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URBAN ENVIRONMENTS AND THEIR ABILITY TO SUPPORT
HUMAN/NATURE RELATIONSHIPS

NICHOLAS SEAN BARAN
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Reviewed and approved* by the following:

Barry Kew
Assistant Professor of Landscape Architecture
Thesis Supervisor

Stuart Echols
Associate Professor of Landscape Architecture
Honors Adviser

Kelleann Foster
Associate Professor & Interim Department Head
of Landscape Architecture
Department Head

* Signatures are on file in the Schreyer Honors College.

Abstract

The majority of the human race, for the first time in its history, can be found living in urban environments. This thesis argues that this recent trend means the waning of humanity's interaction with the natural world which, in turn, jeopardizes the human ability to live. However, urban environments do not have to increase the rift between humanity and nature. This thesis proves that essential elements of nature can exist within urban environments through specific design gestures.

This thesis begins by examining the relationship between humanity and its environment of old, the natural world. This relationship is then followed through the evolution of humanity. Key moments that shift the composition of this relationship are defined. These moments include subsistence farming, the Industrial Revolution, and urban migration. It is argued that each shift brings with it a new frontier, furthering the rift between humanity and nature. The section concludes by examining humanity's most contemporary environment, and the one that is seemingly the most removed from nature: the urban environment.

A case is then made for the importance of a positive and healthy relationship between humanity and nature being incorporated into urban environments. Humanity's ability to live in these environments, going beyond sustaining life, is questioned. Research conducted through the study of Environmental Psychology is used to prove that humans need contact with nature, supporting E. O. Wilson's Biophilia hypothesis.

Once established, what comprises both "nature" and "urban" is analyzed. "Nature" is examined within a contemporary context, moving beyond the pristine and the untouched, while "urban" is defined by two of its constructive properties, volume and form. Both "nature" and "urban" are deconstructed so that the elements of each can be intertwined, proving that nature can exist in urban environments.

Table of Contents

Abstract.....	i
Table of Contents.....	ii
Acknowledgements.....	iii
Chapter 1 Humanity, Nature, and Urbanity.....	1
Chapter 2 Living Apart From Nature.....	10
Chapter 3 Nature Defined.....	17
Chapter 4 Elements of Urbanity.....	19
Chapter 5 Natural Volumes in Urbanity.....	24
Chapter 6 Natural Forms in Urbanity.....	45
Chapter 7 Conclusions.....	66
Bibliography.....	70

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chapter 1

Humanity, Nature, and Urbanity

The reason for addressing the evolutionary history of humans with regard to nature is not merely for nostalgic reflection. Humans and their ever-waning relationship with nature are in the midst of a fundamental transformation. To better understand the new relationship that has grown out of this transformation, humanity and its historic coexistence with nature must be understood. This section will examine: the historic human/nature relationship, the contemporary human/nature relationship, and the definition of “urban.”

the historic human/nature relationship

“The Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul.”¹ In Judeo-Christian mythology, this passage from the book of Genesis, the first passage of the Bible, illustrates the creation of man. Adam, this first human being, was made from the earth in God’s image and placed into the Garden of Eden. Eve, Adam’s partner, was then created from the rib of Adam. The two spent years living in the garden, seeking nourishment from its produce and living in a state of coexistence with the land and their natural surroundings. Adam and Eve are regarded by many who place their faith in Western doctrines of religion to be the first human beings, it is then from the procreation of these two beings that all human life was birthed.

In Mongol mythology, man and woman were created from clay. The Aboriginal peoples of Australia find their ancestral links in the land as well claiming the great rock monolith Uluru as one of their many totem symbols. Even the scientific community, often thought of as standing in direct contradiction to the fields of mythology and religion, bases its creation story on natural phenomenon and processes of evolution and the development from a natural, carbon infused source. Across the globe, various religious and ideological groups seek to explain the origins of humankind through various natural phenomenon. Although the details manifest themselves differently across mythologies, from clay to rock to rib, the important unifying aspect is that each belief proclaims that the parental unit of the human race is nature.

1: Bible.com. Gen. 2.7-2.8. Bible.com Ministries. 21 Oct. 2008 <<http://www.bibleontheweb.com/bible.asp>>.

Once human life was established, further genealogical and cultural evolution began. Five million years ago the earliest traces of the human race could be found roaming about the great jungles which once covered regions of present day Egypt.² It is in these jungles that science claims the race now known as *Homo sapien* split from their four-legged counterparts, the chimpanzees. The earth was in a state of transition at the time of this split. Changes in climate broke apart the jungles of northern Africa and replaced them with patches of fragmented forest separated by expansive grassland ecosystems. This shift in the world of early *Homo* forced the species to adapt. At this time, the human race learned to stand and took its first baby steps. Being able to stand upright in a savanna ecosystem is a crucial survival mechanism. One is able to stand up, gain prospect of that which is around and then return to a bent position if being hidden from view is desirable or necessary. Despite the fact that *Homo* left the Chimpanzees and the jungles behind for the savanna, they retained curved finger bones, a throwback to the old days of swinging from the trees with chimpanzees.³

Further changes in the global climate gradually inverted the forest dotted with savanna to savanna dotted with forest. This change, occurring roughly one hundred thousand years ago, brought with it the earliest record of seasonal change in the human environment. For the first time in human history, *Homo* (better referred to as *Homo erectus* at this point) began to understand seasonal changes as they related to temperature, migratory patterns, food, and water availability.⁴ This global temperature change created what is now recognized as the modern African Savannas interspersed with forested regions.⁵ The early human tribes of this period lived in a state of balanced coexistence with the land and traveled in small nomadic hunter-gatherer bands. The natural world was humanities' sustenance. When the natural balance of the land was disrupted (such as in the overzealous hunting of a species or in a drought) the animal's suffering was paralleled by humanities' suffering. If the animal or plant species died out, so did the tribe.⁶

2: Walker, Alan, and Shipman, Pat. The Wisdom of Bones: In Search of Human Origins. New York: Knopf. 1996.: 238

3: Megarry, Tim. Society in Prehistory: The Origins of Human Culture. New York: New York University Press. 1995.

4: Walker 1996: 239

5: Burenhult, Goran. Towards Homo Sapiens: Habilines, Erectines, and Neanderthals. In *The First Hhumans: Human Origins and History to 10,000 B.C.* Goran Burenhult, ed. Pp. 55-59. New York: HarperCollins.

6: Walker 1969

Post walking upright, the next greatest spike in the timeline of human evolution is subsistence farming and agricultural crop production. This transformation has been referred to as “the beginning of a profound shift away from the intimate, daily contact with other species that had characterized human existence for millennia.”⁷ This new understanding suggested that through the planting of desirable plants, a sustaining harvest could be cultivated. Subsistence farming radically changed the social structure within communities but also with the communities’ relationship to the land, to nature.⁸ Agricultural crop production remains a recent phenomenon in the evolution of humanity. Five thousand years ago only half of the world’s population had access to a stable, predictable, food supply produced by agricultural farming.⁹ Mathematically speaking, the process by which humans today receive the majority of their food, medicine, and raw plant materials, that of farming and harvesting, has only been familiar to the species for about 1% of its total existence.

The creation of a reliable and dependable food source and the need to till and care for the land, upon which this food source would grow, quickly resulted in significant social changes for humanity. To say that this shift marks the breaking point for the human/nature relationship would be a great misnomer. It only stands to mark the beginning of a transformation. Hunter-gatherer bands, which had previously lived nomadic lifestyles, were now static in location, creating more permanent housing structures and living in greater densities than ever before. Though no longer chasing wild game through the hills, these communities still depended heavily upon the land. Likewise, the land began to depend heavily upon them. The relationship between the two changed from one of calculated taking (as seen in hunter-gatherer societies) to one of reciprocal generosity (as seen in early sustenance agriculture). What man put into the land was expected to be returned in time. Again there was a balance. Unwarranted farming or overly ambitious tilling would rape the land of its nutrients, destroying its future potential to produce.

This sedentary lifestyle and the occasional overproduction of crop allowed time for intellectual development. Eventually, from this newfound time for retrospection, society and culture progressed. People began to live in increasingly large communities, furthering the

7: Walker 1969: 239

8: Gould, Kenneth A. Technological Change and the Environment. *Twenty Lessons in Environmental Sociology*. New York: Oxford University Press. 2009.: 97

9: Walker 1969: 239

disconnect between themselves and the natural world, disrupting the natural balance between humanity and nature. For a time humans themselves were not sure that these new social constructs would succeed.

With the rise of the Industrial Revolution came serious doubts about the success of these increasingly large communities. The first Sociologists to discuss these radically new environments are now household names: Karl Marx, Max Weber, and Emile Durkheim.¹⁰ Theorists doubted that these new social and physical constructs found within industrialized cities were going to be able to survive. One of the most famous examples of this doubt came from Thomas Robert Malthus and his now infamous doomsday prediction.¹¹

Malthus, living in England at the turn of the 19th century, saw poverty, death, and despair all around him. It was from such phenomenological observations that he predicted that the human race was doomed. According to his prediction, humanity could only sustain a certain number of its own kind. After that, there would not be enough food or resources for people to survive.¹² This bleak and uncertain period in human history is further documented in the flowering prose of Charles Dickens who beautifully described this period in the opening lines of his 1859 novel *A Tale of Two Cities*.

“It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, we were all going direct to heaven, we were all going direct the other way - in short, the period was so far like the present period, that some of its noisiest authorities insisted on its being received, for good or for evil, in the superlative degree of comparison only.”¹³

This passage by Dickens expresses the uncertainty of the time period. This was also a time when people rushed from the countryside to the city for work and the promise of a better life. The Industrial Revolution was thriving and failing farmers sought solace in city life. What they found instead were the epidemics Malthus was familiar with: Cholera (the product of contaminated drinking water), suffocating soot from factory smokestacks, and crime spawned

10: Gould 2009: 99

11: Malthus, T.R. *An Essay on Population*. New York: E.P. Dutton. 1865.

12: Malthus 1865

13: Dickens, Charles. *A Tale of Two Cities*. London: Penguin, 2000.: 5

by a dauntingly unemployed population.

The new human/nature relationship, birthed by the Industrial Revolution, was no longer one of life-or-death. The balance, with the help of technology, had been set askew. The overproduction of crops made sure that, though a person in the city never touched a plow, they would be able to eat from the harvest. This was the one variable that Malthus notoriously overlooked. It was due in part to these advances in technology that the population did not “pop” as predicted but rather grew and continues to grow exponentially, furthering disconnect between humans and the natural world. Less continued to be inputted while more was taken. This phenomenon can still be seen today in the United States. While the bushels of corn produced in the United States from 1979-2009 jumped from 95 to 160, the number of farms in the U.S. over the same period was cut in half from 4 to 2 million.^{14 15} That the production of corn over time has grown is also significant as it represents humanities ability to invent. Corn can now be turned into a myriad of products replacing the fuel in cars, the sugar in foods, and the grass normally fed to cattle.¹⁶

As stated previously, the reason for addressing the relationship of nature in the evolutionary history of humans is not merely for nostalgic reflection. Humanity and its relationship with nature are in the midst of yet another fundamental transformation in their evolutionary timeline, a transformation a new frontier, to urbanity.

the contemporary human/nature relationship

Nearing the turn of the 20th century (roughly the same time period as London’s Thomas Robert Malthus), Fredrick Jackson Turner introduced his “frontier thesis.” In it he suggested that the United States was unique and culturally independent from Europe in part because of its “rough” frontier mentality.¹⁷ He then went on to claim that, based upon the then recent 1890 census data, the original frontier could be considered closed because it had all been discovered, claimed, or conquered. The United States was entering a second frontier, one that both

14: “Corn: Yield by Year, US.” *U.S. Corn Yields*. National Agriculture Statistics Service. Web. 11 Sept. 2009. <www.nass.usda.gov>.

15: “Farm Labor: Number of Farms and Workers by Decade, US.” *Farm Labor: Number of Farms and Workers by Decade, US*. National Agriculture Statistics Service. Web. 11 Sept. 2009.

16: Pollan, Michael. *Omnivore’s dilemma a natural history of four meals*. New York: Penguin, 2006.

17: Turner, Fredrick J. “The Frontier in American History.” Thesis. 1893.

acknowledged and idolized the first “rough” frontier.¹⁸

Richard Louv, educational theorist and author of *Last Child in the Woods*, moves beyond the second frontier of the early 20th century to describe a new frontier. According to Louv, with the advent of the 21st century humans are leaving the second and entering into the third frontier, advancing one step further from nature or the wild frontier. People in this third frontier have little connection with the natural world.¹⁹ A human sustaining life in an urban environment, the prairie of the third frontier, has very little if any contact with animals other than pet dogs and cats, pigeons, the occasional unwanted rat, and the weekend zoo excursion. Would a people reliant on hunting understand the concept of going to look at the buffalo in the zoo for pure amusement, with no intent to kill for sustenance? Humans in the urban environment have become almost completely disconnected from the source of their food. It is no longer a matter of trading in hunter-gatherer practices for agricultural production (as seen in the shift from the first to the second frontier). Rather, with the help of technological advancements the human race has traded in agricultural production for a trip to the super market. This third and most contemporary frontier, defined in part by a weakening relationship between humanity and nature, is not solely proposed by Louv.

Landscape theorist John Dixon Hunt also mentions different chronological levels of the human nature relationship ultimately reaching a conclusion nearing, though slightly different from, Louv’s philosophy. Hunt categorizes nature into three parts: first nature being untamed and untreated wilderness, second nature being agriculture or the cultivation and command of first nature, third nature being the garden or the attempt to reconcile the disconnect between third nature and its rapidly diminishing origins first and second nature.²⁰

Jane Gillette goes on to discuss this idea in her article *Can Gardens Mean?* saying that, “first nature was experienced by the undivided, unconscious self; that second nature established a separation between the self and what we call nature; and third nature attempts to reconstitute the old unity.”²¹

While Louv expands upon Turner’s work to define this new phase of the human/nature

18: Turner 1893

19: Louv, Richard. *Last Child in the Woods*. Chapel Hill: Algonquin Books of Chapel Hill, 2005.

20: Hunt, John Dixon. *Greater Perfections The Practice of Garden Theory (Penn Studies in Landscape Architecture)*. New York: University of Pennsylvania, 2000.

21: Gillette, Jane. 2005. Can gardens mean? *Landscape Journal* 24 (1): 86

relationship as one of unprecedented disconnect, Gillette expands upon Hunt's work to say that this third phase of the human/nature relationship is one of an unprecedented yearning to reconnect. In a sense, Gillette and Hunt can be seen as first acknowledging Louv's work, then defining this new frontier not necessarily as Louv has (as a great disconnect) but as an attempt to settle this disconnect through the garden (Louv does go on to define a fourth frontier in which the dissonance between humanity and nature expressed in his third frontier is reconciled). Though these concepts differ slightly (with one ending at a problem and the other at a solution) they both help to suggest that humans are entering never before charted territory. Nature, as it has historically existed and related to the human being, is increasingly dwindling and the species is facing a new day, the day of a contemporary human/nature relationship which is primarily experienced through urban environments.

understanding "urban"

According to a recent report by the United Nations Population Division, the majority of the earth's human population now lives in urban environments. The numbers show that in 2005, 3.1 billion people could be found living in urban environments. In 2005, that would mean 48% of the total population (the same report places the total number of people on earth for 2005 at 6.5 billion).²² If the trends predicted in the United Nations' report hold true, 2010 will see 51% of the total human population living in urban environments. In 40 years, 70% of the earth's human population will be living in urban environments. For the sake of comparison, 40 years ago in 1970, only 41% of the total population could be found in urban environments. Over the past 40 years there has been a 7% increase in the urban population. Over the next 40 years there will be a 19% increase.²³

The majority of the human race, for the first time in the history of its existence, now resides within urban environments.²⁴ The data compiled by the United Nations projects that this trend will only increase in the years to come. Two hundred years after Malthus looked at urban life and predicted the end of the world, it has become the way of life for the majority of the world's inhabitants. What then does this barrage of concrete and reinforced steel, brought

22: World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2007 Revision. Rep.No. Population Division, The United Nations. 2007.

