I, Jared B Cole, hereby submit this original work as part of the requirements for the degree of Master of Architecture in Architecture (Master of).

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Engaging Ecology: Incorporating Nature as an Architectural Imperative

Student's name: Jared B Cole

This work and its defense approved by:

Committee chair: Udo Greinacher, M.Arch.

Committee member: Jeffrey Tilman, Ph.D.
Engaging Ecology:
Incorporating Nature as an Architectural Imperative

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Jared Cole

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Committee Chair: Udo Greinacher
Abstract

Much of contemporary architectural design does not capitalize on the advantages of nature’s processes. An over-reliance on conventional design practices and an ignorance of local ecosystems has distanced humans from their origins in nature and encouraged a built environment that excludes and subjugates nature’s potential. Architects have become complacent to adopt new technologies that combat natural forces at the expense of local habitat and occupant well-being; nature has been value-engineered out of architecture.

Ecological design improves the performance of buildings and enhances the health of occupants, and therefore should be an architectural imperative. Rather than subjugated as adversaries that diminish the experience of the built world, natural materials and processes should be valued elements hosted by and embedded into building design. By integrating climate and context into design, an ecological architecture will emerge that supports the health of life systems and the symbiotic relationship between humans and nature.

To investigate the limits of this approach, a proposed hybrid project will aim to integrate natural elements and engage local ecosystems through the design of a contemporary addition to a historical building. A design ethic that supports healthy relationships between buildings, inhabitants, and nature will shape this expansion of the modern urban office. As a result of this project, more creative strategies for ecological design within a difficult urban context could be imagined.
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Humans need nature. From an early age, humans develop a fundamental understanding of how natural systems enrich life and form the basis of human survival, an understanding that only grows in richness when it is periodically affirmed throughout the remainder of our lives. Somewhere between the Industrial Revolution and the modern highrise, however, architects and builders lost sight of this innate link to the natural world. Technological conveniences have allowed mechanical systems to balance even the most thermally illogical enclosures, allowing architects to focus on formal play and overlook building performance. It seems illogical, however, that beings biologically dependent upon the processes of nature for survival would be complacent to spend the majority of life inside buildings that exclude or abstract any presence of the natural exterior world. Respected environmental design critic, Kiel Moe, summarizes the paradox: “We have extrapolated the concept of building as shelter from the exterior environment to the concept of building as a barrier to the exterior and a container of an alternative, more benign interior climate.”

Unfortunately, many buildings function merely as barriers, framing nature as an inconvenient in-between. Convenience, cost, and fashion coalesce to shape architecture more often than the natural elements and processes already existing around it. Planner Ian McHarg, in his seminal 1969 book Design with Nature, was one of the first to call attention to the widening gulf of ignorance between the built landscape and the natural environment being destroyed by its indiscriminate growth. McHarg calls for a fundamental understanding of nature as a process that has existed in concert with humans since the beginning of time, and thus should not be ignored by the forces of modern growth. Humans have allowed their preoccupation with technological progress to overshadow their fundamental understanding of nature, as well as humanity’s role as “steward of the biosphere.”

he argues. It is not the grand ideals of planners that dictate the form of the human built world, but rather it is the soils, the terrain, the watersheds – the natural processes that existed before human habitation and support it now – that deserve deference. “Form follows nothing,” McHarg warns designers, “it is integral with all processes.”

To answer McHarg’s call and craft an architectural approach that is sensitive to the health of the living world would be to incorporate nature in an integral manner, an ethic that has been dubbed “ecological design.” Ecological design encompasses many of the same goals of other environmental design movements, but seeks design that is in accord with natural forces and contextual factors rather than simply compliant with a predetermined checklist of strategies.

Early visionaries of ecological design, Stuart Cowen and Sim Van der Ryn, define it as “any form of design that minimizes environmentally destructive impacts” through an “adaptation to and integration with nature’s processes.”

Cowen and Van der Ryn believe that an ecologically-driven design approach not only encourages a more efficient built environment, but that it also helps to quash “dumb design” – that which, as McHarg also fears, fosters a detachment from nature and an ignorance of the destructive impacts of humans’ actions upon it.

