THE PHYSICAL FROM THE VOID

by

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ABSTRACT

This thesis confronts the ultimate limits of perceiving the constructed world and the limits of our ability to experience architecture. The imperative of architecture is poetic: to and project encounters between matter and energy that shape the existing and bring forth the as yet unimagined to form a continuing human world. This is explored through the imagining of a habitat and vessel that projects the human endeavor of architecture into the formless depth of space.

In drawing the physical from the void, the page becomes a way to move architecture from non-existence into the real by means of the imagination. An imagined world is drawn from the void in search of the center for a universal and humanist architecture. The thesis is conceived as a vehicle for drawing the limits of perception when we attempt to imagine that which is greater than ourselves.
ACKNOWLEDGMENTS

To my wife, Caitlin Burton
To my tireless committee, Hans Rott, Scott Gartner, and Steve Thompson
To my classmates and colleagues for asking the hard questions
To my mom, dad, brother, and all of my family
And to every other teacher who never asked for the right answer
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Man is an imagining being
A void is an emptiness. Emptiness can be a characteristic of space, but space demands a boundary, and even asks for us to imagine a structure. A void is instead all emptiness.

The definition of void expands its reach based upon what the context requires. A void can be the locations which are lacking some thing or some quality, or it can stretch to encompass an imagined time or place which lacks these characteristics of both time and place. Void can even suppose an enduring condition of which there need be no opposing condition. This unopposed void is difficult to imagine, not simply because it asks for a comparison to some thing, but because it is that condition of horror with which a conscious must deal in imagining its own end.

In the beginning and in the end we have our backs to a void. Two voids bounded in between with events that are perceived by a being with flawed perception, limited agency, and mortal memory. The void in this thesis is that which is imagined to exist before structure, before materiality, before thought.

The void will be the precursor to understanding the point, the line, the plane, the volume. If a point is that which has no part, the void is that which has no that. The point, the line, the plane and the volume come into existence by their imagined interactions with each other and their coexistence within time.

There may have been a boundless void, and that non-entity may return to erase that which has been made, but for now there is a here and there is action. The only thing external to the void is the imagining being, and this is the beginning of architecture.

There is no Architecture in the void. Architecture is action upon the physical. The idea of architecture is not entirely physical, but the architect must simply dream, imagine, draw and the thought in a void, and these intentions move into the world of the physical.

What kind of a thing is space if it is both physical and immaterial? We have a similar difficulty with the mind. It has physical aspects, such as the ability to affect the body, yet it does not seem to be material.

Nick Huggett, Space from Zeno to Einstein
Matter and energy, space and material, vacuum and density, light, gravity, time, motion. All these things are imagined, all are physical. The physical is not only matter, what can be touched or extends into space, but space itself.

The physicality of space is difficult to assume as a universal when concerning its experience by human senses. Even the ‘space’ of geometric actions and rules are mediated by our ability to accept and assume certain external ideals of how observed phenomena relate to universal laws. The human senses - and the way the human mind is able to draw upon them as memory or project them as imagination - are primary means by which we begin to formulate the idea that living and experiencing are not void, and that even the not-self beyond the boundaries of our corporal form also has properties and rules that give it substance and being.

To understand space, we must imagine that which is infinite and imperceivable and infer that even though we cannot directly perceive it’s rules, it is governed by rules, and that it has distinct properties. The physical is comprised of both that which can be formed, and that which gives form meaning by encompassing that form. This is not void, for if there were no rules as there are in space, then there could be no way by which physical matter could interrupt or change our perception of space.

This thesis attempts to create an architecture that explores possibilities of physical order that is apart from the specific conditions of our world of origin. Expansion of human endeavor into space is not an intuitive progression for the way that we currently live and build. The depths of space have been viewed throughout history as both heavenly perfection and unknown void. We have come to understand that while space is certainly foreign to human perception, it is nonetheless a nature that we can also begin to understand, interact with, and inhabit. In a certain way, we already inhabit space, but in order to be architecture, our inhabitation must be an intentional matter. Settlement on the habitat is not mandatory, projection of the human endeavor does not strictly follow an imperative for survival. The habitat will travel the expanding solar winds into the interstellar medium whether or not its inhabitants still persist. It will follow its predecessors as an operational artifact of humankind, not a monument to human totality.

For the moment, we need to keep in mind three types of things: that which comes to be, that in which it comes to be, and that after which the thing coming to be is modeled, and which is its source.