23: World 2008

24: World 2008

about by the exponential urbanization of the world's population, mean for the human/nature relationship?

Stepping back for a moment, let us define what is meant by the word "urban" or "urban environments" as they are used interchangeably within this text. Originating from the 17th century Latin terms *urbanus*, *urbs*, *urb*. The word at surface value literally refers directly to a "city."²⁵ However, as one vague term leads to another, one would assume quantifiable data would help to bring a clearer definition to the surface. This is not necessarily the case. According to the United Nations Statistics Division, there are 98 variations of what classifies as "urban."²⁶ Each definition is specifically related to a place. In Botswana, urban is an "agglomeration of 5,000 or more inhabitants where 75% of the economic activity is non-agricultural."²⁷ In Japan, urbanized areas are defined as districts with a density requirement of 4,000 inhabitants per square kilometer or 10,000 people per square mile. Australia sets the bar a bit lower at a density of 200 persons per square kilometer. In Norway and Iceland, localities of 200 or more inhabitants, regardless of any measure of densities, are considered to be "urban."²⁸

For the purposes of this investigation, areas defined as urban will be considered as such if they contain a population density of at least 1,000 people per square mile or 1,000 people per 2.56 square kilometers. In these defined areas, no more than 25% of the population can rely upon any sort of agriculture production or harvesting for economic gains. By this definition an urban area may literally be equal to 1 square mile in area but no smaller. It may contain exactly 1,000 people but no less. It is to be assumed here that as population densities increase and those involved in agricultural processes decrease, the connection to the natural dwindles, feeding into the ever widening gap between humans in urban settings and the natural world. A people's lack of involvement with agriculture processes cannot be seen as the sole factor in diminishing the human/nature relationship. It is however used here as a gauge to attempt to, with some degree of quantifiable accuracy, define what an "urban area" means to this investigation.

This tailored definition attempts to meet the world's definition of "urban" (which does

25: "Urban Definition." *Dictionary.Reference.com*. Web. 9 Sept. 2009. <<http://dictionary.reference.com>>.

26: "Definition of "Urban"" *DEFINITION OF "URBAN"*. United Nation's Statistics Division. Web. 9 Sept. 2009. <<http://unstats.un.org>>.

27: Definition 2009

28: Definition 2009

not exist in uniformity) on a uniform level.²⁹ For the sake of comparison, Manhattan, New York has a population density of 72,000 people per square mile. Rome, Italy, stands at 1,314 people per square mile and Sydney, Australia, has 5,330 people per square mile.³⁰ All of these places would qualify as “urban areas” by the definition described above. The term “urbanization” is then meant to define areas that are either in the process of becoming what has been defined as urban or places that, having already achieved the status of an urban environment, continue grow as specified to expand their urban status. In these defined urban environments, humans are increasingly forced away from the governing principles of nature and the natural world.

29: Definition 2009

30: “CIA World Factbook.” <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html>. CIA. Web. 11 Sept. 2009. <cia.gov>.

chapter 2

Living Apart From Nature

As proven, the current urban environments where the majority of the earth's population now reside, stand in a striking juxtaposition to the landscape that birthed the species. The savannas and the natural world created the human race. Then, the human race went on to develop urban environments. So the question becomes what does it mean for a race to live in an environment so far removed from its natural evolutionary habitat?¹ This section will examine: what it means to live, how the psychological effects of living without nature may be studied, and what results from such studies.

to live

Environment and behavioral researcher William C. Sullivan argues that there may be "consequences living in places that have no resemblance to the landscapes that supported our evolution," though, what he defines as "living" is unclear.² The author sidesteps the issue of defining such a loaded term and readers are left to assume that "living" may be interchangeable with sustaining, surviving, or inhabiting.

For the purposes of this investigation, a clarification should be made. Though Sullivan and others referenced in this work use the terms "living" and "sustaining" interchangeably, this investigation does not. The difference is an issue of quality. Sustaining, surviving, and inhabiting can be used to explain the existence of a species, their will and determination to achieve life. However, that is not to say that a species surviving has attained "life" as this work seeks to define it. To live is an incredibly intricate and complex action that, though experienced by everyone, is difficult to define.

Greek philosopher Democritus spoke of living as containing "*psychê* or soul, that distinctive feature of living things that accounts for their ability to perform their life-functions."³ The early Greeks saw the soul separated from the body and operating "as a kind of cosmic force,

1: Sullivan, William C., Frances E. Kuo, and Stephen Depooter. The Fruit of Urban Nature: Vital Neighborhood Spaces. *Environment and Behavior* 36(5):678-700.2004.: 679

2: Sullivan 2004: 679

3: Berryman, Sylvia, "Democritus", *The Stanford Encyclopedia of Philosophy (Fall 2008 Edition)*, Edward N. Zalta (ed.), URL = <<http://plato.stanford.edu/archives/fall2008/entries/democritus/>>.

and attributed animation to the whole of nature.”⁴

What the soul and body are and how they relate to each other is not the primary focus of this work so, though an investigation into such topics could and no doubt has been created in depth historically, our discussion will stop here with one finally cumulative definition that is meant to be used for the purpose of clarifying the terms as they are to be used within this text only. To “live” is to go beyond sustaining life by achieving a holistic well-being that nurtures a human’s physical, mental, and spiritual faculties. The term “life” will be used in the broadest scientific sense as defining objects that contain carbon.

A species’ ability to sustain life (creating a foundation upon which to “live”) depends heavily upon habitat. In order for a species to survive, the species must exist within ecosystems that can sustain the species’ needs on the most basic levels, food, shelter, procreation, and so on.⁵ When the habitat that supports these basic needs is lost, the species ceases to exist. Biologists refer to this general phenomenon as habitat selection. Biologist Gordon H. Orians explains this phenomenon further saying, “The brain mechanisms involved in habitat selection were shaped by natural selection because individuals who sought out supportive environments produced, on average, more progeny than did individuals who were indifferent to such concerns.”⁶ It is this basic rule of ecology that makes the contemporary relationship between humans, nature, and urbanity such a pertinent and intriguing study. Never before has a species been able to manipulate its surroundings in such a way as to physically remove themselves so far from their landscape of origin (in this case nature). But then again, perhaps humans are not so far removed from the millions of years of evolutionary history that created them as they may think.

The theory that on some primordial level the yearning for nature still thrives within the contemporary human psyche has been around for some time. Edward O. Wilson coined “Biophillicia” to describe this yearning in 1984. Biophillicia, as he describes it, represents a fundamental, genetically based human need and propensity to affiliate with the natural world,

4: Berryman 2008

5: Sullivan 2004: 700

6: Orians, Gordon H. An Ecologic and Evolutionary Approach to Landscape Aesthetic. Landscape Meaning and Values. Edmund C. Penning-Rowsell and David Lowenthal, eds. Pp. 3-25. London: Allen and Unwin.1986.: 14

the world of life.⁷ It is from this world that humankind was born. Like a child looking back to its parents for mental stability and guidance, Biophillic argues that humans must do the same with nature. According to this concept a common thread exists throughout humanity which, having spent 99% of its total existence in a very close, interdependent relationship with nature (the first and second frontiers discussed earlier), continues to desire a strong relationship with nature.

environmental psychology

Though neither the concept of Biophillic, its associated ideologies, nor the questions it raises are directly related to the field of Environmental Psychology. It is however, through the study of Environmental Psychology and the study of the environment's influence on the psyche of humanity, particularly with regard to contact with the natural world, that the ideologies within Biophillic can be tested.

At its core an applied science, Environmental Psychology came into existence during the 1940's. Taking and mixing ideas of both ecology and psychology, this new psychology held to the following fundamental claims: that organisms cannot be considered to exist or act in isolation, that internal and external forces affect organisms, and that living animals adapt.⁸ The very idea that psychological could be influenced by an environment represented a crucial shift in the mind-set of humanity. Environmental Psychology pioneered shifting the focus from the human influence on the human to the environmental influence on the human or the influence of selected habitats upon the human.

Roger Baker and Herbert Wright, two of the earliest Environmental Psychologists, argued that this new psychology should not be conducted in a laboratory but rather this was to be a "non-experimental science" used to develop new theories based upon careful field observations.⁹ Field observations were to be delicately structured and well supervised by highly trained professionals.¹⁰

In its youth, Environmental Psychologists rushed ahead with little methodology

7: Wilson, Edward O. Biophilia and the Conservation Ethic. *The Biophilia Hypothesis*. Stephen R. Kellert and Edward O. Wilson, eds. Pp. 31-41. Washington D.C.; Island Press. 1993.

8: Wicker, Allen. An Introduction to Ecological Psychology. Monterey: Brooks/Cole Publishing Co., 1979.

9: Wicker 1979

10: Wicker 1979

or guidance.¹¹ Early inquires sought to understand things such as how much noise in an environment was tolerable before quality of life was disrupted and how a classroom should be designed in order to produce the most conducive learning environment. As French psychologist Claude Levy-Leboyer explains in her book *Psychologie et Environnement*, “No general principles are available for answering these questions rationally, and therefore, when asked to tackle them, psychologists carried out pieces of applied research trying to use classic experimental designs and conventional measurement instruments.”¹² The unsuitability of theoretical approaches borrowed from laboratory psychology soon became apparent. There are many problems with using laboratory methodologies in out-of-lab environments. The multiplicity of independent variables and the interactions between them in a field setting is extensive. Where in the laboratory, a white room with four walls and a chair can be studied in seclusion, this simplicity does not exist in the field. Elements of light, seating, wind, noise, vegetation, color, and smell collide and change with the season, or more hectic still, the hour. In addition, to simultaneously account for the social, cultural, and physical environments, and the large inter-individual and inter-group differences all combine to make clear analysis from the results of any environmental study from a psychological standpoint perilous.¹³ As if that did not present a daunting enough task, the perception of space by an individual is in part the result of prior experiences had and each individual has had multiple prior experiences.¹⁴

Because of these perils, this academic investigation will not conduct its own psychological field observations. The process of observing, interpreting, and understanding human movements, gestures, and interactions within a space is a delicate process that, to be done to a high academic standard and therefore to produce any usable or trustworthy findings, is a process that this thesis is not prepared to undertake. While observations will be made from time to time of people in given spaces, they are meant to be taken only as observations and not as an understanding of the complex psychological experiences people are having within any given space. Instead, established psychological observations, conducted by professionals, will be

11: Levy-Leboyer, Claude. Psychology and Environment. London: Sage Publications. 1982.: 17

12: Levy-Leboyer 1989: 17-18

13: Levy-Leboyer 1989: 17-18

14: Kou, Frances E., William C. Sullivan, Rebekah L. Coley, and Leisette Brunson. Fertile Ground for Community: Inner-City Neighborhood Common Spaces. *American Journal of Community Psychology* 26(1).1998.: 823-851

studied to prove that the spaces people inhabit influence their psyche, particularly when those spaces included little or no nature.

the effects of living removed from nature

According to research conducted by social scientists William Sullivan, Frances Kuo, and Stephen Depooter, humans show “social and psychological impacts” or “breakdowns” when attempting to sustain life with very little natural contact.¹⁵ In their study, the three researchers, Sullivan, Kuo, and Depooter assessed the importance of human habitat selection with regard to contact with nature. They used two public housing developments in Chicago, Robert Taylor Homes and Ida B. Wells, to show this. The two communities were chosen in part due to their identical cultural and environmental factors. Residents were initially placed in the housing units at random and had no control over maintenance of the vegetation near their homes. It was only in the quality and quantity of the surrounding vegetation that the housing units varied.¹⁶ Nature was therefore isolated as the sole independent variable in the experiment.

“What we found was striking: the greener the neighborhood common spaces, the stronger were the neighborhood social ties near those spaces.”¹⁷ The findings went on to mention that the housing units with more substantial natural settings (closer to that from which the human race originally developed) created stronger neighborly bonds. People in the greener community reported that they “had more social activity and more visitors, knew more of their neighbors, felt their neighbors were more concerned with helping and supporting one another, and had stronger feelings of belonging.”¹⁸

Conversely, the housing units with less of a connection with the natural world produced a negative relationship. These housing units had the highest number of calls to the police and the greatest total number of crimes reported per building.¹⁹ According to the final report on the project, “The greenness of the neighborhood landscape explained 7 to 8% of the variance in the number of crimes reported per building.”²⁰ The findings from this body of work suggest that, to

15: Orians 1986: 17

16: Sullivan 2004: 241

17: Kou 1998: 823-851

18: Kou 1998: 245

19: Kou, Frances E. Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behavior* 33(3).2001.: 343-367

20: Kuo 2001: 246

residents of the ever-increasing urban environment, greenery and a vegetative connection with nature are profoundly important. The study proved that in a real world environment nearby nature is a necessary component of a healthy human habitat. "Nature," as defined in this study happened to be planted trees and grasses in communal spaces. Those vegetative plantings then helped to spur the human ability to live by making the common spaces around the housing complex preferable and usable. Because they were preferred and enjoyable spaces people used and enjoyed them, creating social bonds, community, and friendship. What happened here can be summarized as such: the space was planted with vegetation, the space became preferred and therefore used, people met each other in this new and enjoyable communal space, and the community was better for it.²¹

Another study assessing the importance of nature in human well-being was conducted at a nursing home in Texas. Researchers examined before and after statistics as an atrium and outdoor healing garden were constructed at the home. According to the results, the post construction home saw "57% fewer bedsores, an 18% reduction in patients restrained, a 60% reduction in behavioral incidents, and 48% reduction in staff absenteeism."²² While it should be mentioned that the garden and atrium were installed as a part of the nursing home's holistic new approach to health care (which also included interior redesign and staff policy changes), these two outdoor additions can still be defined as partial contributors to the positive results. According to Dr. Roger S. Ulrich from the Colleges of Architecture and Medicine at Texas A & M University, gardens are most likely to contribute to stress reduction and overall well-being if they contain "verdant foliage, flowers, water (not tumultuous), congruent or harmonious nature sounds (birds, breezes, water), and visible wildlife (birds)."²³ According to patient reports filed by those who walked amongst gardens located next to clinical settings, the gardens became healthy escapes. As one patient noted, "It's a good escape from what they put me through. I come out here between appointments. I feel much calmer, less stressed."²⁴

21: Kuo 2001: abstract

22: Eden Alternative Green House Project. <http://edenalt.com/> and <http://thegreenhouseproject.com/>. 2004.

23: Ulrich, R. S. (1999). Effects of gardens on health outcomes: Theory and research. In C. Cooper-Marcus & M. Barnes (Eds.), *Healing Gardens: Therapeutic Benefits and Design Recommendations*. New York: John Wiley, pp. 27-86.