Ecological design acknowledges that buildings, although crucial to human survival, are simply objects in the field of a pre-existing natural context. Cementing their place in soil, on a site, buildings and their inhabitants join a host of existing living organisms as part of a local ecosystem. Instead of conforming to conventional design standards or the seemingly immutable urban Cartesian grid, then, architects should seek opportunities to overlay human

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3. Ibid., 173.
5. Ibid., 161.
infrastructure more delicately onto the existing natural fabric, respecting “nature’s
google." Ecological design compels architecture to assume an obligation to
the health and well-being of building inhabitants in addition to that of the living
organisms affected by the construction, operations, and longevity of the building.
“Architecture is a dynamic adaptation to place, people, and pulse,” Van der Ryn
asserts, rather than “the abstract short-run economic programs of corporate and
institutional clients and by the fashion dictates of their architects.”

6. Ibid., 42.
Ecological design demands that architecture assume an obligation to integrate itself as a participating member of local and global ecosystems. This notion of ecosystem includes an interweaving of humans, buildings, and the natural environment in a symbiotic relationship. This relationship extends beyond simply building energy performance to include the psychological and cultural needs of building inhabitants. To balance these needs, social ecologist Stephen Kellert advocates the addition of psychological principles to the standard definition of ecological design. In his view, a two-fold approach to architecture will seek not only to lessen environmental impact, but also to “provide sufficient and satisfying contact between people and nature.” Thus, a design ethic emerges that celebrates “our dependence on nature as an irreplaceable core of intellectual creativity and emotional capacity.”

The mental and emotional nurturing provided by nature that Kellert alludes to is a component of what esteemed biologist Edward O. Wilson first dubbed “biophilia.” In one of his early books, Wilson defines biophilia as “the innate tendency to focus on life and lifelike processes” and then later expands its description to include an “innately emotional affiliation of human beings to other living organisms.” Nature will forever maintain its position as “the natural domain of the most restless and paradoxical part of the human spirit,” he claims, and so ignites an unshakable curiosity inside all of us to explore its intricacies and solve its riddles.

Researchers Judith Heerwagen and Gordon Orians expand on Wilson’s views, explaining that humans’ fascination with nature originated from the

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9. Ibid., 124.
positive emotions elicited in our evolutionary ancestors upon successful selection of habitats fit for survival. Civilizations are no longer required to search for suitable habitat, instead using mechanical technology to forge new terrain. Because the period of time in which humans have congregated in urban areas remains miniscule on the evolutionary timeline, however, it is reasonable to believe that we have retained this predilection for a “fit” landscape. This preference for “landscape aesthetics” includes traditional symbolism and art forms, as well as primitive physical landscape features that ensure survival, such as “prospect, refuge, and hazard.”

Ecologists contend that “savanna-like” environments with these features abound in the contemporary built world, subconsciously constructed to evoke the landscapes familiar to humans’ ancient predecessors. Early humans preferred landscapes that were open, with some scalable outcroppings and nearby water sources. This terrain allowed them to easily spot prey over the open ground, scout for predators from an elevated vantage point, and seek protection along the shoreline of a deep body of water. As Wilson summarizes:

Put [the elements of prospect, refuge, and hazard] together: it seems that whenever people are given a free choice, they move to open tree-studded land on prominences overlooking water. This worldwide tendency is no longer dictated by the hard necessities of hunter-gatherer life. It has become largely aesthetic, a spur to art and landscaping. Those who exercise the greatest degree of free choice, the rich and powerful, congregate on high land above lakes and rivers and along ocean bluffs.

Wilson has a point. Even when people in dense urban areas cannot attain this ‘triple criterion,’ they try their best to create a similar terrain, something he calls the ‘savanna gestalt.’ Examples of this include the courtyard gardens and landscape murals found in ancient Roman settlements, as well as the tradition

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of Japanese bonsai, which forms a plant bearing a striking resemblance to larger species native to tropical savannas.\textsuperscript{15} These examples are presumptions, of course, but they do suggest that across cultures humans have had a beloved relationship with nature long after the hunter-gatherer lifestyle of our ancestors diminished.
IV. The Benefits of Nature as an Architectural Component

Despite whether humans’ affinity for nature stems from evolutionary instincts, genetics, or simply a boredom with the artificiality of the modern built world, there is no denying that a deep-rooted attraction exists. Catering to this attraction becomes problematic in urban environments, in which real estate value and building density restrict the quantity and quality of natural habitats. Critics cite a growing disconnect with nature, as many lambast the contrived interior gardens and constrained urban vegetation that constitutes “nature” in most contemporary interior environments. These simple and sometimes blatantly artificial configurations might not be enough to entertain the mind’s need for mystery and complexity — qualities found inherently in nature. The presence of some potted plants or a painting depicting nature is merely an abstraction that lacks the intriguing complexity we desire from genuinely natural elements (Fig. 2-3).