Plato, Timaeus
SPACE AND PERCEPTION

One must note first that Edmund Husserl did want to develop a self-contained theory of space, but only stated, in which way the "sense of space" derived from consciousness - from transcendental subjectivity - is to be understood. His question is thus: What does man understand exclusively due to his consciousness - information and actions by "space"? In the search for the answer he emphasized - as in all his analytic work concerned with consciousness - the "reduction of the given" to "pure consciousness". He also excluded all sense data. Thus it was shown, that without consideration of sense-activity no fruitful statement about space is possible to any reasonable extent. So, whatever the "sense of space" is for humans, is primarily determined by the senses. However if the space-experience is to determine the "sense of space", then one must involve corporeality (bodily-physicality). As the only moment capable of space-experience of corporeality Husserl choses the Kinaesthesia. As noted above, Kinaesthetics is of great importance for space-experience, but it is not the only moment allowing it. Husserl's space phenomenology inspiringly affected further arguments concerned with the space-problematic by their intentions:

1. to relate space strictly to human consciousness
2. to reduce any "constitution of space" strictly to (Eigenbewegung) autonomous movement.

Even a short argument with his phenomenological approach (7th chapter IITH 2nd a) shows however that

1. the description of space-experience without consideration of "the sensible" is not possible,
2. that space cannot be constituted through conscious acts
3. That space in its structure- even as spatial order is already always presupposed

What is left to be questioned is how naively experiencing human beings can understand and comprehend space.

Alexander Gosztonyi (tr. HCR) The Significance of Husserl's Phenomenology for the Problematic of Space
The first thing they observed is number, and it is of two sorts, even and uneven, and they made use of both, but in different occasions: for, from the imitation of nature, they never made the ribs of their structures, that is to say, the columns, angles and the like, in uneven numbers; as you shall not find any animal that stands or moves upon an odd number of feet. On the contrary, they made their apertures always in uneven numbers, as nature herself has done in some instances, for though in animals she has placed an ear, an eye and a nostril on each side, yet the great aperture, the mouth, she has set singly in the middle. But among these numbers, whether even or uneven, there are some which seem to be greater favorites with nature than others, and more celebrated among learned men, which architects have borrowed for the composition of the numbers of their edifices upon account of their being endowed with some qualities which make them more valuable than any others.

It is certain that a Temple built in honour of the Divinity should always be immense. Such a temple must be the most striking and the largest image of all that exists; it should, if that were possible, appear to be the universe. To be reduced to what is called necessity when designing a temple is to forget one's subject.

0 Newton! With the range of your intelligence and the sublime nature of your Genius, you have defined the shape of the earth; I have conceived the idea of enveloping you with your discovery. That is as it were to envelop you in your own self. How can I find outside you anything worthy of you? It was these ideas that made me want to make the sepulcher in the shape of the earth. In imitation of the ancients and to pay homage to you I have surrounded it with flowers and cypress trees.

The conception of the interior of this tomb is in the same spirit. By using your divine system, Newton, to create the sepulchral lamp that lights thy tomb, it seems that I have made myself sublime. It is only decoration I felt I should use. I would have felt I was committing sacrilege if I had used any other decoration for this monument.

Étienne Louis Boullée
When I draw, the drawing is not a step toward the built, but an autonomous reality that I try to anticipate. It’s a process of anticipation - anticipating that a line becomes an edge, that a plane becomes a wall; the texture of the graphite becomes the texture of the built. When you translate the drawings, one has to acknowledge the drawings you make in this autonomous process - where the drawing is the ultimate reality. I draw first for myself, not for somebody who is building - which means there has to be an absolute clarity in my mind, and the ability to retain the idea that I’ve established in the drawing, and furthermore, an anticipation that this idea could be build-able.

In the solitude of darkness I imagine a life compared not by necessities but by the desire to survive using all the forces logic can provide compressing all the thoughts of reason without the senseless gestures of betrayal to unlock its secrets shattering knowledge in desperate search without remorse never able to reach beyond the thoughts which empowered me to imagine.

