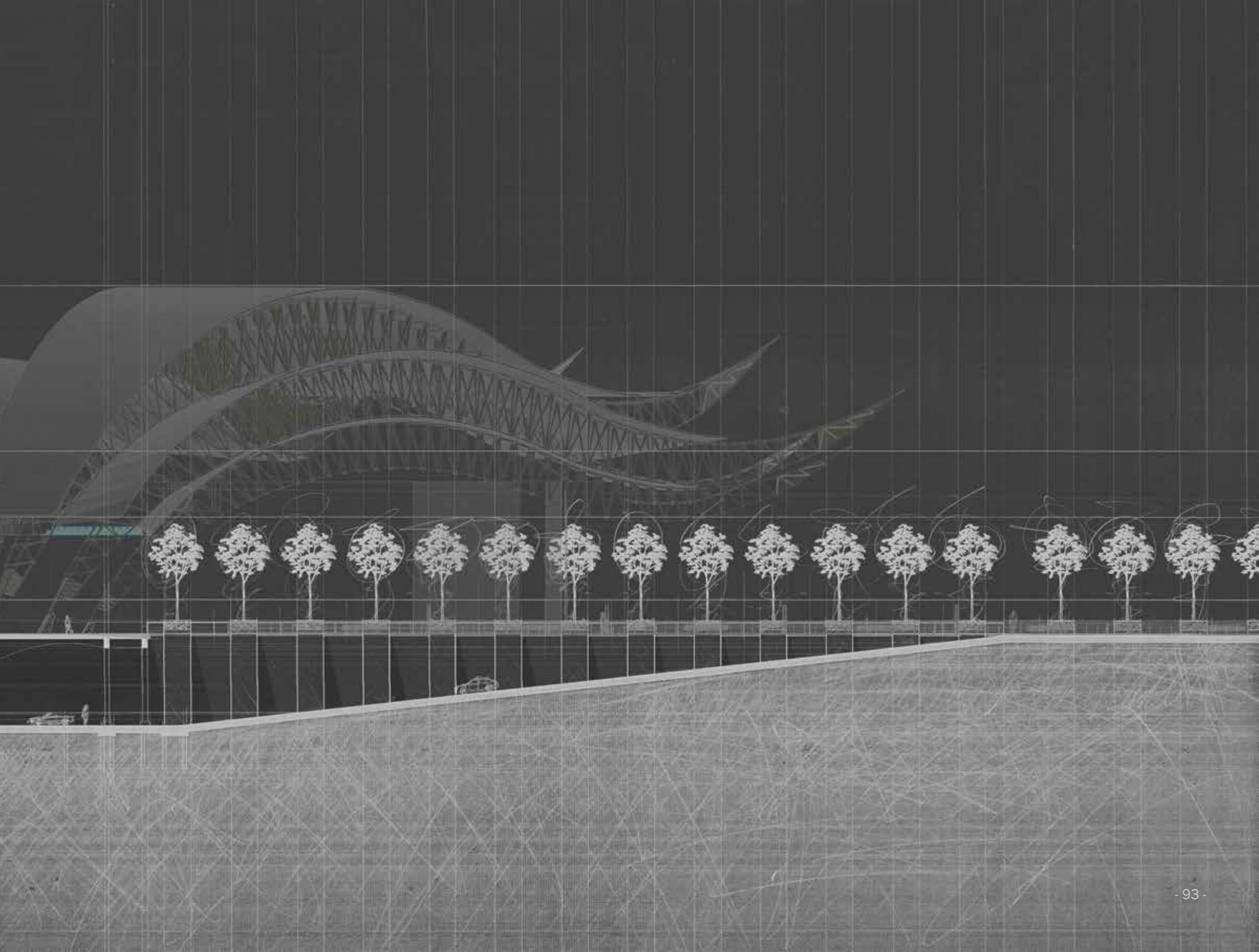
THIRD MEZZANINE LEVEL

PLAZA LEVEL



WATER THEATRE SECTION

0' 8' 16' 32' 64'