In few other environments are the effects of this drought of complexity more apparent than in the contemporary work setting. Decades ago, famed author and architect James Marston Fitch realized the stress that arises from repetitive work and mundane built environments. “When desk workers or students look out the window instead of down at their work,” he quips, “they are not wasting time: they are seeking psychic as well as optical relief from a highly structured and unnaturally monochromatic experience.” 16 It is up to architects to seek ways to incorporate into the interior environment the complexity, beauty, and fundamental life forces that exist beyond the building envelope.

A more intensive and transparent incorporation of nature is required in buildings, one that fulfills our need for intrigue and convinces us that the

buildings we occupy are genuine contributors to the health of a local ecosystem. As complex living creatures, Edward Wilson contends, humans should look for opportunities to interact with the natural world beyond the minimum exposure required to ensure survival. Rather than limit exposure to nature's presence and risk developing an ignorance of its workings, we must acknowledge the benefits that nature provides when we integrate it as a crucial component of contemporary life, as “a luxuriance and excess spilling into virtually everything we do.” A healthy mental well-being, therefore, is dependent upon direct interaction with real natural objects and environments, a need which most current human-built environments fail to accommodate.

Ecologist Stephen Kellert draws an important distinction between experiences with nature that can be described as “direct” from those that are “indirect.” Direct experiences in a building might include natural lighting, natural ventilation, views out windows, natural vegetation, water, visible vegetated roofs, etc. (Fig. 5). Whereas direct experiences engage multiple senses and allow a more immersive engagement with nature, indirect experiences are less intensive and less authentic. Indirect experiences may include potted plants, aquariums, or landscape paintings. While these indirect encounters may partially satisfy our desire to engage with nature, they will often fall short of sparking genuine intrigue. In many cases, they are merely inaccurate or artificial representations of actual natural environments. “Without beauty and mystery beyond itself [provided by direct interaction with nature],” Edward Wilson argues, “the mind by definition is deprived of its bearings and will drift to simpler and cruder configurations. Artifacts are incomparably poorer than the life they are designed to mimic. They

18. Wilson, Biophilia, 118.
are only a mirror to our thoughts.” Indirect experiences with nature simply do not provide the same mental and physical stimulation as the real thing, and thus are less beneficial.

The banality of modern workplace environments and the physical and psychological demands of a regimented work schedule have prompted much research into the benefits of incorporating opportunities for direct engagement with nature in the workplace. Psychologist Stephen Kaplan’s research claims that nature possesses “restorative” benefits. He points out that the brain simply needs rest periodically to avoid burnout and stress. He refers to this stress as “directed attention fatigue,” in which prolonged or repetitive mental tasks – which the majority of modern workers are expected to perform eight hours a day – tire the brain. The brain requires breaks from these concentrated efforts, especially given the amount of supplemental technological distractions present in today’s workplaces. Without rest, the brain’s fatigue can negatively affect one’s problem-solving ability, level of irritability, and ultimately one’s ability to function in a collaborative work environment.

As a solution, Kaplan suggests people be given a chance to allow their brain to enter an “involuntary mode” periodically. In this mode, the brain experiences a sensory fascination that allows its directed attention to rest. Ultimately, the directed attention is restored, and one can resume tasks that require concentration. This involuntary mode can be highly compatible with nature’s restorative effects. He suggests “soft fascinations” that encourage reflection, such as walking in the forest, rather than “hard” fascinations, which are mostly passive, such as watching auto racing. Soft fascinations “hold attention, but in an undramatic fashion” and “leave ample opportunity for thinking about other things” in an effortless

22. Ibid., 172.

Fig. 4 - Short, potted plants in the tall atrium of UC’s DAAP Cafe offer a limited, indirect interaction with nature.

Fig. 5 - This office interior sandwiches lush vegetation, moving water, and winding paths between office wings. In this setting, a more direct interaction with nature can be experienced.
It is important to recognize this description as a distinction from the rows of potted plants that account for much of modern interior landscapes, which offer only momentary intrigue (Fig. 4).