I try to manifest the presence of the horizons
my eyes become earth
projected fragments
of a weightless body
without dimension
without possible modulation
in space or time

Raimond Abraham
Newton and Descartes considered Time a neutral product of relationships between energy and matter, or a condition essentially independent of them. Their Time was a linear field of infinite extension, described by regular increments; accordingly, their universe was not only eternal, but also of infinite measure. Einstein, however, conceived a different Time, one interdependent with the mechanics of motion and materiality. His time is a time of transparency and elasticity, of a subtle and complex interval and modulation. A forceful, active Time that colors and shapes events. His universe is a warp of finite duration and boundary yet of infinite renewal and continuity. The form of the Einsteinian is related to the most ancient symbol of the cosmos: the circle set in motion by Time to create the epicycles of day, month, year, millennium.

Everyone now knows how to find the meaning of life within himself. But mankind wasn’t always so lucky. Men and women did not always have such easy access to the puzzle boxes within them. Mankind, ignorant of the truths that lie within every human being, looked outward - pushed ever outward. What mankind hoped to learn in its outward push was who was actually in charge of all creation, and what creation was all about. Mankind flung its advance agents ever outward, and eventually it flung them into space, into the colorless, tasteless, weightless sea of outwardness without end.

We are a long way from Earth. Our home planet is one I doubt we shall ever see again, but if we are to survive here we must maintain ourselves as a microcosm of Earth. As long as the buildings of our city remain, so long shall man survive in this place. Protection and preservation of our home is paramount.

Sometimes the house of the future is better built, lighter and larger than all the houses of the past, so that the image of the dream house is opposed to that of the childhood home. Late in life, with indomitable courage, we continue to say that we are going to do what we have not yet done: we are going to build a house. This dream house may be merely a dream of ownership, the embodiment of everything that is considered convenient, comfortable, healthy, sound, desirable, by other people. It must therefore satisfy both pride and reason, two irreconcilable terms. Maybe it is a good thing for us to keep a few dreams of a house that we shall live in later, always later, so much later, in fact, that we shall not have time to achieve it. For a house that was final, one that stood in symmetrical relation to the house we were born in, would lead to thoughts, serious, sad thoughts, and not to dreams. It is better to live in a state of impermanence than in one of finality.

May there not arise, perhaps in another generation, architects who - appreciating the influence of the unconsciously received, will learn consciously to direct it.
The world is an inhabitable construct seven million miles in circumference. The main part of the world is the outermost perimeter ring that is spinning with a full rotation every twenty four hours to provide one G of pseudo-gravitational force on the inside face of the plates that make up the ring. The world is constructed outward from a central hub in a series of concentric rings that serve as both habitation and the construction facilities for the expanding megastructure as it reaches its ultimate size. The world is 'lowered' from the central hub and then from concentric facilities into place in diametrically opposed pairs of plates with seven hundred groups of tethers which eventually extend the full radius of over one million miles.

The shape of the ring, when its construction is best understood perceptually from a distant vantage as a thin circle of light, is closely linked to that other rare astronomical arrangement of the eclipse, or more generally the transit, where part of one body is occluded by another. This occurrence is also understood only by perception, where it is necessary to propose a single of limited point of view in order to call the event of the transit a thing. It may not even be a thing in the way we normally understand the physical world, but if one considers the event as an observed arrangement in time, then it is certainly a single physical thing.

From the point of an observer on Earth, a solar eclipse occurs because although the Sun’s diameter is 400 times that of the Moon, its further distance means that they take up almost the exact same angular portion of the observable sky. The difference in the furthest point opposed to the nearest point of the Moon’s orbit marks the difference between a total eclipse, where the moon completely occludes the Sun, and an annular eclipse, where the moon’s angular size is smaller than that of the sun, and appears as a bright ring.

The constructed world lies on an elliptical orbit with a perihelion between the orbits of Earth and Mars, and an aphelion between the orbits of Mars and Jupiter. Upon alignment of the Earth, the Sun, and the constructed world at aphelion with the ring diametrically opposed to the position of the Earth in its orbit, which occurs once every certain number of years, the world’s angular size from an observer on the earth is approximately 0.65 degrees, larger than the 0.51 degrees occupied but the Sun. Thus, the constructed world will appear to encircle the sun, extending .07 degrees or 14% past the Sun’s diameter at its 20 degrees tilt to the ecliptic even at its furthest from Earth.
An order of proportion based on the human body governs architecture at the scale perceived by the individual. An order of proportion based on the positions of the Sun and the eight planets, their relative sizes, distances, and their additive periodic motion determines the correct relationship of objects that are arranged at scales which cannot be perceived but rather must be experienced as part of the travel within this world.