24: Cooper-Marcus, C. and M. Barnes. *Gardens in Healthcare Facilities: Uses, Therapeutic Benefits, and Design Recommendations*. Martinez, CA: The Center for Health Design.1995.: 27

These natural environments may not even need to be entered into as a physical experience but, as research shows, can be productive also as image. One such study conducted by Heerwagen and Orians found that the anxiety of patients waiting in a dental office was greatly reduced when a large mural of a natural landscape was hung over an otherwise blank wall. The stress in the patients was measured both by patient reports and by heart rate data.²⁵

Other studies have been conducted examining the effects of visually experienced nature in reducing stress levels. In one such study subjects were first asked to view a “stressful movie.”²⁶ After the viewing, they were shown another video of either a natural setting or an urban setting. At the end of the screenings the subjects conducted a self-report, expressing their emotional state of mind, and also a rigorous health tests. These health tests measured “heart rate, muscle tension, skin conductance, and pulse transit time.”²⁷ What researchers found were results similar to those detailed by Heerwagen and Orians. Subjects showed “greater stress recovery in response to the natural setting.”²⁸

These case studies provide evidence for the positive effects of nature and the natural world on the well-being of the human species. As the research indicates, humans need nature. Their connection with nature makes them physically, psychologically, and mentally better as a species, and yet how can this connection be addressed in the creation of their current habitats, those urban environments that the majority of humanity now call home, so far removed from the nature? To better understand how this connectivity may be possible, what comprises both nature and urban environments must first be understood.

25: Heerwagen, Judith H. The Psychological Aspects of Windows and Window Design. *Proceedings of the 21st Annual Conference of the Environmental Design Research Association*. K.H. Anthony, J. Choi, and B. Orland, eds. Oklahoma City: EDRA.1990.

26: Ulrich, R. S. (1991). Effects of health facility interior design on wellness: Theory and recent scientific research. *Journal of Health Care Design*, 3: 97-109. [Reprinted in: Marberry, S.O. (Ed.) 1995. *Innovations in Healthcare Design*. New York: Van Nostrand Reinhold, pp. 88-104.]

27: Ulrich 1991: 88-104

28: Ulrich 1991: 88-104

chapter 3

Nature Defined

One person's perception of nature may differ greatly from another person's. According to a dictionary definition, nature is "the material world existing independently of human activities."¹ This material world is then said to consist of things commonly associated with nature such as trees, water, mountains, and animals.² That is one of the 17 definitions that can be found in that particular dictionary. Others speak of the abstract saying that the word defines "reality, as distinguished from any effect of art." Some side with science, saying that it is "the world and its naturally occurring phenomena, together with all of the physical laws that govern them."³ This definition includes all living organisms and their environments. Still others speak of the broadness of the term defining it as "the universe, with all its phenomena."⁴ Linguistic authors Strunk & White warn against using the term without first carefully considering its possible meanings saying such uses "should be avoided in such vague expressions as 'a lover of nature,' 'poems about nature.' Unless more specific statements follow, the reader cannot tell whether the poems have to do with natural scenery, rural life, the sunset, the untouched wilderness, or the habits of squirrels."⁵ The origins of the word are easier to define. The term comes from a reference to the "essential properties of a thing." It also has Latin roots, *natura* or *natus*, referring to being born. These roots reflect an essence or in Latin an *essentia*.⁶

The etymology of the word defines it as a thing both born (created) and containing an essence. It "does not lack; it creates because it possesses. Its creative act is simply its possession of its own characteristic Essence."⁷ *Essence* becomes the keystone to this particular working definition of nature. The pristine forms, gestures, and systems found in the natural world reflect through their manifestation an overarching spirituality or higher essence. As the late Australian Architect and theorist L. Peter Kollar writes, nature reflects "subtle invisible principles in

1: "Nature." The American Heritage® Science Dictionary. Houghton Mifflin Company. 14 Sep. 2009. <Dictionary.com <http://dictionary.reference.com/browse/nature>>.

2: Naure 2009

3: Nature 2009

4: Nature 2009

5: Strunk & White, "The Elements of Style," 3rd ed., 1979

6: Nature 2009

7: MacKenna, Stephen. "The Enneads of Plotinus Index." *Internet Sacred Text Archive Home*. Web. 12 Oct. 2009. <<http://www.sacred-texts.com/cla/plotenn/index.htm>>.

corporeal images. These subtle types or configurations are themselves images of the pure forms of the archetypes projected onto the natural domain and given, as it were, to nature to imitate and elaborate.”⁸

Nature becomes something that can be mimicked in more than a physical sense. This establishes a foundation upon which nature can be designed for in urban environments without a loss of essence. Nature and its essence, existing in urbanity, could then help to rekindle the currently fragmented human/nature relationship. Before this can be experienced within urban environments, urban environments and the parts that comprise them must be understood.

8: Kollar, Peter L. Form. New South Wales: Sydney Press, 1983.: 47

chapter 4

Elements of Urbanity

Comprised of streets, curbs, buildings, people, food, cars, billboards, and cement (to name a few), modern cities are the brilliant cumulation of millions of complex elements. These urban environments can be hard to dissect and interpret. When the city is broken down into spatial terms it becomes easier to investigate. Spatially, students of urban design are taught to discuss cities in terms of point, line, plane, surface, datum, hierarchy, and scale. Implementing these teachings, Paris's infamous Champs-Élysées goes from being an iconoclastic street heavy with history to being an axis with foci at either end. The Egyptian obelisks of Rome, holding on their shoulders the might of two of the world's greatest empires, become two vertical points. These are just two examples of how cities and the elements that comprise them, saturated with such extreme historic, cultural, and socioeconomic value, being reduced to terms that hold less clout can be a valuable exercise. That is in part why this discussion will focus on how the human/nature relationship can be designed for in urban environments through volume and form.

Volume can be defined in part by what it is not. In the book *Contemporary Public Space Un-volumetric Architecture* by James Wines, Denise Brown, and Wes Jones, "un-volumetric architecture" is categorized into surface, vertical, figures, and enclosure.¹ Surface is seen as non-volumetric architecture in its most radical sense while enclosure seems to be the most volumetrically related. Though the definition of enclosure refers to "the sacred precinct, a piece of the world protected from the profanity of the world itself" the examples of enclosure given seem to explain the differentiation between volume and enclosure only as the lack of one or more walls or a roof.² What makes enclosure a sacred space is left ambiguous.

In Patrick Condon's article *Cubist Space, Volumetric Spaces*, constructing volumetric space is defined as simply "enclosing space with solids."³ Condon then goes on to clarify the difference noted in *Contemporary Public Space Un-volumetric Architecture* between "enclosure"

1: Wines, James, Denise Brown, and Wes Jones. Contemporary Public Space Un-volumetric Architecture. Milan: Skira, 2006.

2: Swaffield, Simon. *Theory in Landscape Architecture A Reader (Penn Studies in Landscape Architecture)*. New York: University of Pennsylvania, 2002.:84

3: Swaffield 2002: 84

and “volume” saying that, “Volumetric space in the landscape can be as large as the “outdoor” room experienced when adrift at sea—that is, the room formed by the apparent celestial sphere resting on the horizon. Conversely, a volumetric space can be as small as a closet. Volumetric space is therefore distinct from enclosure. Enclosure is a relationship between volumetric space and human scale.”⁴

Tom Porter, author of *Architect’s Eye*, claims that categorizing a volume means being aware of a holistic shift in experience.⁵ To Porter, this shift is dynamic and tangible. In that regard it could be said that entering a volumetric space would cause a visitor to experience sensations different from those outside of the volume. There may be different noises, a scent, or varied floor texture. All of these changes would point towards “a piece of the world protected from the profanity of the world itself” or in other words, a place different from the outside, a “sacred precinct.”⁶

Though volume is discussed in terms of inside and outside, these should not be seen as definitive expressions. This is not a case where “outside and inside form a dialect of division” with “the same sharpness of dialectics of yes and no, which decides everything.”⁷ Here, what is inside and what is outside, what is yes and what is no, what is volume and what is un-volume, has the ability to transform depending upon experience. In reflecting upon countless hours traversing the vast fertile pampas of South America, vagabond horseman Christian Senechal writes “the prison is outside...Precisely because of too much riding and too much freedom and of the unchanging horizon, in spite of our desperate gallopings, the pampas assumed the aspect of a prison for me, a prison that was bigger than the others.”⁸ Due to a prolonged sense of enclosure, though vast it may be, the pampas became inside to Christian, it became a volume that entrapped him and segregated him from the outside world. It became, whether welcomed or unwelcomed, a sacred precinct.

When the term “sacred” is brought in to the discussion, an entirely new realm of questions come to life. Is there a religious, spiritual, or sacred character inherent in volumetric

4: Swaffield 2002: 84

5: Porter, Tom. Architect’s eye visualization and depiction of space in architecture. London: E & FN Spon, 1997.

6: Swaffield 2002: 84

7: Bachelard, Gaston. The Poetics of Space. New York: Beacon, 1976.: 211

8: Bachelard 1976: 221

space, or is this meant to metaphorically suggest a place for contemplation? To answer these questions a concert hall can be considered as an example of volumetric space. Then, as it is a volumetric space, this concert hall can be also consider “sacred.”

Here, “sacred” is not used with any religious implications, as is often the case but, rather within the context of relativity. When immersed within the volume of the concert hall one attempts to contemplate the performance unfolding before them. There is a concentrated focus supported by the elements of the volume (i.e. the seats face the stage, television monitors reiterate actions or translate languages, the announcer or master of ceremonies broadcasts what is being performed). The volume is designed to create a highly focused, concentrated, contemplative atmosphere directed toward the performance. It is a place that is tangibly different and protected from that which surrounds it making it a “sacred precinct, a piece of the world protected from the profanity of the world itself.”⁹

As volume means more than a space enclosed by solids, form holds within it a deeper purpose. Peter Kollar uses Plato’s Cave allegory to explain this purpose. In Plato’s allegory, three levels of existence are defined; the gross (physical), subtle (mental), and the pure (spiritual). These three levels of existence come together to fulfill the human condition.¹⁰ When a person understands the world to the degree that they are able to exist equally upon all three levels, as defined by the cave allegory, that person has reached the acme of human existence and they have successfully fulfilled the tripartite nature of the human condition. Related directly to the allegory, these three levels (gross, subtle, and pure) are represented by shadows on the wall of the cave (the gross/physical), the effigies or symbols used in conjunction with fire to create such symbols (the subtle/metal), and the natural world, the world experienced outside of the cave basking in the glory of the sun (the pure/spiritual).

To Kollar, form exists in the natural world or the pure/spiritual level of existence. The spiritual realm outside of the cave holds within its various forms “essence balanced by substance.”¹¹ Utilizing a barrage of dichotomies or “anatomical pairs,” he continues to define the splendors of this realm; sameness and otherness, unity and multiplicity, continuity and

9: Swaffield 2002: 84

10: Stephens, Harry. “The Human Condition.” The University of New South Wales, Sydney, Australia. Sept. 2009. Lecture.

11: Kollar 1983: 60

alteration, authority and dependence, completeness and transformation.¹² In this natural realm, all form is brought to life by the light of the sun, the divine “Oneness,” or “the Identity of Being.”¹³

“In the parable only the living beings, the forms are illuminated directly by the sun, and this source of light is spoken of as the source of all life as well. It is the distant, intangible Cause, high above the terrestrial plane, to which all forms owe their very being. We are then presented with the final most important division separating the celestial sun from the terrestrial existence. The ‘Solar Disc’ is the symbol of the First Cause, of the Principle of Being upon which all manifestation depends and from which all the three degrees of existence are successively derived.”¹⁴

Form, as Kollar understands it, is brought to life by the light of the sun (representing a Oneness or Being, perfection) and therefore has inherently laced within it direct references to The Divine, a spiritual essence. Shape would then be seen as the antithesis, having within it no divinity. In the book *Visual Perception and Light* by Lou Michel, form and shape are differentiated by saying that form relates to three-dimensional objects while shape refers to the two-dimensional, the “peripheral contour of the object.”¹⁵ Michel does not go beyond the physical. Form and shape both exist here in the physical realm only. Though, unlike Michel’s definition of “shape,” Kollar’s could exist in three-dimensions, it would still not become form until it was interwoven with spirit or essence. And so, when trying to define form and shape in the urban environment they must be understood beyond physical perception. They must be understood on a spiritual level as the difference between form and shape transcends physicalities.

Diminishing the spiritual essence of form is the idea that function dictates the form of an object, an idea often associated with the core values of modern design. Interestingly enough, the publication that first coined the term “form follows function” originated fifty years prior to the styles of modernism. In Luis Sullivan’s article *The Tall Office Building Artistically Considered*. Sullivan writes, “It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression, that form

12: Kollar 1983: 60

13: Kollar 1983: 60

14: Kollar 1983: 22

Michel, Lou. Light the shape of space: designing with space and light. New York: Van Nostrand Reinhold, 1995.: 49

ever follows function. This is the law.”¹⁶ Though it may seem hard to disagree with such a bold statement, some do. Architect Peter Kollar describes form following function as “the functionalist error.”¹⁷

“The error of functionalism is two-fold. First, in its context the meaning of form is reduced to shape, the notion of the universal is replaced by the sole concern with the individual, the metaphysical is ousted by the physical. Second, by assuming some required performance to be the only valid cause of a configuration or shape, functionalism attributes to the flux of becoming a reality and purpose independent of Being.”¹⁸

What Kollar suggests is a crucial aspect of this investigation. That shape not be confused with form is important as it diminishes the spiritual essence of form. His second point is also interesting as it expresses functionalism’s ability to date itself. By viewing form as the result of a purely utilitarian function, it is automatically limited as these functions serve only temporary goals. To better understand form in an urban environment, it must be seen beyond the ephemeral.

The way that volume and form exist in cities is varied. Also varied are the ways in which their existence can be discussed. There is no lack of terminology attempting to define the various qualities of each. To help further deconstruct volumetric space scale, shape, sensory experience, site, and program will be investigated. To better understand the qualities of form scale, shape, pattern, proportion, and program will be investigated. Where the terminology overlaps is insignificant. Volume and form are both whole entities that, though comprised of various parts (scale, shape, pattern), become something greater than the sum of those parts. Thus, that certain parts are contained within both matters little as they eventually embody a very different whole.

16: Sullivan, Louis H. “The Tall Office Building Artistically Considered.” 1896.

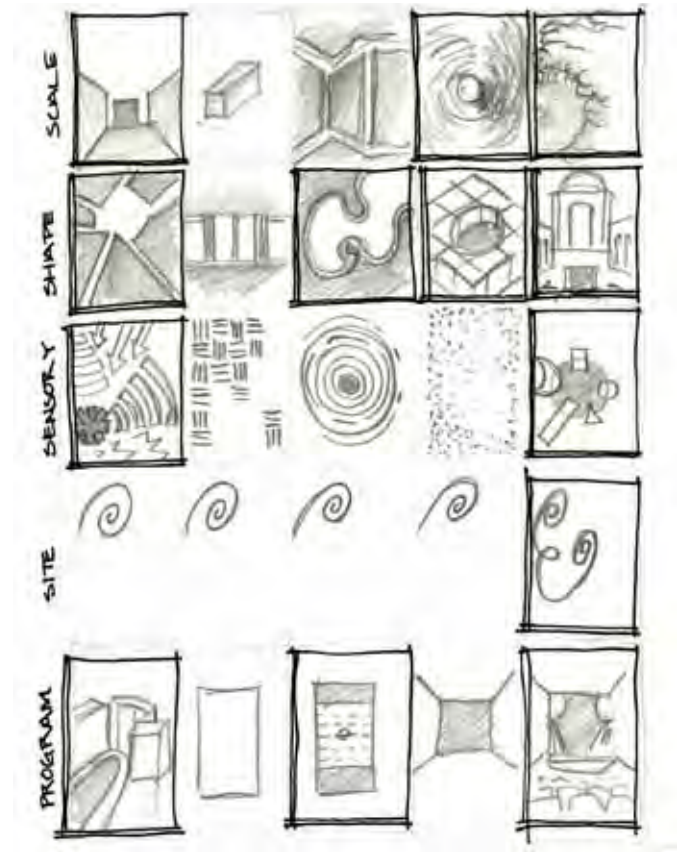
17: Kollar 1983: 39

18: Kollar 1983: 39

chapter 5

Natural Volumes In Urbanity

As has been discussed, volume can be thought of as a sacred space, enclosed or partially enclosed by solids, that is set apart from the outside world.¹ Like form, it is seen as possessing an essence greater than the sum of its parts. And yet to better understand volume and its essence we examine those parts: scale, shape, sensory experience, site, and program. Each part is discussed first as it relates to nature, then to urban environments, in an effort to show that the qualities of natural volumes do not have to be lost within the context of an urban setting.