If this type of restoration could take place within a work setting, it could foster more productive, comfortable employees. Kaplan distinguishes four components that comprise a restorative environment, which are **fascination**, **getting away**, **extent**, and **compatibility**. “Fascination” consists of an action or setting that is capable of holding one’s attention; “getting away” occurs when one consciously decides to relocate physically or gaze into the distance in order to take a mental break; “extent” refers to the richness of the experience, which must be enough to invoke mental reflection and wonder (not simply an electronic display); and “compatibility” requires that a restorative environment is most effective when it fosters exploration rather than causing immense confusion (or danger). Like others, Kaplan believes that nature possesses the potential to provide all four components, and is a vastly under-utilized resource for doing so.  

Along the same line as Kaplan, ecologist Stephen Kellert encourages the design of environments that offer “spontaneous immersion and challenge,” rather than simple “planned encounters.” The intrigue cause by this spontaneity offers the most benefits to human well-being. Creating immersive or challenging landscapes does not require extensive labyrinths or lush interior rainforests. Instead, designers can look for opportunities to blend interior and exterior nature. For example, giving employees a view over a simple vegetated roof can offer more advantages for spontaneous activity than most planted interior atria. If one were to gaze periodically at the vegetated roof throughout the day, one could observe the collection of rain or snow, the bowing of plants reacting to wind, or a bird

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24. Ibid., 172-3.
investigating the foliage. It is not difficult to imagine that the variety of experiences in this setting would be more abundant than a collection of potted plants.

On a quantitative level, research conducted by Lisa Herschong for the California Energy Commission suggests that the option of having distant views away from one's work area promotes a healthier and happier worker. Herschong's studies concluded that workers given a “break view” (Fig. 7) which was a view away from their computer monitor in any direction from a seated position, performed specific tasks at a faster rate than those who had no view (for example, those with tall cubicle walls). In addition, workers whose space was arranged to provide a more desirable “primary view,” that is, a view through a window within one's range of peripheral vision, scored higher on memory tests.26 This notion is confirmed by others, such as environmental design researcher Roger S. Ulrich, whose research shows that people prefer viewing a natural landscape over an urban landscape that lacks natural elements. Therefore, views are important to one's well-being and should be considered integral to performance and satisfaction in the workplace. Unfortunately, if humans possess an inherent ability and desire to learn from nature, they may be distressed to find an utter lack of distinguishable natural cues in modern urban landscapes.27

It is challenging to design buildings in a way that convincingly integrates ecological features and also offers direct experiences with nature. All too often, ecological design amounts to nothing more than the specification of exterior window louvers and a photovoltaic array on the roof. Respected architect Stephen Kieran confronts this trend within environmental design. He warns that architects should seek an aesthetic that positions nature as an “integral, not additive” element

of design. Kieran explains that additive elements can always compensate for a building’s deficiencies, but true beauty (and essentially architecture) comes from an artful blending of the natural with the built. “The machine as a solution is always additive,” he explains, “and therefore not aesthetic because it can be easily removed.” Isolated as distinct parts, additive ecological design elements offer little potential as engaging architectural features, and thus are marketed more as marvels of technology and less as integrated design elements.28

V. Building Reuse as a Component of Ecological Design

The reuse of existing buildings and the field of ecological design share many of the same goals, specifically an aim towards the conservation of energy and the stewardship of local culture. Ecological design encourages architects to accept an ethical obligation to design buildings that support the well-being of occupants and the health of the greater surrounding ecosystem. Buildings which already exist, as embodiments of spent energy and manifestations of human history, contribute positively to ecosystems when their life is extended through adaptive reuse. Rather than build new, building reuse capitalizes on existing energies and resources. This approach not only conserves energy but continues the transmission of buildings as valuable cultural objects from generation to generation. If a fundamental component of ecological design is the support of healthy ecosystems, then building reuse achieves this by utilizing existing resources and providing cultural stability through the maintenance of an existing built fabric.

Ecological design strives for buildings that contain lower amounts of embodied energy and consume less energy through operations during their lifetime. For new design, this requires a careful selection of building materials, local material sourcing, and the inclusion of high efficiency mechanical systems. What is often undervalued, however, is the embodied energy, passive design features, and massive construction that exists in many older buildings. These buildings often lie vacant or face demolition out of neglect, wasting energy that can never be recovered.