Over time, the traveling individual accumulates the required sensations that help to correctly judge distances and proportions which cannot be understood through typical sensory means. Memory of a repeated act becomes sensation. The order of interplanetary distances can be understood currently by a few rudimentary facts that begin to address the vast distances and differences involved: the Apollo missions took about three days to get to the Moon, light takes about eight minutes to reach Earth from the Sun, and a journey to Mars with a contemporary level of technological capability would take seven months.

The path of light from the Sun is assumed to be direct, and traveling to the Moon is relatively simple, but even Mars, with a year nearly twice as long as that on Earth, requires the journey to be framed within windows that make the actual travel distance over five times the nominal distance between the orbits. Similar complications arise from travel in and around the constructed world, so the proportioning system is not accurately representative of human experience of the cosmological orders, but rather stands in for the idea that certain aspects of the relationships of cosmic bodies are knowable by human senses.
The life of an individual on a constructed world concerns in large part the journey by which that person comes to understand the means by which the world is constructed, and how their perception of reality alters and is altered by this growing understanding. The people in this world experience and maintain constructs on a massive scale, invisible mechanisms, complex interdependent systems, slowly emerging natural beauty, and tricks of perception. Both spanning the long duration of construction and over the course of a single life and generation, the composition of the world will change. Even those factors that remain constant may seem counterintuitive or even contradictory to basic facts of human evolution which has shaped our particular existence over a much longer time than it will take to construct and inhabit this world. Thus a basic tenet of life, growth, and continuation of this endeavor will be that each individual come to learn the why, the how, and the what of the world.

The individual formally accepts responsibility for the making and continuation of the world. The activities change but the duty remains the same - to be a co-creator and steward of the construct known as the world. When the Order of Armillia is assumed, the individual receives a bracelet that indicates their initiation and reflects the shape of the world. The individual may wear this or not during life, but in death must wear it in some fashion. It is neither owned nor borrowed, but imposed upon the material dimension of a life lived upon the world. Learning at this time is marked by study of the wider cosmos, what other rules govern the universe at large and small scales, what other bodies are out there and how do they interact, and where the world will travel in time to come. Named for the astronomical instrument of interconnected rings surrounding a sphere which depicts the planes of rotation and movement of the cosmos around Earth of origin. The world has now become one of those rings, and the origin is now the human, encircled by the new, constructed world. The emblem depicts a simplified armilliary sphere, or the world from three angles, with a circle at the center to mark where the two ellipses create a squared form. This represents the device, and its appropriation as depicting the human at the center of the new constructed world, but also reflects the nature of perception, showing that the world could be a circle or a ring or simply an object depending upon vantage point, and that what might appear square at one scale may not be when examined more closely.

An individual may assume the role of a teacher. Becoming a student of the Equatoria is a choice to pass on knowledge, encourage learning, explore possibilities of thought, understand the nature of Ideas, and travel for the purpose of observation, documentation, and imparting of wisdom. There is no outward object or sign that accompanies this choice, but an equatorial individual is often informally known by where they conduct their teaching, how many degrees they have traveled, or how many cities they have visited. A traveling Equatoria travels out of the plane of the true midpoint of the world, so that their path echoes the difference between the sun-earth ecliptic and the equator of the earth of origin. Their path also indicates their city of origin, to within a binary opposition of certainty. Named for a astrological navigational instrument that represents the motion of the heavenly bodies in two-dimensional geometry. The emblem depicts the instrument as an empty vessel in which the equatoria constructs a world of the known.

An individual may venture outside of the world as an explorer. The Triquetrium goes in search of the unknown and the perhaps unknowable. The responsibility of this role is first and foremost to travel into the outer observed universe. Incremental improvements in devices and thinking that aid understanding of distant phenomena are limited to inference and deduction, as well as the important perceptual concept of angular size. In order to truly understand the cosmos, the world must venture forth into the gap between the stars. The Triquetrium is composed of pioneers, emissaries, restless souls who seek the unseen, who must know the reality of the stars and are prepared never to return, but to sow the foundation for the future of the worlds throughout the galaxy and the larger universe. Named for the last most used of the naked-eye instruments before the telescope which simply measures the azimuth of an astronomical body. The Triquetrium represents a simple goal - to continue to be, in whatever way that we understand the condition of existence. The emblem depicts the a form in the cardinal directions of the historical voyages with the dividing angle and object, implying both an added dimension and singular purpose.
From The Narrative Questions of Place and Perception, Tellurion Studies:

The Origin of the Universe
Initial conditions of spatial and temporal differentiation
The nature of physical presence and persistence or change over time
Imbalanced physicality and cyclical processes of physical interaction
The particular history of the universe or how physical laws shape reality
Circumstances allowing for the condition of life
Factors affecting the development and spread of life

The Origins of Life
The definition of life
Critical characteristics of life
Definition of consciousness
Critical characteristics of consciousness

Characteristics of Life
Self-replicating
Self-aware
Singly chosen
Concept of self
Free will
Complexity
Motion
Self-organizing
Sensation
Accumulation of error
Adaptation
Persistence
Survival

Characteristics of Living
Material
Form
Essence
Action
Thought
Agency
Sense
Isolation
Predestination
Purpose
Reason

Origins of Consciousness
Awareness of environment
Awareness of self
Awareness of other consciousness
Awareness of self-hood in other consciousness
Ability of consciousness to control response to environment
Ability of consciousness to override demands of self in recognition of whole
Encounter of wholeness within self
Decisions to judge consciousness paramount
Desire for creation
<table>
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<th>SUN</th>
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<th>VENUS</th>
<th>EARTH</th>
<th>MARS</th>
<th>JUPITER</th>
<th>SATURN</th>
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A year of travel to windward takes the student of the Orrery ten thousand miles by walking. In order to make it from one city to the next in a year, and assuming there is a city at each tether where the sky meets the ground, the world with an inner circumference of seven million miles will have seven hundred tethers or groups of tethers, and seven hundred main cities. This journey will take the individual about half of a degree to windward. The individual may then walk back leeward to the city of origin, traversing another half degree or 30 arc-minutes for a total of one degree, but leading back to the same place. The individual may also move on another 30 minutes to windward, also completing a full degree. In either case, one place is a home, the journey is a way to see, the destination city is mirror, and the second part of the journey is a choice.

This journey is the most important part of the civilized orders. The conception of this endeavor is that the individuals who participate share a common aim, but the differences between cultures on the constructed world will begin as soon as the first pair of concentric plates are guided outward from the central hub. The successive generations of builders will learn shared values, and will all look back up at the same center, but these new inhabitants will change in other ways, drifting apart and thinking new ideas. The journey of the Orrarian marks the interdependence of each community on all the others, and continues a cycle of exchange that reaffirms the common goal. The civilizations on the world may change, but must never waver on the journey. Their journey is that of all humankind.

**Instruments of the World**

The Solar Furnace  
The Shield Room  
The Magnet Ring  
The Outward Bay  
The Solid Orrery  
The Holographic Observatory  
The Temporary Cell  
The Substrate Barrier  
The Interstitial Material  
The Matter Forge  
The Up Elevator  
The Volume Aperture  
The Willing Path  
The Circle City  
The Sensory Pause  
The Scalar Globe  
The True Center  
The Outer Port  
The Structural Tether  
The Connection Spire  
The Walled River  
The Coriolis Spiral  
The Gravity Stair  
The Windward Walk  
The Leeward Way  
The Suspended Viaduct  
The Pillar Temple  
The Linear Singularity  
The Unfolded Sequencer  
The Primary Lattice  
The Secondary Arcade  
The Pylon Field  
The Stationary Torus
From Incomplete Taxonomies. Equatorial Scholar Entry:

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<td>GUSTAVE DE COURiOS</td>
<td>JOSEPH LAGRANGE</td>
<td>MAX PLANCK</td>
<td>DAVID HILBERT</td>
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</table>

Names of those who have drawn space from the unthinking depths of the void.

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Names of those who have drawn space from the unthinking depths of the void.

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Those who have gone before
Cosmological architecture and the constructed world.

As architecture is a physical discipline, it may one day encounter a domain in which it will need to confront the fact that classical mechanics do not entirely describe reality for things. Practical physical tools of architecture are already under the effects of quantum and relativistic physical laws. The most apparent example of both general and special relativity can be observed in the operational design of GPS satellites. Special relativity states that the faster an object is moving relative to an observer, time will pass slower for that object than for the observer. The speed at which these satellites orbit the Earth would have to slightly faster second to account for this difference. General relativity states that gravity, like acceleration, slows time for the object upon which it is acting. In the case of GPS satellites, their distance from the pull of earth has an opposite effect upon their clocks. The effect of general relativity is nearly six times stronger than effect of special relativity, so the net effect is that the clocks must be calibrated for a slightly slower second than clocks further down the gravity well of earth.