ROOF LEVEL

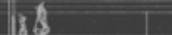
SECOND MEZZANINE LEVEL

FIRST MEZZANINE LEVEL

PLAZA LEVEL

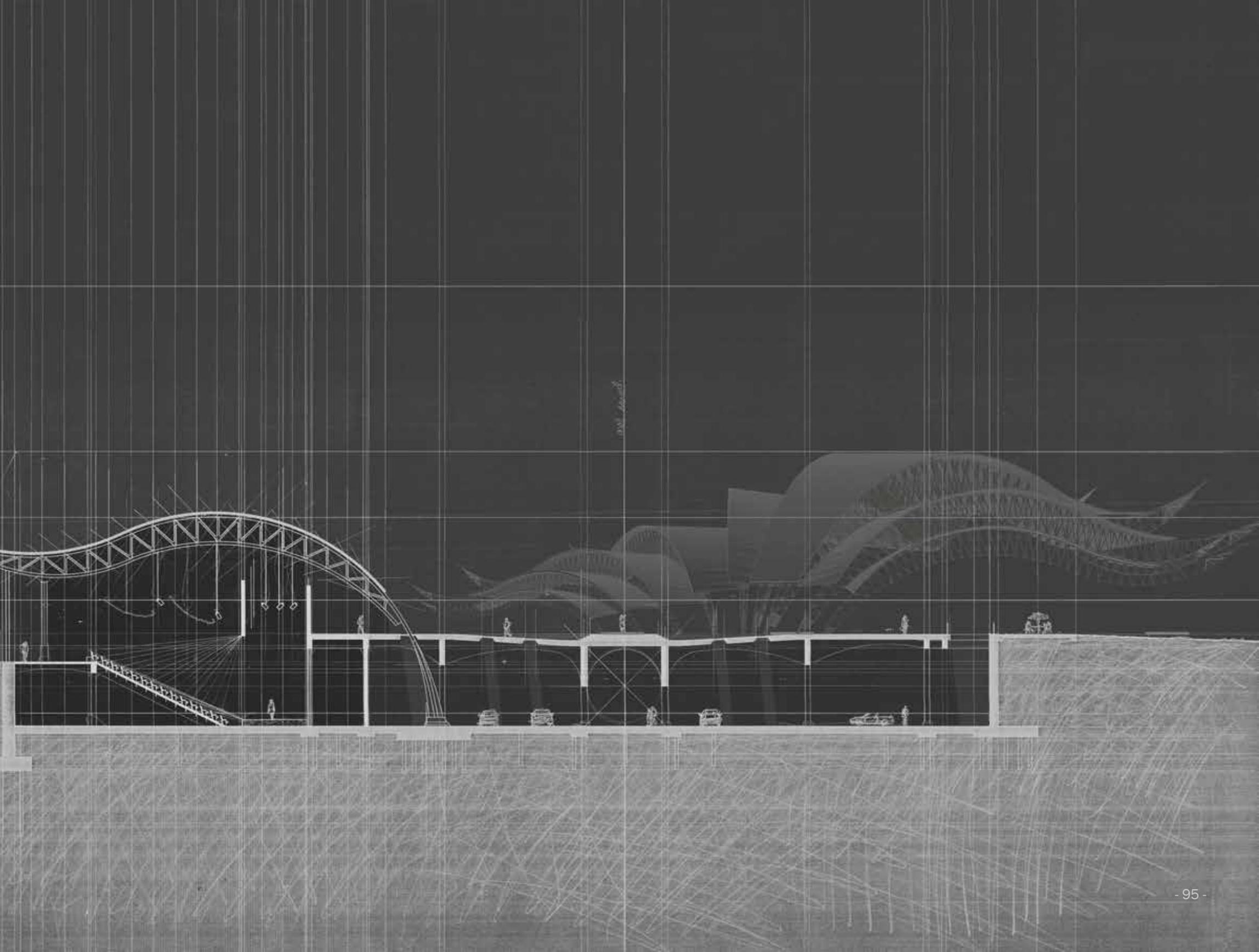
BASEMENT LEVEL

SEA LEVEL



FIRE THEATRE SECTION