The parts of volume are arranged here in order of complexity beginning with scale. The scale of a volume (a volume's relationship between human proportion and enclosure) can be discerned through observation, while understanding the program of a volume (the human purpose of a site and/or activities associated with it) requires greater inquiry and is therefore saved for last. It is not intended that the parts of volume described here are the only parts that come together to create volume, but rather they represent a diverse sampling of those parts. For example, volumes also include parts such as color, texture, hierarchy, and juxtaposition. These are not given the same attention as the other parts because color, texture, hierarchy, and juxtaposition can be discussed under already established subheadings. Color and texture are discussed as elements of sensory experience while hierarchy and juxtaposition are discussed as qualities of program. The qualities of each part are also not to be seen as the only qualities of the part, but rather they represent a broad sampling.

¹: Swaffield 2002: 84

scale



Paley Park. New York City, NY (NB)

scale

The scale of a volume is based on a relative perception. It is the relationship between human proportion and enclosure. Scales fluctuate greatly and at each level a different experience is had, a different sacred relationship understood. Despite this variance, the idea of a “perfect human scale” has been suggested by several theorists. Aristotle described this scale as one far from arbitrary in which a person could “perceive” an objects “unity and wholeness” at a glance.¹ In 1877, a German architect by the name of Maertens, attempted to distinguish this scale scientifically by relating field of vision measurements to the width of the nasal bone (one of the smallest parts of the human body used to discern individuals). What he discovered was that a distance of 70 to 80 feet and an angular dimension of 27 degrees works best. This translates to a ratio between the size of an object and its distance from the beholder as 1:2.²

In nature, this ratio of scale is only one of many. The largest volumes can be experienced in the natural world. Space is perhaps the best example of this. The true size of this celestial enclosure is still being discovered. In the natural world on Earth, the scale of a volume can be as vast as the volume created by the horizon for a lone person adrift at sea or as intimate as a small cave dwelling. As these volumes were not created for humans by humans, they are not always of a human scale (the 1:2 ratio mentioned by Maertens). The volume of space and the



Above Left: A sketch showing a natural volume of an intimate scale (relative to the human being) (NB). Above Right: One of the largest volumes that can be experienced in nature, (Mihael).

1: Blumenfeld, Hans. “Scale in Civic Design.” *The Town Planning Review* 24.1 (1953): 37

2: H. Maertens, Der optischem asstabin den bildendenk uensten(2 nd edition) Berlin, Wasmuth, 1884.

volume created when adrift at sea are extreme examples of this non-human scale. However, volumes of a human scale can occur in nature. These places are often composed of fields or some other type of clearing, possibly a body of water, surrounded by trees or natural rock ledges.

In urban environments, volumes are designed for people, by people, and still such volumes are not always of a human scale. Though the scale never actually reaches towards infinity, as is the case with the volume created by the horizon while adrift at sea, it can feel as though it does, belittling or humbling the visitor.

Il Campo, a medieval square located in the heart of the densely clustered Sienna, Italy, is an example of a volume that does not adhere to the human scale of Maertens. While the space is large enough to hold the Il Palio, the city's annual horse race, it is also void enough to engulf the lone human. The volumes building height to void space ratio is 1:5. This makes it a volume of an inhuman scale. Paley Park in New York City, New York is another example of inhuman volumetric scale. Its ratio between building height and void space is roughly 4:1. Here, the size of the volume is trumped by the height of its surrounding buildings. Il Palio exhibits just the opposite. In Il Palio, the void space between the buildings is much larger than the buildings themselves.

Realistically, each volumetric space described here probably exists somewhere in the natural world. A depression in the woods could fill with water and become a pond the size of



Above Left: Paley Park in New York City, NY representing a volume of a human scale (NB). Above Right: Il Campo in Sienna, Italy representing an urban volume of a larger scale (NB).

Sienna's Il Campo. While this assumption begins to break down with Paley Park, a small urban void enclosed by towering buildings, it is still possible. Glacial cracks and crevasses do exist and reflect similar proportions. Therefore, it is hard to conclude definitively that any one scale of a volume effects whether or not that volume has a natural essence. While some may be more realized in nature (such as a clearing in a forest of Il Campo proportions) and others less common (such as a glacial rift creating a volume the scale of Paley Park) they do still exist. At the same time, it is hard to argue that the works of Maertens and Aristotle hold no value when discussing an optimal human scale. What they suggest, a ratio of roughly 1:2 where an objects unity and wholeness can be seen, may be the most comfortable for human beings, but whether or not that relates to some aspect of the natural world is unlikely.

shape

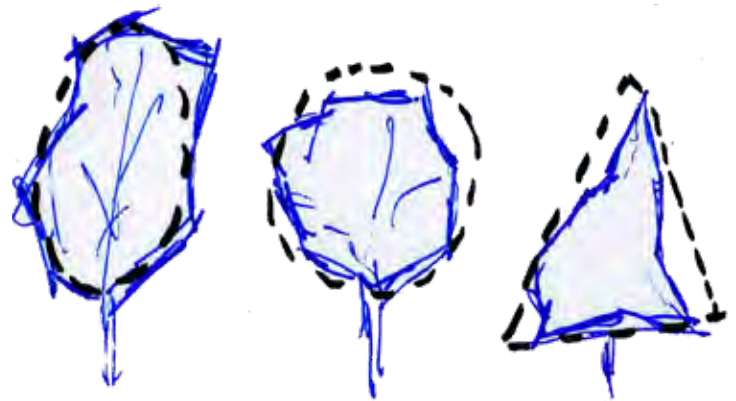


Australian War Memorial. Canberra, Australia (NB)

shape

A volume's shape can be understood from within the volume. It is the perception of shape from the visitor's perspective and can be categorized using familiar volumetric terminology (cubic, cylindrical, spherical).

In nature, volumetric shape is often thought of as organic, void of right angles, straight lines, or perfect circles. Though natural shapes certainly include amorphous entities such as lakes and ponds, they are not the only shapes that should be considered natural. The moon can form a perfect circle when viewed from a distance. From such a distance the craters and rifts in the moon's surface are not visible. Like the moon's perfection from a distance, the horizon appears to be a straight horizontal line, though in reality it curves with the earth's surface. This effect created such a convincing flat and disk-like volume that early explorers worried they would sail off of the edge of the earth.



Above Left: The illusion of a perfect moon (Viatour). Above Right: Shapes are simplified (Kew).

The reason these illusions of perfect shapes exist is described in part by Gestalt psychology. Gestalt psychology expresses humanities desire to experience “holism” in a “quest for objectivity.”¹ Under this theory “the mind will simplify the visual environment in order to understand it. Given any composition of forms, humans tend to reduce the subject matter in our visual field to the simplest and most regular shapes. The simpler and more regular a shape

1: Ash, Mitchell G. Gestalt psychology in German culture, 1890-1967 holism and the quest for objectivity. Cambridge: Cambridge UP, 1995.

is, the easier it is to perceive and understand.”² It is the mind's way of quickly making sense of a situation. In nature, this ability to understand surroundings quickly could be linked to survival. Today, this illusion occurs continuously in the urban environment.

From within an urban volume, shape can be hard to discern. What is sometimes perceived as one shape is often another. Such is the case with Rome's Piazza della Rotonda. This piazza, dwarfed by the presence of the Pantheon, has been carefully designed to appear square. Here, an obelisk has been placed in the perceived center of the space to provide a central point to the volume. It is then visually assumed that all vertical elements of enclosure surrounding the space are equidistant from the central obelisk, which is in fact untrue. In reality, the piazza consists of several buildings that do not stand parallel to one another. This revelation can be better seen two-dimensionally from above. Moving eastward through the city of Rome, one encounters Vatican City's, St. Peter's Square. What could be perceived in this piazza as an oval or even circular in shape is technically elliptical. What this means is that there are two distinct points from which the shape of the piazza was drawn. This creates two points within the space that a perfectly direct parallax through the encompassing travertine pillars can be seen.



Above Left: A figure/ground sketch showing the true shape of the void that is Piazza Della Rotonda (NB). Above Right: A sketch from inside the Pantheon showing how, with the help of the centering obelisk, the piazza appears orthogonal (NB).

Not all urban volumes are geometric in shape. In New York City, NY, Central Park's Meadow is a wonderfully organic shape that coincides perfectly with its designers' intent.

2: Ching, Francis D. K. Architecture Form, Space, & Order. New York: Wiley, 2007.: 38

to create an “escape to the country,” complete with rock outcroppings, lakes, ponds, and fabricated structures (such as the old dairy building).³ Berlin, Germany’s large central park known as Tiergarten expresses much of the same organic shaping.

Looking beyond the clearly organic shapes found in places like Central Park and Tiergarten becomes crucial in understanding the elements of shape that can be used in an urban setting to reference the natural world. In nature shapes are imperfect, yet the mind perceives them as perfect. As Gestalt psychology explains, this illusion of perfection is the result of a yearning in the human brain to understand and simplify.⁴ The examples of Piazza della Rotonda and St. Peter’s Square demonstrate how this illusion of perfection can be designed for in an urbanity. This gesture reflects elements of nature on a more subconscious level than a simple fluid or amorphous shape, as seen in New York City’s Central Park and Berlin’s Tiergarten.

3: Cranz, Galen. The Politics of Park Design. Cambridge: MIT Press, 1982.: 5

4: Ching 2007. 38

sensory experience

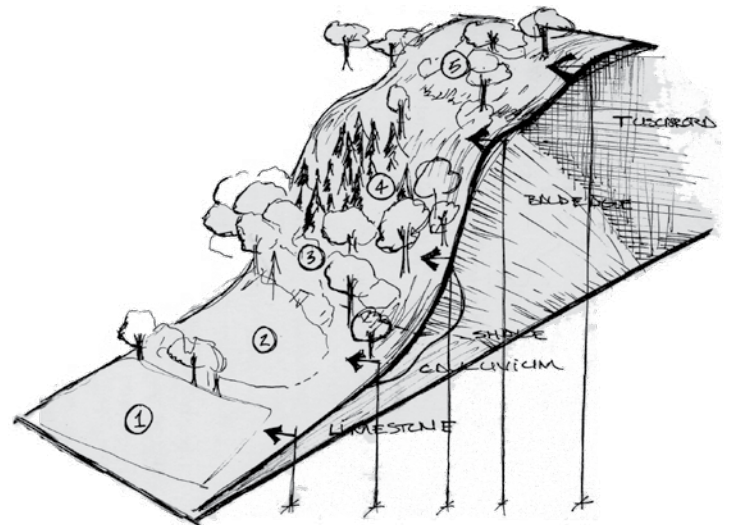


Chiang Mai Night Market. Chiang Mai, Thailand (NB)

sensory experience

Sensory perception is understood through holistic human-centric experiences. These experiences are defined by the five senses as described by Aristotle: scent, sight, touch, taste, and hearing.¹ These senses can help us understand places that are sacred or isolated from others, distinguishing the essence of one volumetric place from another.

In nature, sensory experiences are often linked to methods of survival. Being able to see one color from another can be the difference between picking a ripe berry versus a poisonous one or being able to see the predator coming towards you in a lush jungle.² In less catastrophic situations, senses help define the character of specific environments. A gap environment is a naturally occurring volume created by a notch in a mountain system. It is usually formed by water cutting through a ridge. In the sandstone hills of central Pennsylvania, gaps occur frequently. They create the sense of a place that has been separated through sensory experiences. The hydric, shaded, and gently sloping conditions foster specific plant life and biodiversity that add to the unique experience. Scents become damp as the gaps hold moisture well. Underfoot, the ground softens from years of fluvial deposition. Overhead, the great Eastern Hemlock, a tree that thrives in gap conditions, filters in sunlight.



Above Left: An image of a gap system in Pennsylvania (Dallos). Above Right: An illustration showing how a gap becomes a holistic sensory experience from the bedrock through the tree canopy (NB).

1: Cohen, Marc S., and Patricia Curd. Readings in ancient Greek philosophy from Thales to Aristotle. Indianapolis, IN: Hackett Pub., 2005.

2: Lotto, Beau. "Optical Illusions Show How We See." Lecture. TEDGlobal2009. 24 Jan. 2010. TED: Ideas Worth Spreading. Oct. 2009. Web. 24 Jan. 2010. <www.ted.com>.

A holistic sensory experience, like the one described in the gap system of Pennsylvania, does not have to be lost in the urban context. Senses simply have to be acknowledged and designed for. One incredible sensory volume is Rome's Piazza di Trevi. Here, the roar of Bernini's Trevi Fountain deafens visitors while those close to the fountain bask in its refreshing overspray. Sydney, Australia's Hyde Park, lined with native Eucalypt trees, produces the familiar smell of cough medication. These unique sensory perceptions help to set these volumes apart from the surrounding urbanity.

One way humans are constantly touching their urban environment is movement through space on foot. Though what is walked upon is seldom thought about, the textures that are experienced in this way can tell a lot about surroundings. Buddhist Monk, Thich Nhat Hanh, speaks of this relationship in a poem entitled Kiss The Earth.

“Walk and touch peace every moment.
Walk and touch happiness every moment.
Each step brings a fresh breeze.
Each step makes a flower bloom.
Kiss the Earth with your feet.
Bring the Earth your love and happiness.
The Earth will be safe when we feel safe in ourselves.”³

In this poem, Thich Nhat Hahn brings attention to the often-neglected tactile experience between the foot and the world. Specifically, he mentions the “moment” in which such contact is made. This moment of sensory perception can be incredibly insightful if paid attention to. For example, the San Pietrini cobblestone streets of Rome are hard to miss underfoot, even more so on a wet day. These uniformly dark volcanic stones are flat and smooth to the touch. Half a world away on the island of Nantucket, the cobblestone streets are much less uniform. These stones are random in size, shape, and color. Though they are both technically cobblestone streets, the sensory experience underfoot is much different and, in these cases, directly related to the history and location of the respective places. In Rome, the dark San Pietrini cobblestones came from the adjacent volcanic hills. On Nantucket, one theory suggests that the stone was brought out in ship's ballasts, then left on the island. It is a more random assortment of stone.⁴

3: “Kiss the Earth: A Poem by Thich Nhat Hanh | Healthy and Green Living.” Care2. Web. 23 Oct. 2009. <<http://www.care2.com/greenliving/thich-nhat-hanh-kiss-the-earth-poem.html#>>.

4: “Nantucket History: Cobblestone Streets With Betsy Tyler and Jeff Willet - — Plum TV.” Welcome to PlumTV.com - Home to all things Aspen, Hamptons, Martha's Vineyard, Miami Beach, Nantucket, Sun



Above Left: The random cobblestone streets of Nantucket (NB). Above Right: The squared cobblestone streets of Rome (NB).