Our interaction with these effects is limited to such simple functional solutions, yet when the world itself is a constructed environment, every physical effect of these larger cosmological laws will be an important part of both building and living within its volumes and upon its surfaces. The constructed world will be in more direct exploration of possibilities and challenges in the relativistic and quantum regimes of physical law. The size, rotation speed, and necessary strength and protection of this construct will be part of living, and create apparent changes from one part of the word to the other. In order to attain architecture at this scale, these forces must be understood, channeled and reflected in the form of every element of the built environment. The architect takes on responsibility for placing the world within these wider cosmological constraints and expanding upon pure function to create a universal architecture of humankind.

For architecture to exist, the physical must stand against the void.

The building of this world is both purposeful and poetic. The factors of gravitation and light are the basic constraints of the constructed world. The world is a circle 7 million miles in circumference, with concentric rings of construction facilities built out in diametrically opposed pairs of sections from a central hub. The hub receives matter from redirected trojan asteroids at the L4 and L5 Lagrange points between the sun and Jupiter. The remainder of the asteroid belt is redirected towards these gravitational equilibrium points which serve as quarters for the material needed to construct the world. The total mass of the asteroid belt is both very diffuse and insufficient to provide materials for the construction of this world. The Kuiper belt, the Oort cloud, and certain lesser bodies will be necessary in the full construction of this world. The world will remain incomplete until the inevitable destruction of the solar system by the Sun at the end of it’s life cycle is approaching. This will mark the opportunity for the facilities of the world to consume the mass of all the planets and even some of the expanding Sun in order to fully complete its form and be ejected out into the interstellar medium on a focused beam of light hitting a newly deployed stellar sail one hundred million miles in diameter.

Implications of the sublime.

The most important factors in the continuation of human life beyond the bounds of this earth are the physical, the spiritual, and the unknown. In the constructed world, Gravity is a sensed, corporeal effect upon the physical and light is perceived evidence of a spiritual dimension manifested upon physicality. The parameter of the unknown is the ever-present, unknowable, un-sensed yet wholly real thing against which the thoughts of our minds can form as silhouettes. This is not the void, but unreachable physicality that we can imagine fills every void into which we will never look, and creates our everything out of those endless nothings and keeps our existence discernible from the null.

The unknown, the immeasurable, the invisible - this is represented by the internal workings of the man made construct, and its functions. The method by which the inhabitants are protected by the third significant danger to life (solar high energy particles and galactic cosmic rays) is an internal technology which makes use of invisible, intangible forces to combat the damaging energies of cosmic wind. The idea of a material shield not only adds an undesirable impure and additive architectural requirement to the functional purity of the structures shape, it actually increases the chance of harm to inhabitants from secondary particle scattering. Many materials and thicknesses have been studied for their scatter reaction to galactic cosmic radiation, and while there is a certain level at which thicknesses of most materials begin to show efficacy, the proportions of mass between structure and shielding become disproportionate long before becoming useful. Our current protection is provided both by the atmosphere and the immense dynamically protective magnetic field generated by earth’s molten metal core. Water, incidentally, seems the most effective static shield against GCR events, perhaps, like the transparency of water to our aquatic-evolved eyes, because of our origins as evolving organisms in the ancient waters of earth. Taking our water and our magnetic sheath with us will be both necessary and symbolic.

Two things needed to rationally preserve life are not strict physical aspects of the constructed world, but are important parts of a remembered origin with which this architecture must contend. Water and the generation of magnetic fields, perhaps in conjunction, will serve as the practical barrier to incident cosmic rays and important elements of the unseen internal workings of the world that keep the stuff of life in balance with the vast unknown.

Another quality that ventures into the unknown are the embodiment properties of materials. While an engineer can describe the behavior of materials, and the architect can judge the appropriateness of materials, the scale and motion of the world will require material with properties of behavior and interaction that are not yet known. The materials used will be raw elements obtained and broken down from orbital matter, then woven back together for extreme and delicate purposes as unfathomable as the size and speed of the world they create. These uses will not be restricted to functional purposes. The architect of the constructed world will be charged with understanding the correctness of interactions between these exotic materials from where they bear upon each other and hold the world together, to where they form and support the inhabited spaces of the world, sitting next to many materials more familiar, making both parts anew in this strange context.