A key study demonstrating the efficiency resulting from the reuse of existing buildings is a 2011 report by the National Trust for Historic Preservation titled “The Greenest Building: Quantifying the Environmental Value of Building Reuse.” As the first study to clearly quantify the ecological benefits of building

Fig. 8 - Despite the benefit of clean energy provided by the PV panels in this image, the failure to integrate ecologically-sensitive elements with architecture is blatant.

Fig. 9 - Shielding windows from solar gain but constructed of elegant reclaimed wood, the vertical louvers on this school provide both an environmental and aesthetic function. Most architects would have chosen simpler, aluminum components that would have given the building a sterile, machined appearance that would not complement ecological design.
reuse versus new construction, it tests six different building typologies across four different climate zones of the U.S., concluding that constructing new nearly always creates a greater environmental impact than renovating an existing building of the same size, location, program, etc. The study also compares the performance of existing buildings that had been renovated to achieve an *average* level of energy efficiency with new buildings designed to achieve a *high* standard of efficiency. Results show that between ten and eighty years is required in order for the majority of newly-constructed high-efficiency buildings to match the reduced climate change impact of a renovated building.29

In addition to the benefits of energy conservation inherent in existing structures, the survival of the physical past has the potential to occupy psychological and cultural voids. Many have theorized about the psychological necessity of engaging in a tension between the past and the present. As distinguished history theorist David Lowenthal points out in his book *The Past is a Foreign Country*, the past is a phenomenon that will always shape the present but need not dictate its course. The past provides a “safely mapped” course, and thus offers a tempting escape from the insecurities of a present which is forever flowing into an uncertain future.30 Aside from a temporary escape into nostalgia, the past also serves as a measuring stick for events in the present. As an invariable contrast to the present, accessing the past allows for a heightened ability to evaluate events occurring in the present (for better or worse). In other words, judgements in the present are inevitably shaped by the knowledge of the past. The past, then, serves as both an occasional retreat and an inescapable part of everyday life.31

An overreliance on the past as a model for decision-making in the present,

31. Ibid., 33.
however, risks mere imitation at the sake of innovation and creativity. It is impossible to ever know or comprehend the full history and circumstances of any artifact, and thus the past must be accepted as an altered, mutable phenomenon. Similar to the abstracting of nature, little is gained by mere imitation of the past. Rather, the past serves us best when it is present and can be evaluated more accurately for what it is. Lowenthal suggests, therefore, that the past is not a separate sphere of mystery (i.e., a “foreign country”) but an armature upon which to support current progress. “A patrimony simply preserved becomes an intolerable burden; the past is best used by being domesticated – and by our accepting and rejoicing that we do so.” Feeling the need to conserve inherited structures – but also the liberty to alter them – is one way to tame the past by fusing it with the present.

Kevin Lynch, a renowned urban planner and theorist, echoes the need for an interweaving between disparate temporal elements in the built environment. Because the environment shapes the actions and behaviors of humans, a rapid destruction of existing buildings and the behavioral cues they have provided for generations can diminish identity and stability. A total eradication of the past environment, therefore, results in an “isolated present” in which the past is neither known nor accessible. What is more desirable, according to Lynch, is an environment that can evolve and accept modification amidst the existing, “a world in which one can leave a personal mark alongside the marks of history.” A built fabric consisting of both old and new thus affords a “crevice through which one can venture back and forth” between manifestations of different moments in time. It is this possible oscillation between time and space that architecture – specifically adaptive reuse and the fusing of contemporary building additions to existing

32. Ibid., 65.
33. Ibid.
35. Ibid., 55-60.
infrastructure – is capable of facilitating.

The physical link to the past that buildings possess has not been overlooked by ecologists and is similar to what Stephen Kellert describes as the “moralistic value” inherent in nature. This value is experienced when one develops a sense of belonging to something greater than oneself. The psychological link that humans feel towards something greater can be formed by cultivating a respect for the past. An understanding of and reverence for the past, for what has been, is crucial to the formation of identity and the act of orientation in the present, and what will be. One method of fostering this reverence is through the conservation of historical built fabric. In describing the characteristics of “restorative environments,” psychologist Stephen Kaplan cites historical artifacts as strategies for partially providing the level of engagement the brain requires in order to restore its capacity to function on concentrated tasks. As opposed to natural objects, “conceptual” objects such as historic artifacts can “promote a sense of being connected to past eras and past environments and thus to a larger world.” In addition, the presence of these objects and the connection to a “larger world” that they promote could be especially significant to one’s well-being in alienating environments, such as dense urban centers. While Kaplan was referring to smaller objects from the past, his theory can be extended to the scale of buildings. Thus, the preservation and reuse of existing buildings is complementary to the presence of nature and can contribute to a restorative environment.

