

## Biographical Sketch



Cullen Sayegh is a fifth-year architecture student at the University of Tennessee. Growing up in East Tennessee, Cullen's first glimpse into architecture consisted of the Tennessee Valley Authority's dams, whose cultural and environmental impact is readily apparent across the region. Just as the memories of the TVA were inextricable to his childhood, Cullen was soon fascinated by the built environment's power to communicate the history and meaning of a place. Following his freshman year at UT as a history and economics major, he switched into architecture. Since then he has excitedly engaged in research, first through a faculty-led project studying urban wind ventilation in China, and later developing an index of experiential strategies for connecting architecture with nature via environmental stimuli. He has also served as a TA for the School of Architecture's architectural history and theory courses. Through these opportunities Cullen learned to value research and analysis as a generative process.

These experiences all proved formative in developing Cullen's proposal for the Aydelott Award. From initially brainstorming sites, to the grant-writing process, to finally beginning the trip and visiting each site, the Aydelott Travel Award has proven to be a career-altering experience. This opportunity has provided him with the confidence and enthusiasm to apply for a 2019 Fulbright Grant, pending at the time of this report. Cullen hopes to eventually take the knowledge he developed over the course of his Aydelott experience and leverage it in the future as he pursues a graduate degree in architectural history.

Student:

Cullen Sayegh

Faculty Mentor:

Dr. Gregor Kalas

Buildings:

1. Trollstigen Visitor Center | Architect: Reiulf Ramstad Arkitekter

Trollstigen, Norway

2. *Ouvrage Hackenberg* | Architect: Paul Painleve and C.O.R.F.

Vekring, France

3. Humble Administrator's Garden | Architect: Wang Xianchen and Wen

Zhengming | Suzhou, China

4. Angkor Wat | Architect: Unknown | Angkor Archaeological Park,

Cambodia

Institution:

University of Tennessee, Knoxville, College of Architecture and Design

## Introduction



Fig. 1. View of the moat of Angkor Wat at dawn where water and sky mirror each other, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.

One of the most important realizations of my Aydelott trip was the recognition that architecture has, for centuries, operated at the intersection of flows at various scales, from the building interior to regional networks. More than that, it is a manifestation of various connections in built form and allows humans to comprehend large scale infrastructural and environmental systems through meaningful places. This revelation came unexpectedly, like most do, on the last week of my trip when I witnessed a 5:00 AM sunrise over Angkor Wat's sky-piercing spires. As I hurried to the central temple to take a crack at photographing the famous Cambodian sun, I paused to reflect on the mile-long moat. Here, perfectly captured in the dark mirroring of the water was an image of the temple, its surrounding island, the moat, and the sun, all in perfect order (Fig. 1). I finally understood what

the ancient Khmer civilization had known almost a thousand years ago: that architecture can reveal latent networks of cultural activity. The architecture of Angkor Wat heightens embodied experiences, rendering culturally specific understandings of space and territory outside of the immediate temple precinct visible to the visitor. These moments are an essential component in understanding how architecture, by emphasizing environmental and infrastructural forces, gives cultural meaning to a place such as Angkor.

The following four architectural works were chosen for their ability to operate within natural forces and infrastructural networks, allowing users to understand connections they otherwise could not comprehend at the human scale. The sites were selected as exemplary nodes within larger networks comprising architecture, infrastructure, and constructed landscapes:

-Trollstigen Visitor Center | Geiranger-Trollstigen Tourist Route

Architect: Reiulf Ramstad Arkitekter | Trollstigen, Norway

Network: Linear

-Ouvrage Hackenberg | Maginot Line

Architect: Paul Painleve & C.O.R.F. | Vekring, France

Network: Hierarchical

-Humble Administrator's Garden | Classical Gardens of Suzhou

Architect: Wang Xianchen & Wen Zhengming | Suzhou, China

Network: Randomized

-Angkor Wat | Angkor Archaeological Park

Architect: Unknown | Angkor, Cambodia

Network: Centralized

Some of the networks were established on purpose, while others were generated unintentionally over time. These four architectures were selected for—rather than in spite of—their apparent differences in chronology, geography, program, and network typology. The selection serves to highlight the many ways in which diverse architectures codify and express relationships between humans and their landscape, thus providing meaning in a place-specific manner. These associations are highlighted and made explicit by the selected sites. In the following essays I explore how each of these sites are intrinsically connected to a wider network, possessing the ability to condense multiple relationships into a larger understanding of place.