While a holistic sensory experience may be considered the most effective in setting the volume apart from the outside world, as demonstrated in the gap environment and in the urban context at Piazza di Trevi, certain senses may be considered of a greater hierarchical importance. Aristotle placed a particular emphasis on touch when describing the importance of the senses.

“An animal is a body with soul in it: every body is tangible, i.e. perceptible by touch; hence necessarily, if an animal is to survive, its body must have tactual sensation. All the other senses, e.g. smell, sight, hearing, apprehend through media; but where there is immediate contact the animal, if it has no sensation, will be unable to avoid some things and take others, and so will find it impossible to survive. That is why taste also is a sort of touch; it is relative to nutriment, which is just tangible body; whereas sound, colour, and odour are innutritious, and further neither grow nor decay. Hence it is that taste also must be a sort of touch, because it is the sense for what is tangible and nutritious.”⁵

When humans touch their surroundings underfoot and are forced to become aware of this tactile experience they begin to understand where they are. This is true of both the natural volumes, such as the gap, but also the urban volumes as seen in the examples of the San Pietrini and Nantucket cobble stones.

Valley, Telluride, Vail. Web. 26 Oct. 2009. <<http://www.plumtv.com/videos/nantuckets-cobblestones/index.html>>.

5: Cohen 2005.

site



Bombing of Wesel. Wesel, Germany (Find)

site

The site of a volume is the volume's location within the ever changing context of both space and time. Because humans are constantly contained by the parameters of space and time, they often neglect to consider how space and time effect their surroundings, or in this case the site of a volume. Space and time do change and evolve as does site. The evolution of site and the ever changing elements of space and time create dynamic volumes.

This elasticity of site is extremely prevalent in the volumetric spaces of the natural world. For example, a meadow in a deciduous forest may be seen as a volume. Its site, the context of space and time that it exists within, fluctuates. Seasonally, the meadow changes from a position of growth and livelihood in the spring and summer months to one of hibernation and death during the winter. Daily, the meadow changes color, reacts to sun and shade, can be swamped by a hard rain or flattened under a visitors foot. It reacts to and changes with its greater context of space and time. Over time, a fire may run through the meadow clearing it and the forest. Site changes also occur to volumes in urban environments.

Though volumetric space in urban environments is often thought of as static, this is not the case, particularly when spaces are studied over any length of time. Even over a short period of time, volumes in an urban environment can change drastically.

For instance, the unplanned destruction of urban areas can create evolved examples of volume. Here, volume is shaped by the evolution site. In 20th century warfare, the aerial bombing has become an effective weapon. These wartime maneuvers opened densely inhabited urban fabrics. A new site is then revealed which, depending upon the extent of the bombing and the pre-existing character of the city, can become an open square, an oblong depression, or an organic void. In modern times, more precise destruction has created distinct volumetric spaces in the urban fabric of cities. The destruction of the World Trade Center buildings in the center of New York City's densely gridded financial district has left behind a rectilinear volume, the redesign of which has become a herculean undertaking.

In a less catastrophic tone, the natural aspects of site can play a defining role in the creation of urban volumes. Pittsburgh's Point State Park sits on triangular parcel of land at the convergence of the Allegheny, Monongahela, and Ohio Rivers. The park's strategic location once made it an ideal place for fortification. Through time and the evolution of the world



Above Left: An aerial bombing in Wesel, Germany during WWII brings a new volume into the fabric of the existing city (Find). Above Right: The site of the old World Trade Center buildings turned into an urban volume by the attacks of 9/11 (GoogleEarth).

around it, the fort became obsolete. Meanwhile, the city of Pittsburgh grew behind and eventually the fort was replaced by what is now Point State Park, an urban void set apart from the rest of the city. The space also acknowledges its context in space and time, or its site, by being designed to occasionally flood. A series of descending concrete steps that work their way to the waterfront accommodates this flooding.

Juxtaposing both catastrophic urban change and natural influence, the existing outdated infrastructure of post-industrial cities can also become part of the defining character of volume. Promenade Plantee in Paris, France, once an elevated rail system, is now a lushly planted 2.8 mile linear park. Underneath the rail, a place once avoided due to the earth-shaking traffic above, there now exist several shops and restaurants.¹ James Corner's Field Operations, a landscape architecture/urban design firm, has just completed phase one of The High Line in New York City, New York. The High Line is a project similar to Promenade Plantee where what used to be an elevated train line is now a 1.45 mile park.² Here, what was a derelict urban space for trains has been transformed to house four varieties of sumac trees, a cupcake vender, and a bird sanctuary. Promenade Plantee and The Highline demonstrate how existing sites (in both cases unused elevated rail networks) can be transformed in an effort to refresh and renew post-

1: "Promenade Plantee." Paris Walking Tours. Web. 26 Oct. 2009. <<http://www.paris-walking-tours.com/promenadeplantee.html>>.

2: Field Operations. Web. 26 Oct. 2009. <<http://www.fieldoperations.net/>>.

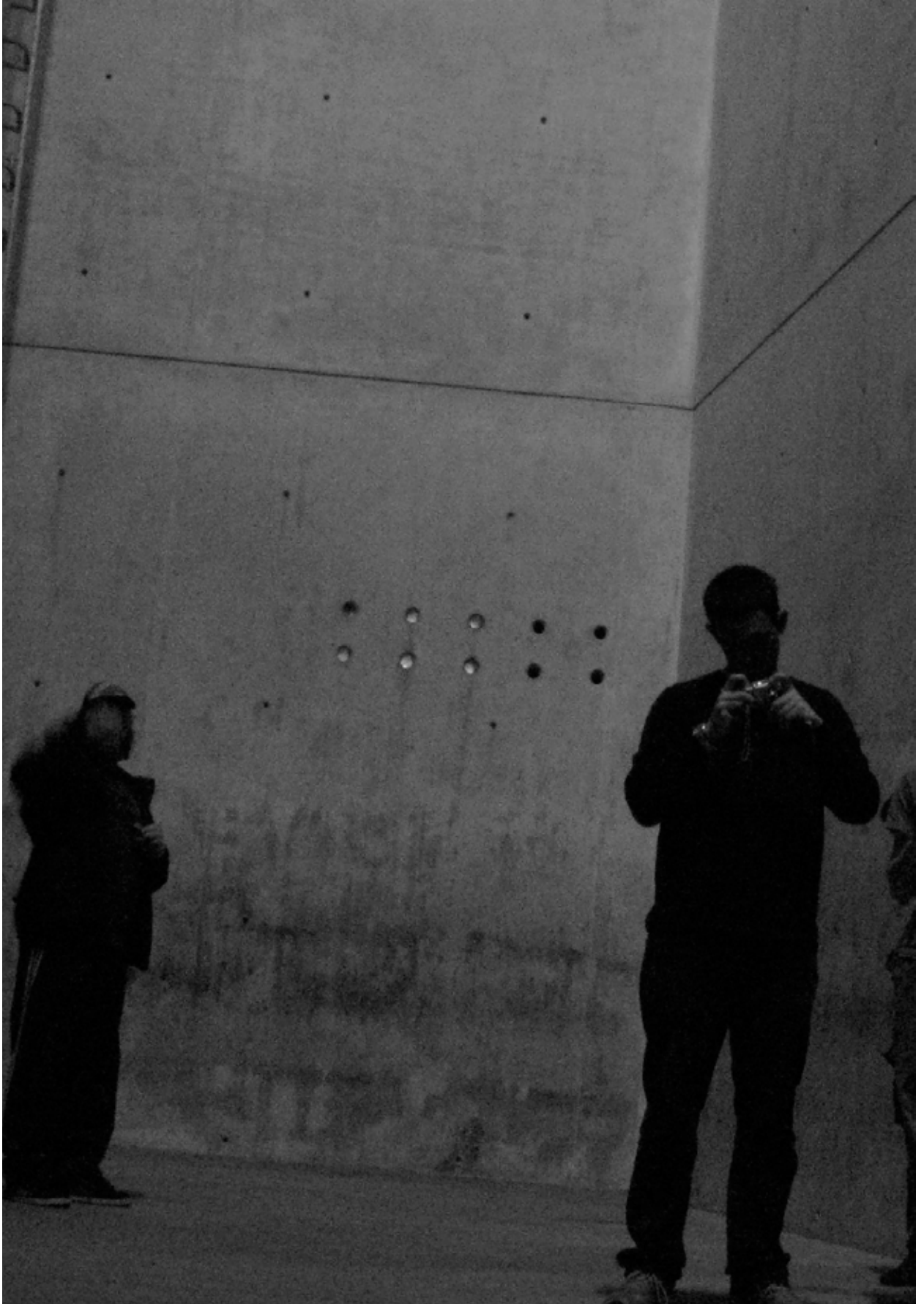


Above Left: The pre-existing rail system upon which the Highline was constructed has influenced its evolution as an elongated linear volume (NB). Above Right: Natural river systems delegate the triangular shape of Point State Park (Pittsburgh).

industrial cities. As more and more cities evolve toward post-industrialism, these two projects provide inspiring examples of how once heavily constructed and programmed inhuman spaces can be transformed into wonderfully executed linear public volumes.

All of these urban volumes, whether created by human caused catastrophe, nature, or the evolution of the city around them, are linked by a common thread. They all are referenced to their site, their context within space and time. In nature, the meadow refers to seasonal change, climate, time of day, and light. In the urban environment it is sometimes dreamt that objects are static or contained. This false assumption and the designs that result from it devalue the significance of the site of an urban volume's ability to connect with some aspect of the natural world, in this case its site or its evolution through space and time.

program



Jewish Museum. Berlin, Germany (NB)

program

Program refers to the purpose of a site and/or activities associated with it. When speaking of the program of a volume, it is to be understood here as a human purpose, that is the purpose for which a human would use or interact with the volume. Without becoming lost in a sea of indefinite possibilities, it should be acknowledged that the program of a volume is subjective and multi-layered, and could be defined with relation to something other than the human, though here it is not. Program focuses on the way a person interprets the purpose of a volume and the way they use that volume. However, it is possible for this to fluctuate with individual interpretation.

Despite the possibility of variation, certain volumes in nature can be said to contain programmed constants that hold true for the majority of the human species. For instance, the way a human being interacts with a generic meadow-surrounded-by-forest landscape is evocative of a program, designed for a volume, that is ingrained in our evolution. As discussed earlier, human beings evolved from *Homo* of the forest, swinging from the trees and walking upon all fours much like modern day Chimpanzees, to *Homo erectus* of the savanna, standing tall and walking on two legs. *Homo erectus* had developed the ability to stand up and survey the landscape, a talent crucial to survival in a savanna (or meadow) environment. Humans were now able to stand up and gain prospect over their surroundings.¹ At the same time, they were able to retreat to the forest for refuge whenever necessary. The fringe area, where the forest connected with the savannah, became a space in itself representing the best of both programs, the ability to see out over the landscape and the ability to seek shelter in the dense forest.² This process of survival is further defined in Jay Appleton's *The Experience Of Landscape*. Appleton says that "at both human and sub-human levels the ability to see and the ability to hide are both important in calculating a creature's survival prospects... Where he has an unimpeded opportunity to see we can call it a prospect. Where he has an opportunity to hide, a refuge."³ Appleton refers to this "aesthetic hypothesis" as his "prospect-refuge theory."⁴

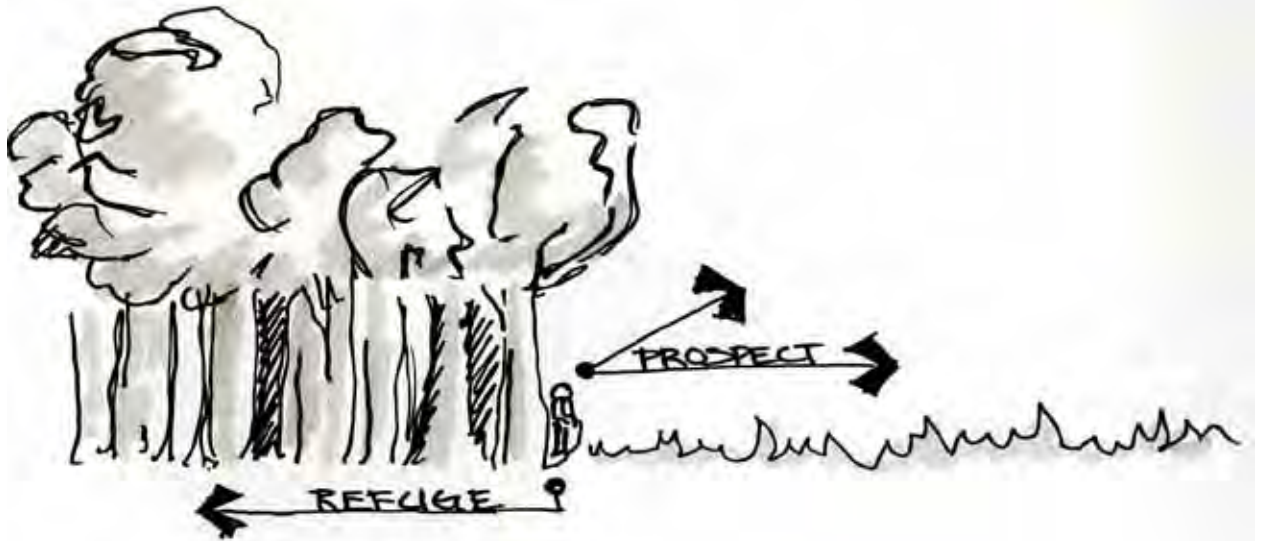
This example of program in a natural space demonstrates program at one of its

1: Walker 1996: 239

2: Walker 1996: 239

3: Appleton, Jay. Experience of Landscape. Rev. ed. Chichester, New York: John Wiley & Sons, 1996.: 76

4: Appleton 1996: 76



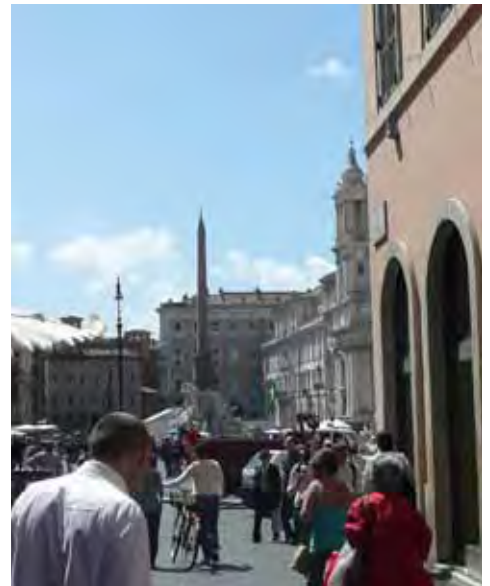
Above: This sketch depicts the prospect/refuge relationship described by Appleton as experienced by *Homo erectus* in a volume created by savannah being surrounded by bushland or forest (NB).

most basic levels, that of survival. Prospect and refuge in a meadow surrounded by forest environment shows how the program of a space in nature often facilitates the progression of a species. In the urban context, this program still exists but is quickly overshadowed by many others as seen in Rome's Piazza Navona.