The acknowledgement of a sensitive relationship between the built and natural worlds and an effort to incorporate nature into buildings is similar to the notion of a “spirit of place,” another component mentioned by many advocates of ecological design. While the mention of this phrase elicits eye rolling from

many architects who conveniently dismiss the notion of place as an emotional (and somehow, thus, totally irrational) attempt to thwart formalism, there is no denying that some points on earth garner a special meaning, or “spirit,” in our consciousness over time. Buildings possess this potential. Pulling from many different theorists, Stephen Kellert defines spirit of place as the “singular outgrowth of the marriage of nature and human culture.” While he acknowledges the conflicting human desires to be both rooted yet mobile, stable yet surprised, Kellert warns that the built environment must make an attempt to offer rootedness by establishing itself in harmony with local ecosystems.39

If homogenous, isolated, overly conditioned, consuming boxes are the best that architects can design, then a risk of placelessness arises. Beyond any academic’s argument for what constitutes place, Kellert states the consequences quite simply: “Building and landscape design that affirm the spirit of a place reinforce our commitment to and stewardship for these places.”40 In other words, a building – or place – that is better understood through its enduring survival will attain more cultural value over time, and thus will stand a greater chance of surviving to the next generation. This is a sentiment echoed by preservationists and ecologists alike.
VI. Precedents: Integrating Nature in Design

Stewart Middle School - Sidwell Friends School
Washington, D.C.
KieranTimberlake

Kieran Timberlake's addition to Stewart Middle School is a blend of ecological and biophilic design elements. The result is an intriguing and transparent dialogue between interior and exterior ecosystems. The first striking element of the design is the large wetland that steps down to the building's entrance. These cascading marshes slow stormwater runoff from the building's roof and serve as a “living machine,” cleaning wastewater produced by the school for later reuse (Fig. 12). Not only is the process of the purification monitored and tied into the school's curriculum, but its prominent location rivals the building for attention as an attractive focal point. Positioned in close relation to the building, the wetlands are meant to “confront the tradition of Western education of the academic quadrangle, to simultaneously accept it but turn it on its head, inverting its focus outward to the natural world and its systems.” Thus, the processes of nature maintain an important transparency on the site rather than being pushed underground and out of view.41

The positioning of the wetlands and the school's accessible vegetated roof allow for direct observation of and interaction with immediate ecosystems. Elevated exterior terraces (Fig. 13) surrounding the marsh area, in addition to the accessibility of the rooftop (Fig. 10), provide opportunities for promontory views. This fulfills the biophilic desire for “prospect,” or positioning oneself strategically above a landscape. A final detail of the school that supports ecological and biophilic design is the array of vertical wooden louvers, which provide solar screening. The louvers are made from salvaged wood, supporting an ethic of conservation in addition to draping the building in a layer of warm, natural materials. Because they complement the rest of the building's wooden rain screen

materially, they are considered by Kieran Timberlake as aesthetic, not additive, environmental design elements.42

Fig. 13 - Section showing the water collection basins and raingarden, in addition to the promontory position enjoyed by observers. The wetlands and the building exist in a constant dialogue: nature cannot be ignored.