Trollstigen Visitor Center | Geiranger-Trollstigen Tourist Route

Norway in June is busy with activities. The days are mercifully long and bound to get longer by the day, with midday temperatures reaching a balmy 75° F. Norwegians relish this short-lived opportunity to enjoy the sun. The road to my desired destination, the Trollstigen Visitor Center, was closed for eight months and had only just reopened when I turned onto the Geiranger-Trollstigen National Tourist Route. The Trollstigen overlook is inhospitable for most of the year, yet its plunging valley, striking waterfalls, and hiking trails entice many visitors to make the trip. For many miles the landscape remains consistently hilly. Soon however, the highway buckles and bends into a steep incline consisting of four hairpin curves as the road twists up a granite cliff. It is after this initial climb that the hair-raising drive truly begins, as the road takes you through a dramatically mountainous landscape. As I crested the edge of yet another fjord, flanked by tufts of snow on either side, I began to notice the poles marking the path of the roadway in the depth of winter. Elsewhere, small sheds pop up, filled with a type of black sod used to cover the snow to make the highway passable in the late spring. The road turned evermore anxiety-inducing as my rental car struggled to muster enough torque to crest the steep 6 degree incline at Ornesvingen, located about halfway to Trollstigen. By this time, I desperately wanted to leave the car, yet Trollstigen was still three long hours away. Finally, I neared the Visitor Center. Here the fjords give way to the moss-covered and ruddy lichen-hued slopes of the alpine tundra. After cresting a large ridge and weaving past a few granite boulders the

Visitor Center is in sight, rising from the earth and seemingly ending at the mountain pass's sudden drop (Fig. 1). I parked in the impeccably designed lot, eager to leave the confines of my car. The cast-in-place concrete structures of the Visitor Center intersect at the edge of the lot, parting for a raised path to an unknown destination. Passing the Visitor Center, I hurriedly moved down the steel gangway towards the overlook in the distance. Here, the breathtaking view of the Trollstigen valley presents itself; a magnificent 2,788 foot drop that overwhelms the senses. Rising from the valley's base is the Geiranger-Trollstigen National Tourist Route as it winds up the slope of the mountain, crisscrossing the Stigfossen waterfall. I soon realized the Norwegian understanding of the land, one that acknowledges the inherent beauty and hostility of their mountainous topography, and mankind's inevitable contribution to it.



Fig. 1. Reiulf Ramstad Arkitekter, view of visitor center from the route's southern approach, Trollstigen Visitor Center, Trollstigen, Norway, 2005-2012.

The Trollstigen Visitor Center is the final stop on the famous Geiranger-Trollstigen National Tourist Route, which features many displays of Norwegian art and architecture while traversing 65 miles of breathtaking landscapes. Highlighting the drama characteristic of Norway's natural surroundings is the spartan, yet expansive rest stop designed by Reiulf Ramstad's firm, an exemplary intervention along the tourist route's linear network. The Visitor Center was completed in 2012, although it took eight years to build. The area's short summer season only allowed for a brief construction timeframe between late May to September. The Trollstigen pass, after which the Visitor Center was named, lies at the intersection of an old mountain footpath, used by traders of rural inland communities to connect with coastal ports in the centuries before the highway's construction.<sup>1</sup> The footpath is now a popular hiking route with the adjacent tourist highway tracing its path at various points. The highway is a relatively modern construction, having been built in the early 20<sup>th</sup> century for English motorists who were as equally attracted to the picturesque views of the valley as contemporary visitors. The roadway was significantly upgraded after the Norwegian government established the National Tourist Route program less than 20 years ago. The program seeks to "combine Norwegian nature, architecture, and design into something greater than the sum of its parts."<sup>2</sup> The Trollstigen Visitor Center was one of the first such initiatives funded by the project, replacing an existing tourist stop at the famous Trollstigen overlook.