The volume of Piazza Navona is defined by an ancient program cutting through the fabric of the urban environment. The piazza has evolved directly over Circus Domitianus, a first century stadium in which various games and spectacles were held.⁵ Standing in the piazza today, its shape makes it easy to imagine chariots being raced around site just as they were 2000 years ago. The act of racing around the parameter of the volume, though no longer the primary program, is still carried out during the city's annual bicycle and foot races. The ancient program also continues to influence the direction of movement through the space. On any given day the "infield" is filled with artists, vendors, and musicians while the "outfield" is lined with outdoor seating for various cafes and eateries. The space between the two, which could then be considered the track, is left free for the movement of wandering pedestrians and the occasional service vehicle. All of this is easily overlooked by the passerby. The confusion, beauty, and hustle of one of the world's most vibrant and energetic public spaces hardly asks the common visitor to pause and analyze its program.

These two examples of programmed volumes (the generic forest/meadow and Piazza

5: "Roma: Piazza Navona." Home. Web. 24 Oct. 2009. <<http://www.romainteractive.com/pznavona.htm>>.



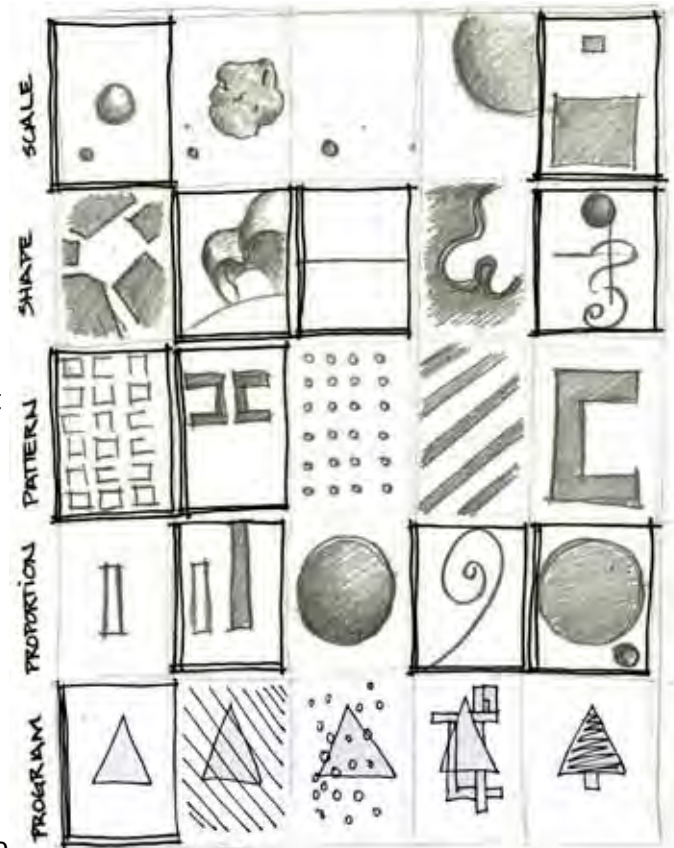
Above Left: This perspective diagram illustrates how program defines volume in Piazza Navona. The arrows represent historic and present circulation patterns while the squares represent the static programs of the space (NB). Above Right: An image looking into Piazza Navona from the north. (NB)

Navona) appear to be very different places and very different volumes. However, they have some similarities. If a meadow is considered, and how it comes together with a forest, the fringe area, the area where the forest meets the meadow, becomes the area for both prospect and refuge. These are two programs crucial to the survival of a species.⁶ Likewise, in Piazza Navona, the fringe area, the space where the volume meets the urban fabric of the city, has become the safest and most comfortable portion of the volume. This is evident in the fact that this is where people sit and eat, an act that naturally leaves a creature incredibly vulnerable and therefore is best programmed in a portion of a volume that is safe and secure. This shows how, on some level, the programming of a volumetric space in an urban environment can be influenced by the programming of a natural volume.

chapter 6

Natural Forms In Urbanity

Within and without volume exists form. Unlike volume, is a sacred place inside separated from that which is outside, form and its qualities of scale, shape, pattern, proportion, and program exist as part of both the inside and outside worlds simultaneously.¹ As such, its essence can not be split between inside or outside. Here, essence is an embedded metaphysical or beyond-physical spirit inherent within form due to its divine conception.² The parts of form are arranged here similar to the parts of volume highlighted previously. This is done to help draw relationships between the two.



Like the parts of a volume, the parts of form discussed here represent a diverse yet incomprehensive sampling. Again similar to volume, parts such as color, texture, hierarchy, and juxtaposition are not given the same attention as other parts because they can be discussed under already established subheadings. Color and texture are discussed as elements of pattern while hierarchy and juxtaposition are discussed as qualities of program. Also, like the qualities of the parts discussed in the previously, the qualities of the parts of form discussed here are only representative of a diverse sample of qualities and are not considered to be all-inclusive. The basic argument for each part follows the same general format: each part is discussed as it relates first to nature, then urban environments, in an effort to show that the qualities of natural volumes do not have to be lost within the context of an urban setting.

1: Stephens 2009

2: Kollar 1983: 22

scale

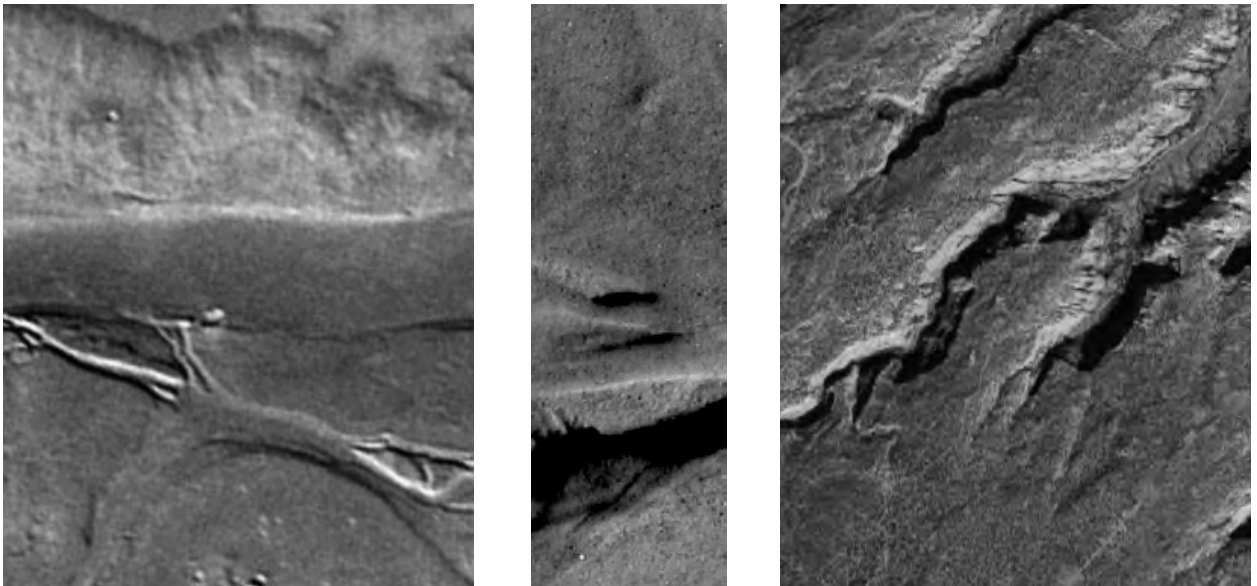


Sculpture By The Sea Walk. Bondi, Australia (NB)

scale

The scale of a form is expressed as the relationship in size between two objects and is understood as a comparison. Often, the scale of a form is seen as it relates to the human, though this does not have to be the case. Size, which is often mistakenly used as a synonym of scale, differs in that the size of an object represents only the “physical dimensions of length, width, and depth of a form” without reference to any other object.¹

In the natural world, the scale of a form can vary tremendously while retaining its character. This is particularly prevalent where water interacts with land. In these situations, the molecules of water and those of land react with one another. Water, being a universal solvent and a powerful erosive force, sweeps across the landscape leaving visible forms in its path.² These traces appear without significant formal variation at various scales because what occurs at a microcosmic scale is dictating the form of the macrocosmic.



From Left to Right: Mars from 100km away (GoogleEarth): a beach in New Zealand from 1m away (NB): Moab, Utah from 10km away (GoogleEarth). These three images demonstrate how, despite their variance in scale, the organic and fluid form that is created when water interacts with earth is the same.

This same phenomenon can occur within urban environments. Here, building material becomes the microcosmic elements dictating the macrocosmic form. Again, as the scale changes, the basic form does not.

1: Ching 2007: 34

2: “Water properties: Water Science for Schools: Physical and chemical water properties.” USGS Georgia Water Science Center. Web. 07 Nov. 2009. <<http://ga.water.usgs.gov/edu/waterproperties.html>>.

Take for example the concrete masonry unit (CMU) that is rectilinear in shape.³ When a structure is comprised of any material it becomes inhibited by the expressive potential of that material. A wooden house can only be built within the boundaries of what a construction material, such as wood, will allow. Mixing materials (such as adding a glass window or steel supports) allows for freedom and wider boundaries. The final form may not appear to be a direct descendent of this material, the micro may not fully dictate the macro. In poorer regions of the world where multiple building materials are not easily accessible, one tends to suffice. Often, that one material is the CMU. When a structure is built primarily by a rectilinear unit then that structure tends to be rectilinear. The form of the building material repeats itself at a larger scale, that of the built structure. When several of these structures are repeated, more rectilinear structures appear, the form continues to form.



Above: Amman, Jordan and its CMU construction realized at various scales (a wall of a small building to a city-scape)(NB). In this urban environment, the form of the structures repeats through various scales because of the form of the building material.

However, this is not always the case. Buckminster Fuller's geodesic dome is one example of forms ability to transform itself through scale. Spaceship Earth at Disney's Epcot, is a famous example of this. In the geodesic dome, triangular shapes are repeatedly stacked edge to edge to create a dome. Two-dimensional triangular shapes come together to create a three-dimensional sphere. The shape of one form comes together to create the shape of another form. Therefore, forms that appear on the microcosmic level (triangles) do not appear on the macrocosmic.

3: Welcome to specBlockUSA. Web. 07 Nov. 2009. <<http://www.specblockusa.com/>>.

When discussing how the scale of a form can infuse urban areas with natural elements, the continuity of such elements across various scales appears to be crucial, as this is what occurs in nature. Forms that retain their essence across various scales can impart upon us some reflection of the natural world, some part of form's unbroken spirit. This is seen with the interaction of water and earth in nature and again in the CMU construction of the urban environment. Contrary to this notion of uniformity across various scales is the geodesic dome. Though Fuller's geodesic dome is structurally and aesthetically interesting, it fails to convey a continuity of form across various scales. Because of this, it could be considered to contain less natural essence than CMU construction.

shape



Interior form of DG Bank Building. Berlin, Germany (NB)

shape

The shape of a form can be thought of as the purely physical gestures (curves, lines, voids, and solids) that help comprise an overall form. Shape can be two or three dimensional. Shape is often used as another definition of form, but what separates the two is that form transcends the sum of its parts. Shape is only one of those parts lacking the greater essence found within form.

In nature, the shape of forms are often organic, curvilinear, or amorphous. However, this is not always the case. As mentioned when discussing the shape of volumes in nature, the moon and other celestial bodies create what appear to be perfect circles when viewed from a distance. Also, the horizon can be perceived as a perfectly straight line when experienced from a distance.

These examples only briefly demonstrate how natural shapes occur. The implications of their existence is often unclear. What does it mean that a river has a curved stream bank or that the sun creates a seemingly perfect circle? In an urban environment, there also exist a plentiful array of shapes, yet here they begin to take on cultural and experiential meanings.

The city street is an effective example of this. At street level, the shape of a street can be a telling element of form. For instance, a street that is linear in shape provides the visitor with a view toward a destination. When the form of a street shifts towards a curvilinear or snaking shape, the destination is no longer clear. As opposed to highlighting a final destination,



Above Left: A view towards the Spanish Steps of Rome from 1,200 feet away (NB). Above Right: A view into Via Della Rotonda (where the Pantheon is located in Rome) from 600 feet away (NB).

the curved shape of the street emphasizes building facades and side streets that change often with the curves in the street. Here in an urban environments, subtle variations on the shape of form have large impacts on perception. What is being described here is the difference between organic patterns and the grid, two shape-based analogies used to delineate the shape of urban form.

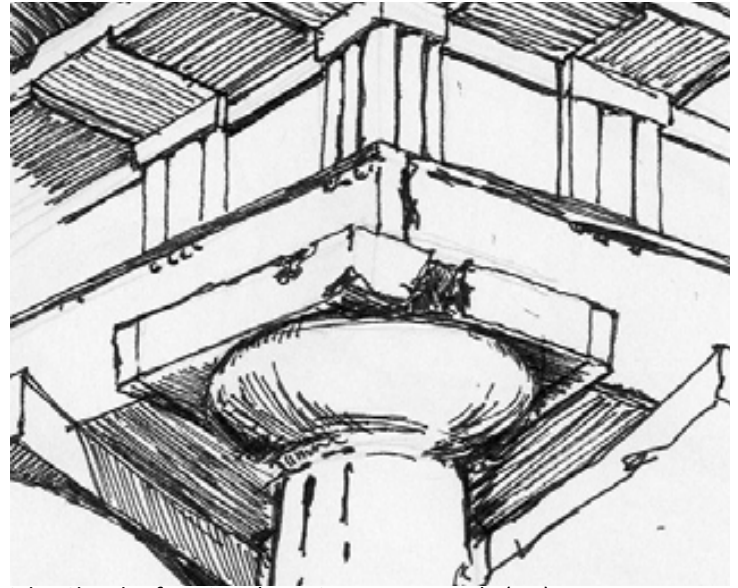
The idea of a city as an organic being originated with the birth of modern biology. Italian Francesco di Giorgio Martini pioneered defining the relationship between organisms and the city in works such as *Man as the prototype for urban form* in the late 15th century. In the comparison of urban form and organismic life, human organs were paired with functional spaces of the city. Martini expressed the analogy saying, "Open spaces like squares and parks were the lungs of the city, the center was the heart pumping blood (traffic) through the arteries (streets) and so on."¹ To some, drawing an analogy between the city and a living organism is flawed. Kevin Lynch points out that, "Cities are not organisms... They do not grow or change themselves, or reproduce or repair themselves."² Whether or not the labeling of "organic" is the most effective analogy is debatable. What gridded versus organic urban forms suggest is more concrete. The grid is a symbol of power, planning, and control of urban land by one group of like-minded or influential people. Organic development suggests the opposite, that the meandering streets were developed over time by several different parties or interest groups.³ Both shapes carry with them signs or references to something else, glimpses of a deeper meaning.

This also holds true in the varying shapes of architectural forms. For example, the column has been used in architecture for thousands of years and has been dominated by three basic shapes, Doric, Ionic, and Corinthian. Each shape differs in form only slightly, yet their structural and cultural variance is great. Doric columns tend to be the least decorative of the three. Originally Greek by design, these columns are stout in shape, resulting in their ability to support the most weight of the three columns. Due to the stout shape and extreme load bearing potential, the Doric column is considered the column of masculinity. The Ionic column has less load bearing potential than the Doric and is more decorative in shape. In *De*

1: Kostof, Spiro. City shaped urban patterns and meanings through history. Boston: Little, Brown, 1991.: 52

2: Lynch, Kevin. Image of the city. Cambridge, Mass: M.I.T., 1960.: Intro

3: Kostof 1991:52



Above Left: Sketch of Ionic column (NB). Above Right: Sketch of Doric column in Paestum, Italy (NB).