Coming back to the center.

Life within a cosmological architecture necessitates the positioning of the human body in relation to the heavenly bodies through which the habitat transits. The architecture also requires its own structure to be revealed in the order of proportion and hierarchy given to even the largest and most complex of the constructs. Thus the main point of departure for viewing the thesis is the connection of the radial tether and the circumferential lattice for orientation and focusing of tectonic aspiration, and the tactile detail and symbolic geometric language of the human-scale structures and objects found within the field of view of the drawings.

Gravity is a necessary function of human life on this new constructed world, but the perceived fictitious force of centripetal gravity is somewhat akin to the occupant away from the world, rather than pulling them towards it. Humanity has been freed from the fall. Instead of falling in and down, one falls through and outwards. Onwards perhaps. The human must still stand against, but the goal has become an aspiration towards the center, not the inexorable tug to the unseen depths from whence we came. We still strive towards a sky, but when we fall, we fall into the stars. The way in which gravity is created on this world implies that destiny lies out amongst the stars, no longer always back at the ground. Even while the interior surface is finally built to be an inhabitable surface of ground, with an atmosphere and a sky, the whole world is up in that sky, seen as a slender connection to the distant center. When an individual dies, their remains are ceremonially carried to the outer wall of the ring, and released the following day on a trajectory that intersects the Sun.

IMPERATIVES
Unresolved Parameters

Protection from the energies of the vacuum: The method of shielding or other intervention to protect the third most important factor for life. Potential solutions to the issue of solar radiation and galactic cosmic rays include electrostatic-inflated membrane enclosures, massive magnetic fields generated by circumferential emplacements or conduits, or a system of physical barriers composed primarily of water, the substance that shields living cells best against the immense energies of radiation traversing the vacuum of space.

The progression of the seasons: Tidal locking with a slight procession would provide a solution by maintaining a rotating tilt with respect to the ecliptic but would eliminate the possibility of rotation or day/night cycle, unless a majority of mass was locked and only a small proportion was rotating with it as an anchor. This is unacceptable because it negates the conception of this world as an autonomous object. The idea of using an external mirror array would allow for the most flexible control of light cast upon the surface of the world, but this would also become an additive solution that invalidates the original conception of axial tilt as a simple means to make the position, orientation, and motion of the world directly create the character of the environment within.

The tensile strength of materials: The maximum speed at which the edge of a cylindrical form of a given material can rotate is equal to the square root of its specific tensile strength (tensile strength over density). There is no known material that can withstand the inward centripetal force on the tethers and their connection points generated by the speed of 0.5c at which the outer ring will be rotating. This speed also creates the enormous hazard of possible foreign object collision. Even contact with a particle of dust with the mass of one gram would release 11,250,000,000,000 joules of energy, comparable with the force of the attack on Nagasaki. The use of magnetic fields or ‘exotic matter’ (speculative elements with as yet unobserved material properties) are possibilities for

The availability of matter: The total mass of the asteroid belt is very low - only about 5% the mass of Earth’s moon. This could only serve as the most basic framework upon which to build just the center hub of the world. The position of the asteroid belt, however, is advantageous because of the relative gravitational stability between the pull of the Sun and Jupiter. This serves as the place where material is collected and built into the world. Other possibilities for practical considerations of how much stuff is needed could look to the dwarf planets of the Kuiper belt, through which the voyager spacecraft has already traveled, and in which there is estimated to be matter totaling at least ten times the mass of earth. The amount of energy required to harvest this matter are enormous, but compared to the output of the sun, they are quite small. Another option could be the deconstruction of moons of planets, but this is unacceptable because it alters the major orders and proportions of the solar system from which the world is to obtain its rational form. To build on a mountain, you cannot remove the mountain.
I would like to specifically note Iain Banks’ Culture Series for stating the idea of a constructed habitat called an orbital rotating once every 24 hours and providing 1 G of pseudo-gravity. This construct is envisaged here as an exploration into what drives us to create architecture, and what lies ahead for our species in the imaginatively rich depths of space.
BIBLIOGRAPHY


ILLUSTRATIONS

p08 Etienne Louis Boulée - Cenotaph for Newton - 1780
p09 Raimund Abraham - Stargazer, from Loci Ultimi, the Last Abodes of Mankind, 2003
p10 1 - Lebbeus Woods - Einstein’s Tomb - Pamphlet Architecture 6