In many ways, the Visitor Center and the Tourist Route as a whole act as filters where people can engage with the country's breathtaking

and often inaccessible natural landscape. This is particularly exemplified by the Norwegian concept of “*allmannsretten*,” roughly translated as the “right to roam,” which guarantees and encourages exploration of the natural environment by allowing hiking and camping on both public and private land for a brief number of days.<sup>3</sup> The Trollstigen Visitor Center is the perfect place for experiencing the variety of the Norwegian countryside; the rest stop sits at the route’s apex, subtlety negotiating rugged natural topography. The Trollstigen gorge is located at the divide between two watersheds, one that leads to Romdalsfjord in the north and another to the southern Valldal valley. Ramstad focused on the tension between the ever-shifting water traversing the site—first as snow pack and then in its liquid form as a cascade—and the inert rock formations found on the mountain.<sup>4</sup> The forms of the building exude Nordic simplicity. A pair of board-form concrete structures are surrounded by two streams that collect glacial runoff in the spring before dropping thousands of feet to the valley below (Fig 2).



Fig. 2. Reiulf Ramstad Arkitekter, view of Visitor Center from one of its hiking trails, Trollstigen Visitor Center, Trollstigen, Norway, 2005-2012.

The annual cycle of snowy winters and temperate summers played a major role in the design of the Visitor Center. Both the highway and rest stop are closed in the winter, usually buried under 20 feet of snow. This required durable materials and a thoroughly detailed building envelope that can be easily sealed (Fig. 3). The site is at the center of constantly shifting terrain, yet the Trollstigen Visitor Center celebrates this dynamic environment. A series of walkways, flood prevention barriers, hiking paths, and look-outs extend from the building which allow visitors to explore and observe the landscape in multiple ways. The Trollstigen Visitor Center maintains a simple program (bathrooms, a café, small gallery, and a place to stretch one's legs), yet references the landscape it is situated within through spatial sequencing and natural building materials. In this way the Trollstigen Visitor Center makes latent forces explicit, providing users with a new understanding of the ever-changing Norwegian landscape.



Fig. 3. Reiulf Ramstad Arkitekter, project manager Christian Fuglset stands on the roof of the Visitor Center in February 2012, Trollstigen, Norway, 2005-2012. Courtesy of Reiulf Ramstand Arkitekter.

the rest stop carefully orchestrates the visitor's experience from the car to its pedestrian path and finally to the valley's overlook. The automobile's approach to Trollstigen is tempered by the crest of a hill nudged between the steep tundra valley. The view from the approach presents only the roofs of these cast-in-place concrete triangles, set at various angles calculated to reduce the live load of winter's massive snowdrifts. From afar, the subtle footprint of the sod and grass roofs appear, masking the building and the dramatic view of the Trollstigen valley behind it. The parking lot is a welcome relief after hours of anxiety-inducing driving. Benches and restrooms, which welcome the weary traveler, are located along the sloped board-form concrete structure that runs north-south (Fig 4). The slight incline of the longitudinal building leads to its intersection with the other conditioned space on site (Fig. 5). Sculptural COR-TEN steel exhaust vents are the only architectural elements that pierce the verdant carpet of golden root and orchardgrass (Fig. 6). A diverging section of the roof is cast in stepped concrete to create auditorium



Fig. 4-5. Reiulf Ramstad Arkitekter, looking from the parking lot towards concrete benches and a framed view of the Trollvegen Mountain; the intersection between the two primary structures, Norway, 2005-2012.