Architectura, Vitruvius describes the Ionic column as more gracefully related to the proportions of the female body.⁴ These columns came to dominate the facades of post-Renaissance libraries and courts, furthering their culturally accepted relationship to knowledge and justice.⁵

As has been demonstrated, the shapes that are observed in the forms of nature are plentiful and highly varied. They range from amorphous, curvilinear bodies to rectilinear, angular physical gestures. In the urban environment the shapes are no less varied. The study of organic and grid cities, as well as columns in an urban context demonstrates how shape can begin to address social and cultural issues. However, due to the incredible abundance and variance of natural shapes, it is difficult to firmly assume that certain shapes extracted from nature and brought into the urban context would be more reminiscent of nature than others. Though it may be easy to assume that the bending path is more “natural” than the straight, it must be remembered that straight paths do exist in nature and serve their own purpose. Also, though an organic city such as Sienna, Italy may be loosely compared to a living organism, this analogy (as Kevin Lynch suggests) is somewhat flawed.

4: Pollio., Vitruvius. Vitruvius ten books on architecture. New York: Cambridge UP, 1999.

5: Pollio 1999

pattern

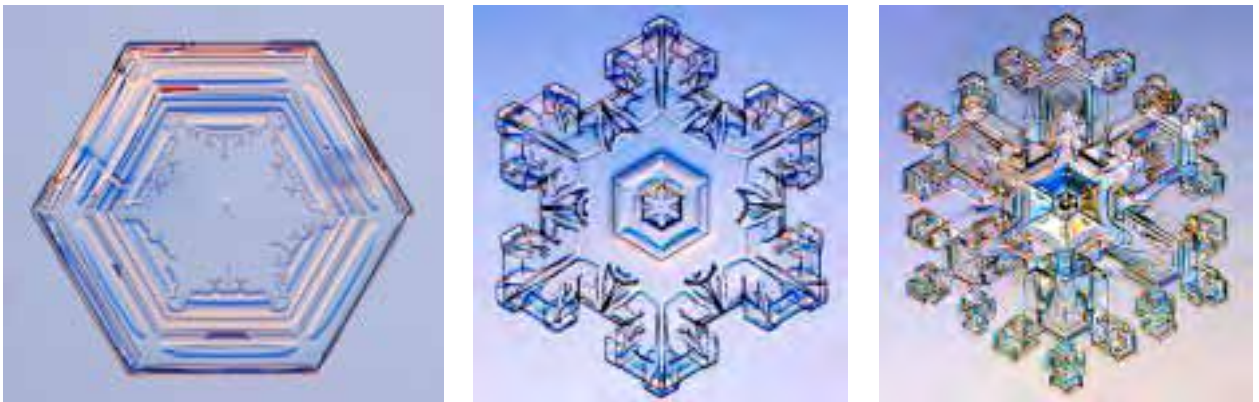


Memorial to the Murdered Jews of Europe. Berlin, Germany (NB)

pattern

Pattern is (much like proportion) to be understood as things relating to things rather than things relating to humans. A pattern can be viewed as a repetitive gesture carried from one singular unit into several. While there is no limit to the maximum extent of a pattern, a minimum requirement exists. To go from a singular form to a patterning of forms requires that there be at least two forms representing one another.

In the natural world, patterns are plentiful and imperfect. Peter Kollar refers to these plentiful imperfections using a series of dichotomies or, as mentioned during the discussion *Urban Volume and Form*, anatomical pairs. Pairs such as sameness and otherness, unity and multiplicity, and continuity through alteration can be seen all around us in the natural world.¹ The snowflake is a cliché, yet pertinent, example of this. Though millions of flakes fall from the sky during any given snow storm, no two are perfectly identical. The general pattern repeats, and from a distance appears to be identical, yet on a molecular level and more often than not on a formal level they are not the same. Science has proven that no two are identical in every way, each is a unique piece of a greater pattern of forms. Though, when viewing a sky of falling snow flakes, they appear to be the repetitive pattern of a singular form.²



Above: These three images of snowflakes in various patterns of crystallization reaffirm that, while snowflakes are made of a common material, their patterns change slightly making each an individual epitomizing sameness and otherness, unity and multiplicity, and continuity through alteration (Guide To Snowflakes).

1: Kollar 1983: 60

2: "Snowflake Chemistry." Chemistry - Periodic Table Web. 05 Jan. 2010. <<http://chemistry.about.com/od/moleculescompounds/a/snowflake.htm>>.

Several types of patterning forms exist in the urban environment as well. Moving from historic to contemporary examples, it can be seen how the patterning of forms in urbanity has moved from a series of anatomical pairs, like those represented in natural patterns, to patterns of strict uniformity, then back again.

Historically, the repetitive patterning of forms has been used to stress power, grace, and sophistication. These early patterns were created by hand, resulting in patterned forms that, though intending to be one in their sameness, had slight imperfections and variances resulting in otherness (much like the snowflake). These early patterns still exist and manage to awe spectators. In Venice, Italy's Ca' D'Oro, the simple patterning of arched forms creates a balanced and beautiful outdoor/indoor spatial relationships. The arches all consist of hand cut stone that by its very nature exhibits a pattern of continuity with slight alteration.

Patterns in the industrial urban environment have tried hard to break away from the anatomical pairs described by Kollar. Few urban forms with the exception of sculpture are constructed entirely by hand anymore and the result is uniformity. Industrial techniques that create patterning forms are more efficient when they are all created to be identical. To create identical patterns, only one mold is needed. The process of creation is then repeated and streamlined into a blazing display of proficiency.



Above Image: The broken fractal facades of Federation Square uses a continues pattern while switching materials from zinc to sandstone (NB).

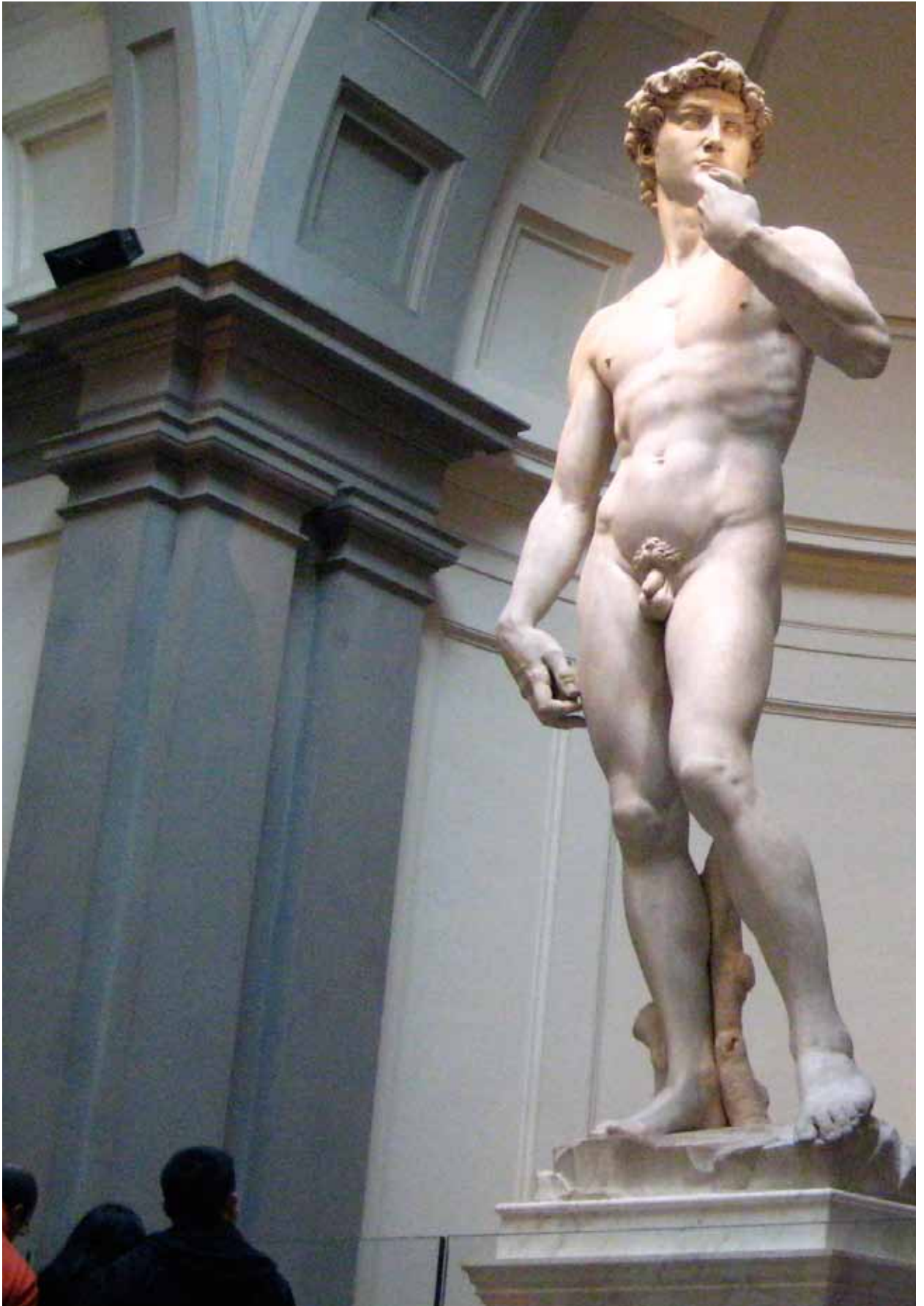
One example of this technique being broken in a post-industrial urban setting is Federation Square in Melbourne, Australia. The building facades of Federation Square use broken and fragmented fractal patterns to create a dynamic contemporary space in the middle of a city that prides itself on art and culture.³ Though the forms are of a similar pattern, that of a fragmented fractal, they are not repeated tirelessly in an effort to create uniformity. They are randomized and repeated in varying patterns creating many of the same anatomical pairs nature displays (sameness and otherness, unity and multiplicity, continuity through alteration).⁴

Examples such as Italy's Ca' D'Oro and Australia's Federation Square prove that the patterns of natural forms can exist in urban settings. Not only can they exist, but they can do so beyond a purely imitative gesture. What is found in both examples is not a repetitively uniform floral print (which could be considered a purely imitative gesture) but rather a series of uniform structures that contain un-conformed elements making a sophisticated reference to nature.

3: "Site Construction/Design." Federation Square - Melbourne's Meeting Place. Web. 08 Nov. 2009. <<http://www.federationsquare.com.au/index.cfm?pageID=28>>.

4: Kollar 1983: 60

proportion

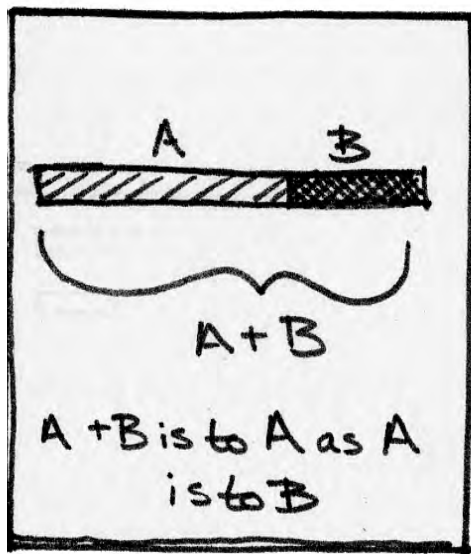


David by Michelangelo. Florence, Italy (David)

proportion

Proportion of forms is not viewed as relative to human experience but rather relative to other forms. It is a part, share, or number considered in comparative relation to a whole.¹ This relationship between part and whole can be ambiguous, as the moment when a whole becomes complete is often unclear. However, when focus is directed solely on numbers as they relate to a whole, as opposed to physical parts or pieces comprising a whole, the understanding of proportion becomes less clouded.

Historically, the proportions of forms in the natural world have been said to hold spiritual significance. The Golden Ratio or phi is one example of this suggested divine relationship. Phi is a numeric relationship in which the length or size of $a+b$ is to a as a is to b and equals roughly 1.618. The proportion is said to be of the sacred geometries in part because it is found universally at various scales. For instance, the Golden Spiral can be used to distinguish the proportions of the human ear. The same proportional spiral is found in the patterning of a sunflower and in spiral galaxies.² Plato, who worked closely with Golden Geometries, spoke of being able to see through them “both one and infinite in multitude.”³ He understood that within certain proportions there exist deeper levels of understanding.



Above Left: A diagram of phi (NB). Above Right: The spirals of a Sunflower (A Spiral).

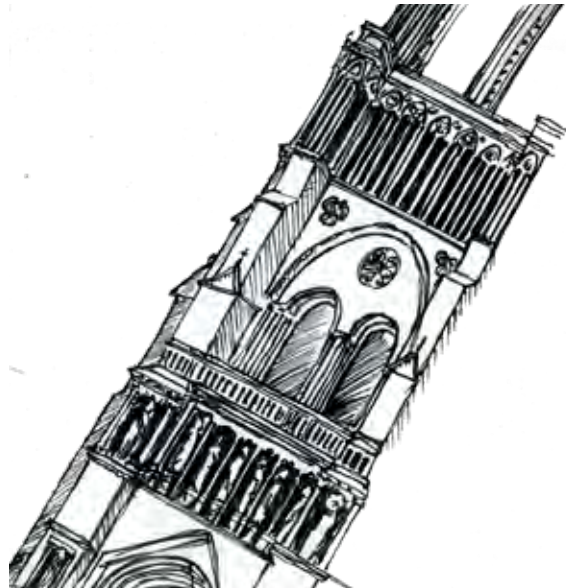
1: “Proportion Definition | Definition of Proportion at Dictionary.com.” Dictionary.com. Web. 04 Jan. 2010. <<http://dictionary.reference.com/browse/proportion>>.

2: Phi: 1.618. The ‘phinest’ source to the golden section, golden mean, divine proportion, Fibonacci series and phi, 1.618. Web. 07 Nov. 2009. <<http://goldennumber.net/>>.

3: “The Republic by Plato.” The Internet Classics Archive: 441 searchable works of classical literature. Web. 07 Nov. 2009. <<http://classics.mit.edu/Plato/republic.html>>.

In the urban context, the proportions of form can still hold true to the Golden Ratio. The numbers that revealed to Plato “one and infinity in multitude” can be easily transferred from forms of nature to forms of urbanity.⁴ These architectural wonders of the urban world represent numeric relationships that refer to a “proper or harmonious relation of one part to another of to the whole.”⁵

Historically, urban architectural masterpieces such as the Acropolis in Greece, the Great Pyramids of Egypt, and Notre Dame in Paris all made use of harmonious ratios such as that of phi. Not only can this proportion be viewed on the facade of the architectural forms mentioned but also in many ancient floor plans, Gothic Cathedrals included.⁶ In contemporary architecture, the United Nations building in New York City and the CN Tower in Toronto carry on this tradition.⁷ In other instances divine proportions can be manipulated specifically for the urban context. Michelangelo’s David has his hands (the hand normally exists as a Golden Ration between itself and the arm to the elbow) and head slightly out of proportion with the rest of his body. As the sculpture was originally intended to occupy an outdoor space in Florence, its hands and head were enlarged in order to convey emotion from greater distances.⁸



Above Left: An image of David’s proportionally askew head (David). Above Right: A sketch of the facade of Notre Dame that was constructed to using Golden Geometries (NB).