Water

earth

air

fire

2 equilateral
triangles

4 elements:
Creation

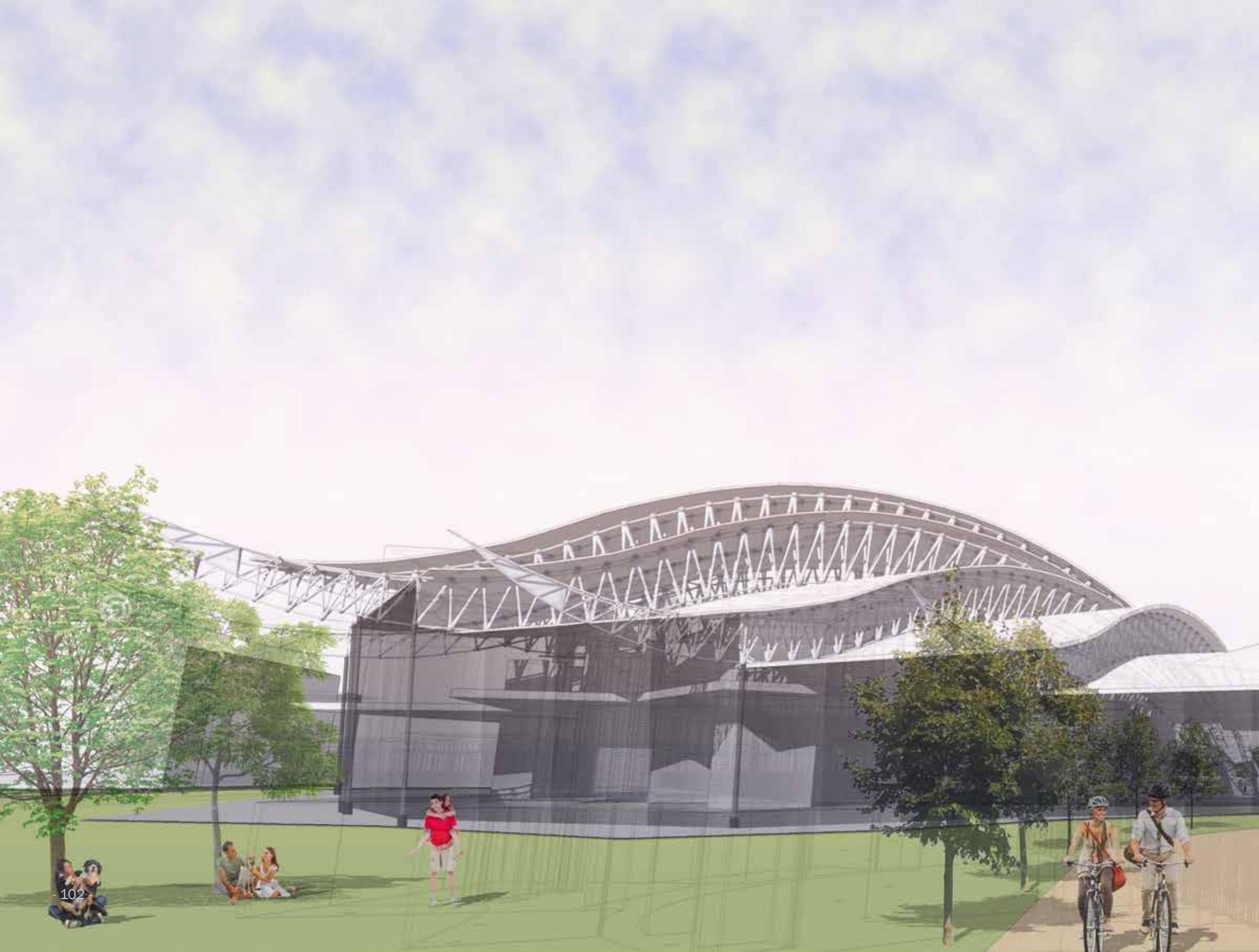
phenomena
beautifully perceived individual experience within an organic architecture