42. Ibid., accessed February 20, 2014.
Housing Development in Munich
Munich, Germany
Herzog + Partner

This complex consists of a strip of conjoined, steeply-roofed housing units. Many strategies are utilized to conserve energy, harness solar energy, and merge the natural and the built environments. With a narrow footprint and an east-west orientation, the units are positioned to maximize southern solar gain. This solar gain is mediated by a double cavity envelope, which allows for the control of solar gain and provides a “buffer effect” to meet the demands of separate zones within the units.43

On ground level, this double envelope stretches to provide space for an interior garden area. Solar penetration on this level serves a dual function: during the summer and winter, it fosters plant growth, allowing building occupants to enjoy year-round vegetation just steps from their living rooms; during cold months, solar gain is allowed to accumulate and heat up this area, providing excess heated air for circulation throughout the ground floor and upward to the top floors. During warmer months, exterior vines will filter much of the potential solar gain. Some rays may penetrate the glass and warm the garden room, however, in which case the warm air they produce can be quickly exhausted through vents located along the peak of the angled roof. PV panels and solar generators are also integrated into the exterior structure as additional energy-saving strategies.44

The steep angle of the roof hosts a number of unique strategies: shedding water, emitting daylight, directing excess heat flow to the upper areas of the building, as well as housing a vegetated interior environment. Not only does this one integrated component result in an efficient building, but it also allows a transparent understanding of nature’s processes and an opportunity for humans to

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44. Ibid.
directly interact with them.

Fig 17 - Section demonstrating the multiple functions of the roof: shedding water, filtering sunlight, and allowing the transparent display of an ecosystem at work.
In the words of Stefan Behnisch, “Well-being does not depend on measurable variables such as temperature; it also depends on the quality of the space.” The intent of the IBN building is to provide an economical, yet qualitative interior environment. To achieve this, the building layout consists of long fingers of offices that open up directly onto lush enclosed interior courtyards. These courtyards contain vast amounts of varying vegetation and numerous water features, ripe with opportunities for direct interaction.

Radiant heating in the small research offices that line the vegetated courtyards allows for an efficient heating and cooling system, but also frees the ceilings of ductwork that would have been necessary had a forced air system been specified. The result is roughly an additional eighteen inches of overhead space. Behnisch decided to use this free space as an opportunity to lower ceiling heights in the offices, resulting in a conservation of building material and reducing long-term heating and cooling costs.

Storm water management was another strategy employed. A large exterior pond is tapped to fill decorative pools in the building’s interior courtyards. Water is purified in these pools through aquatic vegetation, then seeps into underground cisterns for use in the vast irrigation of the courtyard’s plantings. All these features culminate to form a fantastic office space that allows workers direct views to daylight and vegetation and the opportunity for variable and intriguing engagement with the organic interior landscape. The processes of nature are on full display, and its lush bounty welcomes exploration in the interior courtyards. Each employee has views and direct encounters with nature; in essence, each employee, regardless of status, possesses the coveted “corner office.”

46. Ibid., 30.
Fig. 21- Section showing the ecological engagement of the interior courtyards and the transparency between people and nature, work and leisure.
The studio headquarters and personal penthouse of Diane von Furstenberg is included in this study as an example of strategies for integrating natural and biophilic principles into the conversion of a historical structure. Critics might contend that its environmental design strategies conceded too much to the dictates of fashion, however the project does include strategies to increase natural lighting, slow stormwater runoff, incorporate salvaged materials, and utilize heating and cooling via geothermal wells.48

The principle concept is a modification of the traditional light well. Rather than a vertical light core positioned perpendicularly to the ground, a “stairdelier” slices a void diagonally through the center of the building, following the path of a stretched staircase. Natural light floods down from the top floor, reflecting off strategically-placed heliostat mirrors and glass to disperse light horizontally and downward to the lower floors. Once the historical rooftop level is breached by the new stairwell, a capping glass enclosure extends, twists, and morphs into a metaphorical diamond. Thus, the journey upward through the building culminates in a face-to-face meeting between human and heavens. From this promontory position, occupants have a vantage point from which to view the greater city and reassess their scale within it.49

The roof also features an additional story covered with vegetation, allowing users the experience of a lawn six stories above ground level. This patch of vegetation, although small, partially amends the destruction of local habitat by the building’s original construction. Over a hundred years after the complete erasure of vegetation from its site – thus depriving its immediate ecosystem of diverse habitats – the contemporary greenroof addition seeks to reestablish natural terrain.

49. Ibid.
and rectify the wrongs of the past.

Fig. 25 - Section showing the “stairdelier” slicing through the building levels, bringing natural light and transparency to the lower floors. The promontory position on the roof gives one a new perspective on the city – and the sky.
VII. Design Proposal: The Ecological Office

Human-made structures will forever interrupt ecosystems to some degree, due to the amount of embodied energy contained in building materials, the required excavation into the earth, the shedding of rainwater by impervious surfaces, and the consumption of raw energy for lifetime operations. Architects are only able to create a limited set of goals upon which to concentrate. Therefore, there exists no true formula for “correct” ecological design. As design guides, the LEED rating system, the Architecture 2030 challenge, and the Living Building Challenge are examples of established “checklists” that can be used to create a building that in many ways is sensitive to its surrounding ecosystems.