4: “The Republic by Plato.” 2009

5: Ching 2007: 278

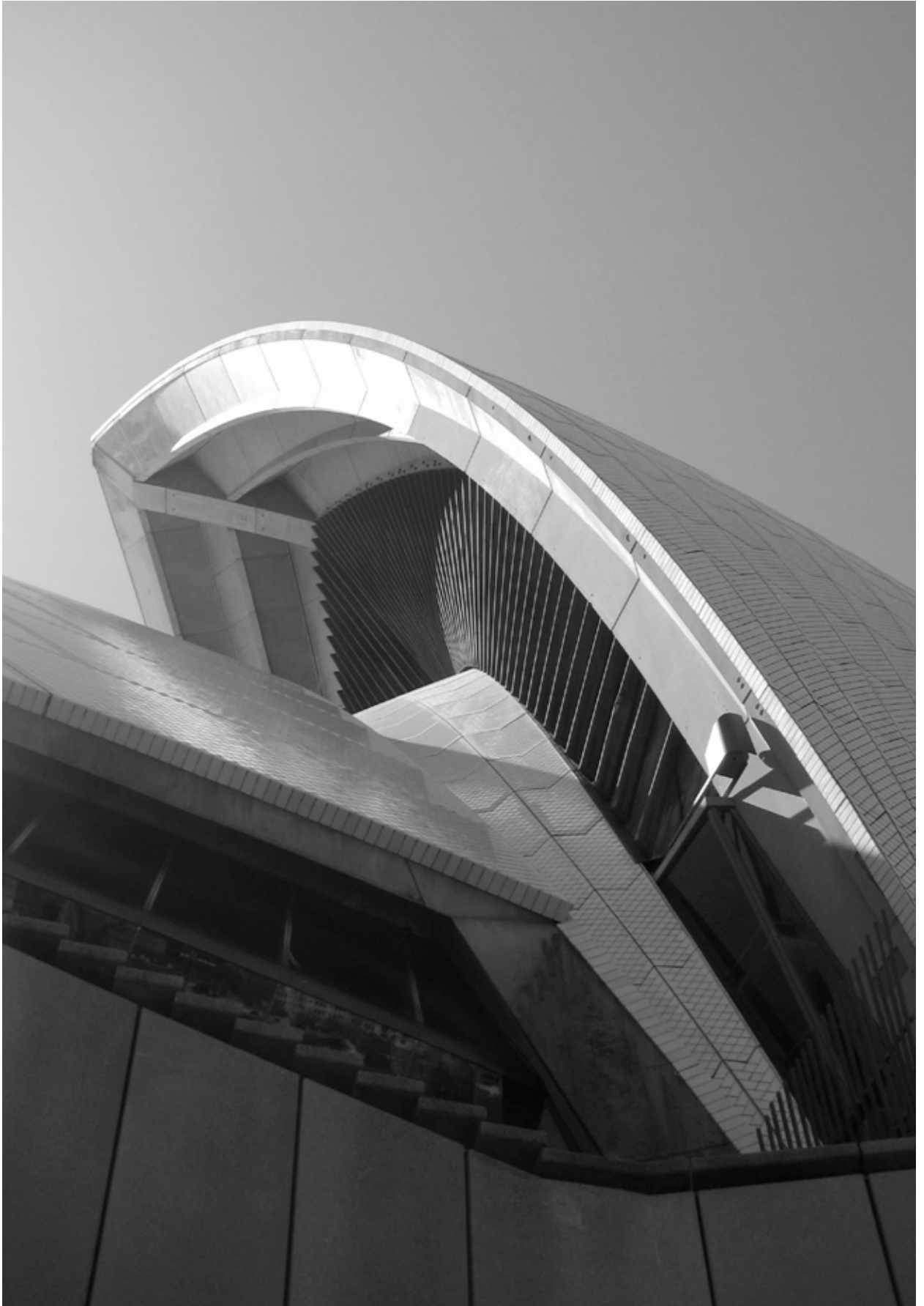
6: Ching 2007: 288

7: Phi 2009

8: “Michelangelo Buonarroti: David.” Art and the Bible - artbible.info. Web. 07 Nov. 2009. <<http://www.artbible.info/art/large/338.html>>.

The proportion described by Phi in nature, paralleled by those seen in the forms of urban architecture and sculpture, is an example of how certain proportions of form can transcend nature without jeopardizing their essence. The “one and infinity” that Plato saw in the proportions of the natural world do not break down as they are transferred into the urban world. Though at times this proportion is manipulated to foster one result or another, as seen with the proportions of Michelangelo’s David, it is still based on Phi. And so, it may be possible to conclude that, even with slight variations, the proportions of form (numerically speaking) can transfer almost exactly from the natural world, to the urban.

program



The Sydney Opera House. Sydney, Australia (NB)

program

The program of form can be thought of as form's purpose. Unlike the program of a volume, which is defined as the volume's purpose as it relates to the human being, the program of form can exist in the context of this thesis without relation to the human. A form may contain an inherent program that could be carried out regardless of human intervention (nature provides strong examples of this).

In the natural world, animals are programmed to survive. In general terms, this means they must eat, sleep, reproduce, seek shelter, breathe, and so on. Despite these basic needs, which are often universal for all life sustaining creatures, millions of small programmatic variations and diverse forms occur. Through evolution, animals have taken forms that support their specific survival programs that are both ingenious for their simplicity and beautiful for their complexity. There are examples of this all around the natural world from the fragility and lightness of the bird's wings to the power of the alligator's tail. In these two examples the form of both the wing and the tail follow the program of movement (movement being one aspect of the animals program of survival). Because of the environments in which they move, the bird in the air and the alligator in the water, they are programmed to move using different techniques. It is impossible to fly on the earth without taking into account the gravitational pull of the earth. Thus, birds have adapted their bodies to be very light, replacing teeth and a jaw with a lightweight beak, and by hollowing out their bone structure.



Above: Pigeons, a ubiquitously urban bird, perched along the ledge of The Yeni Mosque in Istanbul, Turkey (NB).

In the urban environment, the relationship between program and form is often less direct. As discussed previously, humans have done such a good job of sustaining life that they have been able to move beyond simply hunting, foraging, and fornicating to develop art, culture, and religion.

The forms of transportation hubs display a program's influence on form and its possible integration with the cultural and art of a region. Airports serve one primary program, which is to facilitate air travel service. Recently, issues such as security, comfort, and timeliness have become attached to this primary program, but on the most basic level airports are still simply there to provide travel by air. With this one unifying program, it may be assumed that the forms of each airport are similar. This would make particular sense when considering that the pilots flying all over the world are in fact from all over the world. The greater the uniformity of forms, the easier the navigation around and understanding of the forms, and thus the greater the efficiency. However, this is not the case. Not all airports are identical in form. And so, if the primary program of an airport is to provide air travel service, then why is it that not all airports are identical in form?

It was realized some time ago that as airports are often a traveler's first impressions of a region. If they are not a traveler's final destination and are merely a stop in the journey, then they may be the first and last impression a person has of a region.¹ That being considered, the program of an airport transforms from being one of a purely utilitarian nature (facilitating air



Above Left: A Buddhist temple inside of Bangkok's airport (The Bangkok 2010). Above Right: The forms of Denver International Airport (Free 2010).

1: Rybczynski, Witold. "The history and future of airport design." Slate Magazine. Web. 03 Feb. 2010. <<http://www.slate.com/id/2223232/>>.

travel) to a program of a more ambiguous stature (to represent the essence of a region). As a result, airports look different. The canopy of Denver International Airport is created of very different forms than other airports because it is meant to reflect the Rocky Mountains in the distance. In the middle of Bangkok's Suvarnabhumi Airport, there is a recreated Buddhist Temple. For even less drastic examples of diverse forms in airports look in the gift shops. Now, without even leaving New York's JFK Airport you can purchase a miniature Statue of Liberty and a classic Milton Glaser I "heart" NY shirt (Interestingly, the I "heart" New York logo originally by designed Glaser for New York City has been transformed all over the world with NY being replaced with everything from "Singapore" to "Sydney" to "Marxism").

In nature, the bird reflects program's ability to instigate clear forms. Within an urban context, program can become convoluted by culture. Airports, established to support one program have found other programs and their forms now represent those variances. The program of form best representative of those found in nature are those that remain true to their most fundamental programs.

chapter 7

Conclusions

This thesis was begun in 2008 and completed in 2010. Over those years, the exigency of this work has only increased. The balance between inhabiting urban and non-urban environments may have reached its tipping point in 2008, but in just two years the number of people living in urban places has continued to rise dramatically.¹ This significant milestone makes the research question at the heart of this thesis even more pertinent; how can people foster a much needed connection with nature in these new urban environments? To answer that question and regain a healthy human/nature relationship, the design of the urban environments that house the majority of the world's population must be treated with astute care.

This thesis began with several interrelated goals. At the foundation of all of them is the desire to better understand the relationship between humanity and nature. To achieve this comprehension, the historic relationship between the two was examined. After finding several cultures, religions, and communities that attribute humanity's origins to the natural world, it is concluded that the two share a very strong connection historically. The research conducted on the evolution of *Homo sapien* goes on to support the fact that humans and nature lived in close relation to one another until subsistence farming began. To say that this shift marks the breaking point for the human/nature relationship is questionable. It only stands to mark the beginning of a transformation.²

Eventually, from this transformation, evolved the Industrial Revolution of the early 19th century. With the Industrial Revolution came urban migration. As more and more people moved to urban environments the relationship between humanity and nature was strained. In recent years E.O. Wilson's Biophilia, and the work of Environmental Psychologists such as Kaplan and Kuo, have proven that the human ability to live suffers under such a highly taxed relationship.^{3,4} Their studies and ideologies prove that when the human species is removed from contact with nature, a contact that it has known for 99% of its total existence, the species' quality of life

1: World 2008

2: Walker 1969: 239

3: Wilson 1993: 34-41

4: Kaplan 1994

is diminished. Thus concluding that contact with nature has remained a crucial element in a human being's ability to live, going beyond their ability to exist or sustain life.

With the importance of a healthy relationship between humanity and nature understood in both a historic and contemporary context, the question remained how, in such an increasingly urbanized world, is humanity able to connect with nature? To better answer that question, both nature and urban environments were investigated.

After touching briefly upon the ambiguity of the term, nature is shed of its often untouchable demigod persona. It is re-envisioned as something that carries with it a natural essence. Breaking down the physical aspects of nature and focusing instead on its essence makes it possible to envision nature in urban places. While nature in a physical sense can be limited to the untouched, the pristine, and the remote, these places seldom exist in urban environments. Instead, the essence of nature is seen as transferable, allowing nature to intertwine with urbanity. As volume and form exist within both nature and urbanity, they are seen as vessels that travel between the two (nature and urbanity) while carrying nature's essence, facilitating this desired intertwining.

To better understand the details of this intertwining, urban environments were then dissected into volumes and forms. To further deconstruct urban environments, volume and form were broken into a sampling of their suggested parts. These parts are defined as scale, shape, sensory experience, site, and program for volume and scale, shape, pattern, proportion, and program for form. These specific parts were selected to represent a diverse sampling of the total parts that come together to create volume and form. Each part was discussed as it related first to nature, then urban environments, in an effort to show that the qualities of natural volumes do not have to be lost within the context of an urban setting. The conclusions from those discussions are briefly summarized here beginning with the conclusions drawn regarding volumes and finishing with those of form.

With the exclusion of scale, it was concluded that the parts that come together to create volumes in nature can be mimed in urban environments. The illusion of perfect shapes, found in the volumes of nature, was proven to also exist in urban environments such as Rome, Italy's, Piazza della Rotunda and the Vatican City's, St. Peter's Square. Though a plentitude of examples exist to describe holistic sensory experiences in natural volumes, it seems that

certain senses mean more in a person's ability to connect with nature than others. The senses of touch and taste are shown to be of a higher importance.⁵ Site's ability to embrace elasticity over stagnation is also of a higher importance, as this is what occurs with the site of a volume in nature (exemplified by a fire transforming a forest). However, with regard to the program of a volume, stagnation is an important aspect of transferring qualities of nature into urbanity. Here, prospect and refuge, two unwavering human survival instincts, prove their continuing ability to influence the use of volumes. The programming of Piazza Navona in Rome, Italy, directly reflects what would be found in nature. The fringe area, which is the area most conducive to prospect and refuge, becomes the safest part of the urban volume, the part where everybody sits to enjoy their meals.

The parts that come together to create form in nature can all be interwoven or mimed in urban environments with the exception of shape. The diversity of shapes found in nature, both geometric and organic, make it too difficult draw strong conclusions. This is not the case with the various scales of forms. In nature, the essence of a form can be continued through various scales without being jeopardized. This continuity across scale exist within urbanity through a module such as concrete masonry unity (CMU) construction. This type of construction also begins to address another of form's properties: pattern. Pattern is able to exists beyond being purely imitative. Rather, it can create a series of uniform gestures with un-uniform elements. The snowflake proves this phenomenon in nature, while the detailing of Melbourne, Australia's Federation Square demonstrates this phenomenon in the urban setting. The proportions of form are easily transformable from natural to urban environments as long as the proportions remain true to those found in nature such as phi. This can be seen in the fact that ratio of the forearm to the hand is the same proportional relationship found on the facade of Notre Dame in Paris, France. Remaining true to nature is also central to a program's ability to move from nature to urbanity while retaining its essence. Here, the simplicity and truth to programming displayed in the form of a bird can be compared to the original truth to programming experienced by early airports.

The conclusions from *Natural Volumes In Urbanity* and *Natural Forms In Urbanity* summarized here should not be viewed as a comprehensive list of possible ways to connect

5: Cohen 2005

nature with urbanity. Rather, these examples are used to present a unique and diverse sampling of ways to bring elements of nature into urban environments in order to better facilitate the human ability to live. There are several other ways to achieve this same facilitation that are not mentioned in this thesis.

Urban agriculture and living machines are examples of these alternatives. Urban arboretums, green street programs, and artful storm-water management systems provide more examples. These examples show how physical aspects of nature can be integrated into other environments. However, bringing nature into urban environments does not always have to be physical. Policy changes and urban planning initiatives can spearhead change that would otherwise be slow moving or nonexistent. New York City, New York has recently embarked on a policy driven initiative to plant one million trees. Chicago, Illinois has embarked on a similar mission.⁶

These examples, and many others not mentioned, were left aside because this thesis makes a point of going beyond what is generally perceived as natural. The qualities of volumes and forms in nature are described here with a focus on their *essentia*, or essence, as opposed to their purely physical representations. If urban environments are flooded with what is often considered natural in a physical sense (i.e. agriculture, forested land, animal habitat, one million trees) then the two no longer coexist but rather what is urban begins to regress into what is natural. The sophistication of nature presented here allows nature's essence to transgress into urbanity without one attempting to dominate the other, they are able to coexist. Thus, people living are once again able to connect with nature, healing the currently bruised relationship between the two, and granting humans dwelling in urban environments a stronger opportunity to live.

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academic vita

Academic Vita of Nicholas S. Baran

Nicholas S. Baran
338 Big Hollow Rd.
State College, Pennsylvania, 16801
nicholas.baran@gmail.com

education

Bachelor of Arts Degree in Landscape Architecture, Penn State University, Spring 2010
Honors in Landscape Architecture
Thesis Title: Urban Environments and their ability to support human/nature relationships
Thesis Supervisor: Berry Kew

related experience

World Travel and Research Opportunity.
I was able to spend the 2008/2009 school year traveling and conducted thesis research on the topic of urban design and humanity's relationship with nature in Fiji, New Zealand, Australia, Thailand, Jordan, Italy, Spain, Turkey, Greece, France, and Germany.

awards

Deans List
The College of Arts and Architecture Creative Achievement Award
Schreyer Ambassador Travel Grant
John O. Simonds Honor Award for Creativity
Departmental Award for Excellence in Landscape Architecture
George S. Wycoff Merit Fellowship
Center Section PA/DEL Chapter ASLA Academic Scholarship