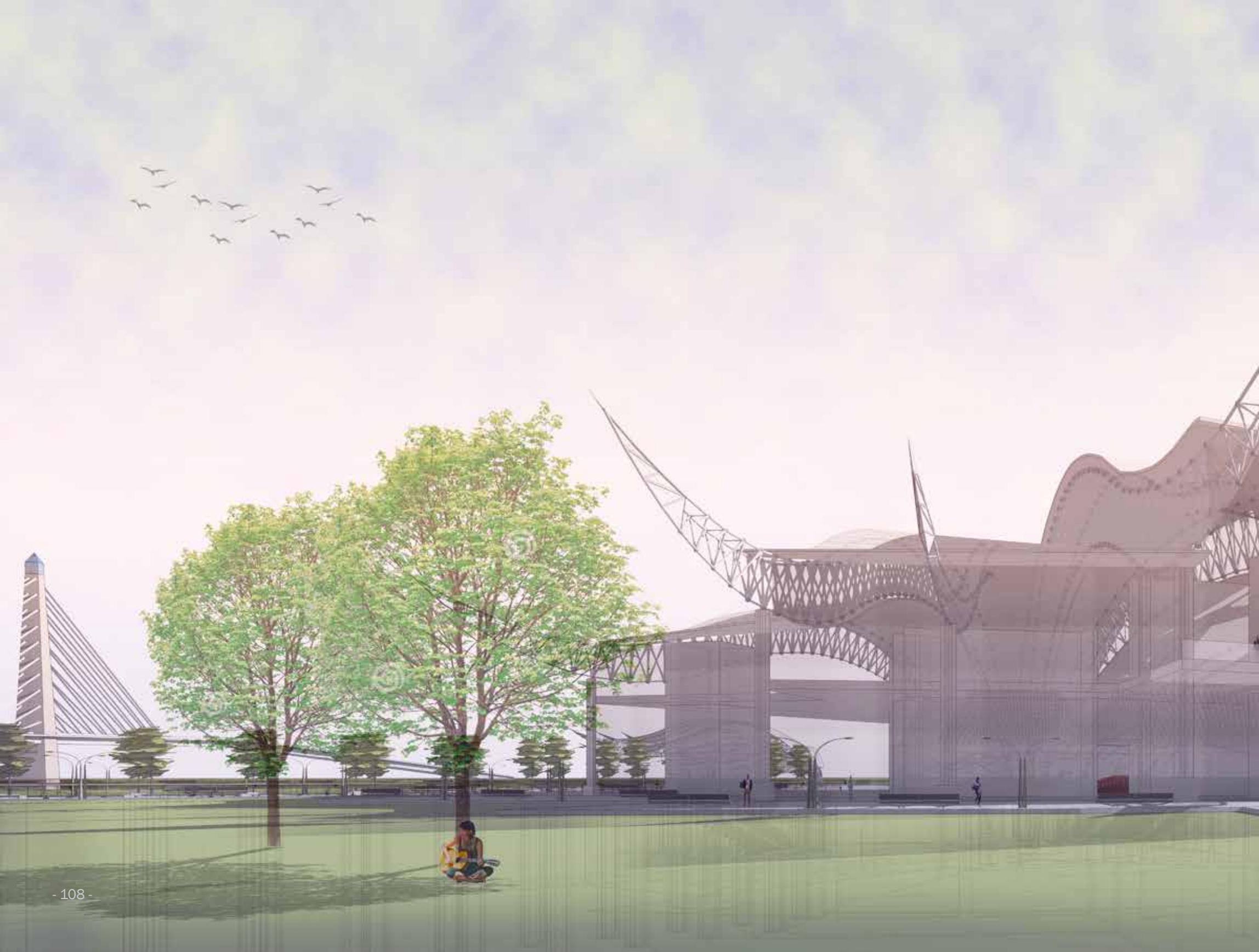






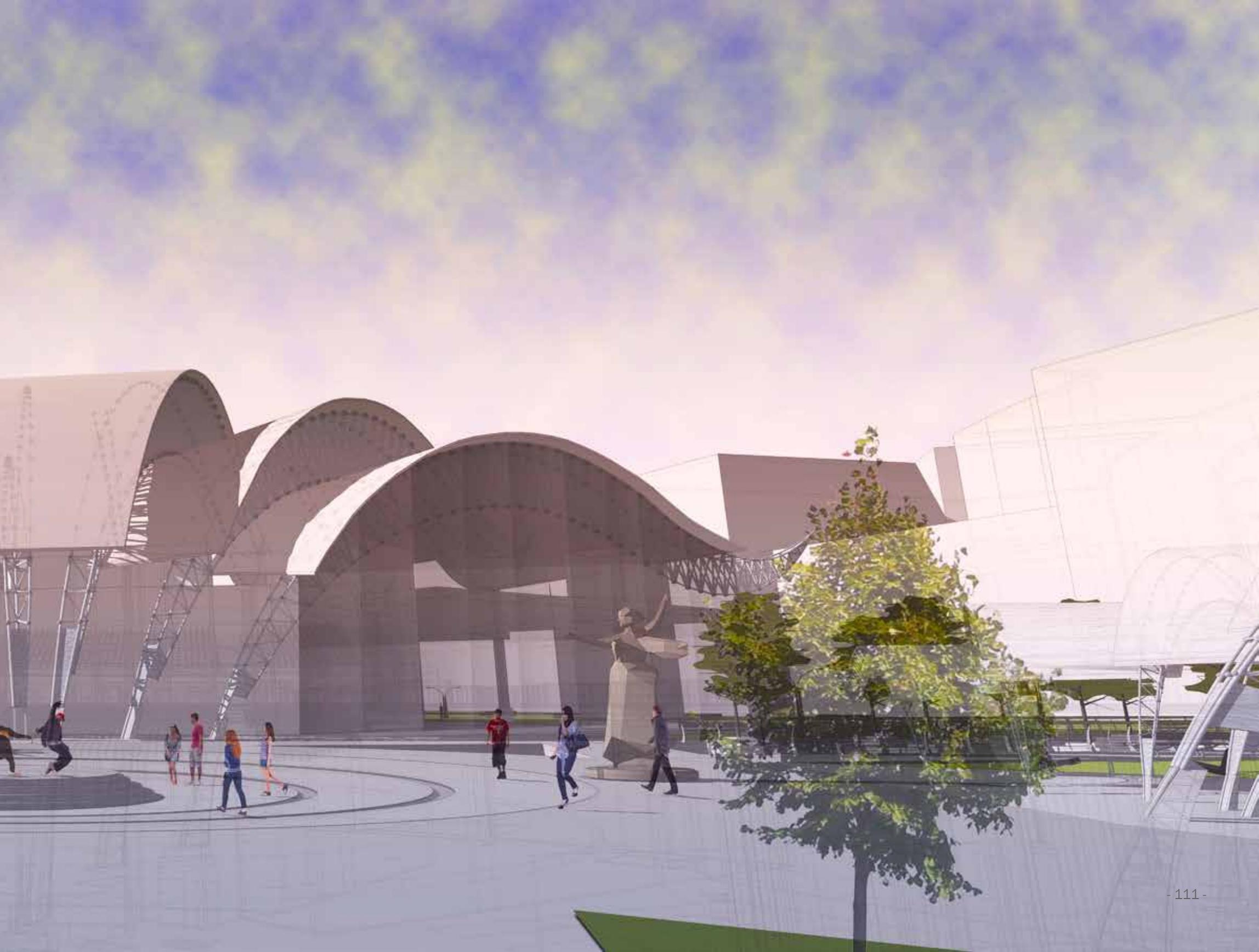




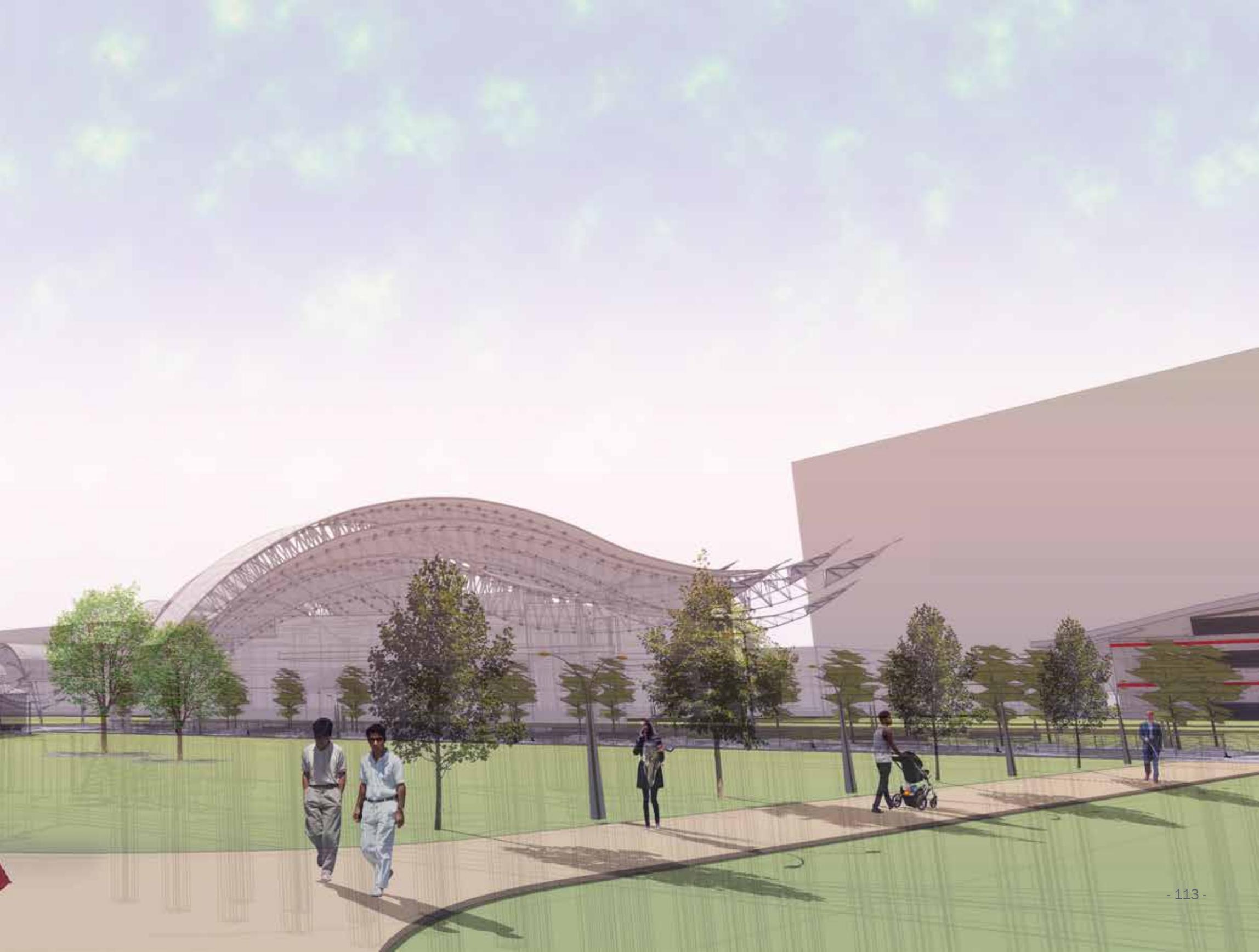












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“There are many persons to whom it gives pleasure to behold a cathedral; who are delighted with pictures and poems; but who will never take the trouble to find out who was the architect or the author of the work. Naturally - or at least it should be so - interest is shown for the works and not for the names of authors and details of their lives. One may well wonder whether it would not be better to play compositions without mentioning the names of composers.”

— Béla Bartók



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