Although each system has its faults, the proposed project for this thesis will design an office that incorporates the tenets of the Living Building Challenge. This will provide a solid design template that blends quantifiable goals with intangible mandates such as biophilic design. Rather than quantifying building design through complex software, this project will apply proven passive design strategies. The goal of this project is not to produce the most energy-efficient building, but rather the aim is to produce a building that integrates itself with natural processes in a way that promotes a healthy ecosystem, including the survival of flora and fauna and the well-being of its human occupants.

Therefore, the building proposed in this project will address three distinct elements of ecological design, aiming for a design that: 1) allows direct engagement with nature, 2) emphasizes the healthy tension between the past and present, and 3) strives to integrate ecological design components, rather than seek additive fixes (Fig. 26). An added benefit, as described earlier, of integrating natural elements into design is the presence of mystery and complexity, which has the potential to stimulate creative thinking and problem solving. The natural elements also have the potential to spur conversation, serve as meeting places, and provide the setting for random social encounters.
The result is an office conducive to collaboration, an environment of cohesion and idea-sharing that is coveted by many contemporary office planners. Environmental design researcher Janetta Mitchell McCoy suggests that successful collaborative work environments contain: spaces that can be shared by a team as their “conceptual playground,” an array of formal and informal settings for random encounters between employees, easy access to team’s spaces by others who choose to drop by, and also the option of working independently in an environment devoid of distractions. Teams should be located near each other to encourage unplanned interaction, which is often a source of collaboration.

The client for this proposed building expansion will be Bluestone Creative, a Cincinnati-based marketing firm that unabashedly announces its objective as: *to enjoy the scenery while we work :)*. This sentiment is affirmed by the words of co-founder Jack Conrad, who describes Bluestone’s aim to be an “anti-agency,” valuing personality and character over superficial and impersonal corporate flare. In fact, they are true believers that workers are influenced by their environment, which is a crucial observation for a company whose success relies on a constant streaming of creative ideas. In discussing the team’s creative process, Conrad describes the concept of openness and transparency. Team members must be seated together in order to share ideas, and supervisors must be nearby and easily accessible. With all the time devoted to group work, however, lack of privacy and solitude become problems. Many employees enjoy escaping to some unfinished and vacant upper floors in their current downtown building, where they can be assured silence and a break from the chaos of work. The need for collaboration in the proposed office addition will be accommodated by grouped desks and separate “huddle spaces”

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51. Ibid.
(team conference spaces), while the potential for escape will take the form of interior and exterior vegetated areas.

Fig. 26 - Author’s diagram showing concept of ecological design strategies.
Proposed Office Program (for 200 employees)

Reception = 400 sq. ft.

Open Work Area = 6000 sq. ft. (min. 25 sq. ft. per employee)

Huddle Rooms = 3000 sq. ft. (20 teams x 150 sq. ft.)

Conference Rooms = 2000 sq. ft. (1 x 300 sq. ft., 2 x 350 sq. ft., 1 x 500 sq. ft.)

Kitchens/Eating Areas = 6000 sq. ft. (4 kitchens with eating areas)

Special Event Space = 2000 sq. ft. (for firm-wide gatherings)

Restrooms = 2500 sq. ft.
Existing Conditions

Two conjoined vacant buildings will host a new office expansion. Sited at the corner of 8th and Main Street, they straddle Cincinnati’s Central Business District and the boutique shops of Over-The-Rhine. Despite its central location, the site is in a sea of many surface parking lots, but it holds potential to be a part of Cincinnati’s *Eighth Street Design District.*
Fig. 28 - Conceptual rendering showing extensions from the historical building. This joint between old and new allows employees to circulate between interior and exterior and experience the existing building in a new light. Flooding this juncture with light draws workers out into this social and circulation zone between the existing building and the new annex.

Fig. 29 - Partii showing the existing building (in white) annexing by way of a "vegetated joint."
VIII. Bibliography