Fig. 6-7. Reiulf Ramstad Arkitekter, vernacular and highly insulative sod roofs with HVAC and kitchen exhaust ducts; a visitor inspects the gallery, Norway, 2005-2012.

seating for group presentations. The largest two triangular structures dramatically merge at a thick curtain glass curtain wall before pulling apart into two twin concrete points, a subtle gesture to the surrounding jagged topography. This building contains a restaurant serving authentic Norwegian cuisine, a sunken gathering space, and a gallery displaying the history of the Tourist Route and overlook (Fig. 7).

The visitor proceeds from the Visitor Center, towards a ramp that crosses a pool of gushing snowmelt where the two streams meet. The pool contains a series of carefully designed cascades, highlighting water's everchanging solid and liquid phases, as well as providing flood protection (Fig. 8). As the visitor crosses the raised ramp, he is encouraged to pause at a U-shaped concrete bench sunken into the pool, which charts the water level as long summer days thaw the snowpack. The simple bench encourages the visitor to interact with nature's rhythms. The ramp leads to the first dramatic outlook onto the waterfall and valley (Fig. 9). The path stops to pause for



Fig. 8-9. Reiulf Ramstad Arkitekter, the concrete platform (left) and cascades allow visitors to understand the site's seasonal shifts; the raised walkway leads to the first overlook, Trollstigen, Norway, 2005-2012.

carefully designed vistas and hiking trailheads. Along the footpath, weatherized steel chairs are arranged at strategic viewpoints intended to bring visitors into individual communion with nature. The Trollstigen valley remains as solid and immobile as ever, but with every viewing platform the vista is reinvented, allowing a fresh perspective at each new vantage point.

Finally, a stair leads down a breathtaking descent to the final overlook platform, hovering daintily over the valley below. The stairs, delicately placed into the cliff, allude to the name of Trollstigen, which means "troll's ladder" in Norwegian. The descent to the final platform magnificently unravels the visual frame of the valley, offering oblique views the length of its stair to the final steel precipice which juts out into thin air. Similarly awe-inspiring, the Geiranger-Trollstigen Tourist Route lies directly underneath the platform, twisting in nine hairpin turns as it descends thousands of feet to the valley floor. This moment perhaps best encapsulates the

concept of *allmannsretten* and its mutual respect for both nature and man's creation (Fig. 10-11). The provision legally allows citizen and tourist to camp for a few days within 500 feet of a property owner's dwelling.<sup>5</sup> *Allmannsretten* as a legal guarantee of public access implies conservation of the nature; however, the laws are grounded in a deeply-rooted cultural respect for the landscape and the Norwegian's place within it. Historically, the unforgiving winter climate of Norway required that residents possess an extensive knowledge of building materials for warmth and shelter. This deep cultural connection to nature recognizes how people make provisions for survival by constructing in a respectful manner and with local materials. This particularly unique approach to the environment is important in understanding the relationship between the tourist route, which encourages public access to Norway's highlands, and the Visitor Center, where the concept of the "right to roam" is realized with a site-specific architecture and landscape strategy. This is achieved by a layering of thresholds from automobile to overlook and durable building materials that highlight their natural origin.



Fig. 10-11. Reiulf Ramstad Arkitekter, the final overlook offers an expansive view; under the platform the tourist route weaves its way up the cliff, Trollstigen Visitor Center, Trollstigen, Norway, 2005-2012.

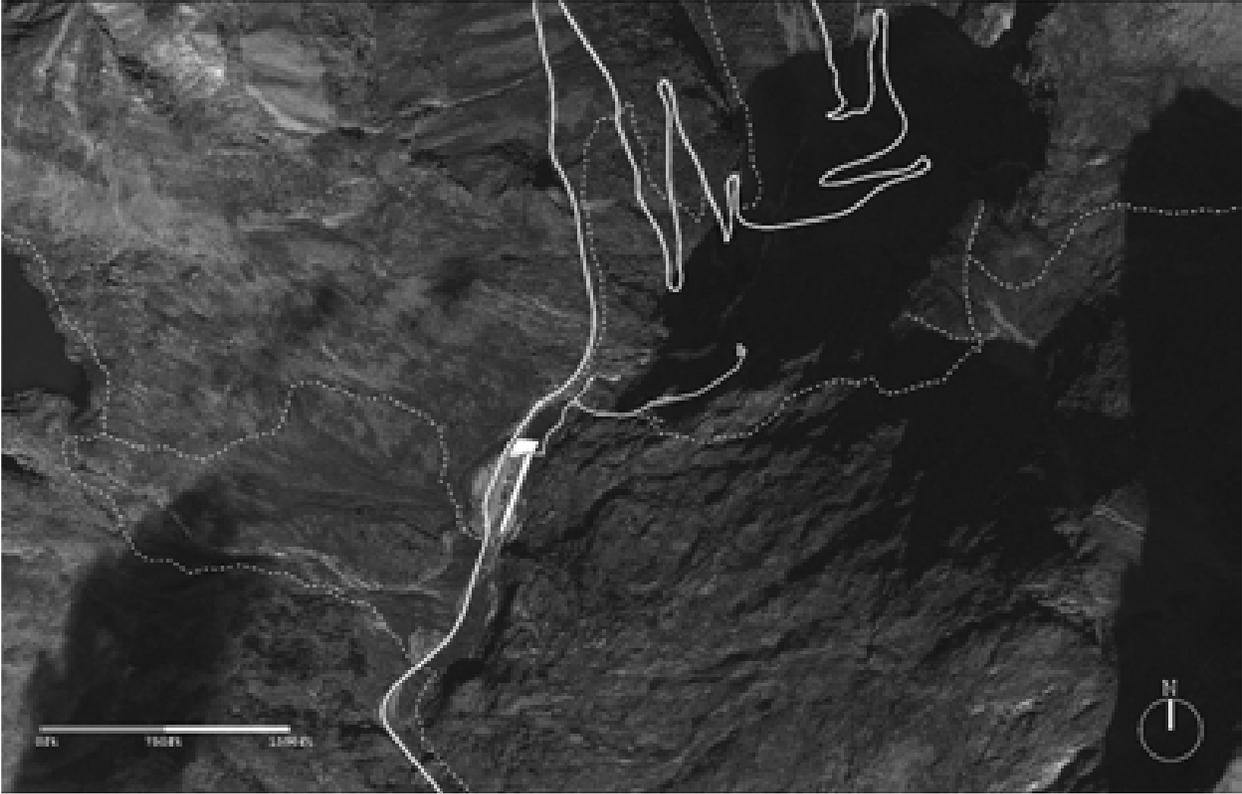


Fig. 12. Reiulf Ramstad Arkitekter, Trollstigen site plan with highway, footpaths, and hiking trails (dashed lines), Trollstigen, Norway, 2005-2012 (drawn by author).

At Trollstigen the visitor is encouraged to experience the landscape firsthand, leaving the car behind and exploring the many trails and paths that emanate from it (Fig. 12). Walkways, alternating between COR-TEN steel platforms and simple paths, carefully lead visitors from their automobiles to the epic view of Trollstigen's mountain pass. The Visitor Center handles this transition between highway and trailhead effortlessly as its raised paths and viewpoints mediate between infrastructure and landscape (fig. 13-14). Acting as a filter, the architecture intercedes between the tourist route and nature, encouraging visitors to actively engage with the environment outside of their automobile. The use of materials at Trollstigen emphasizes the presence of architecture as a mediator between the road and nature.



Fig. 13-14. Reiulf Ramstad Arkitekter, hiking paths diverge from the paved trail; a COR-TEN and birch seat is attached to a granite outcrop, uniting man and nature, Trollstigen, Norway, 2005-2012.

Material choices play an important role in simultaneously acknowledging man's presence at Trollstigen and minimizing its footprint at the same time. The architecture endeavors to be "significant yet discreet," employing vernacular strategies to recall the historic structures seen on the highway such as the highly insulative sod roofs of traditional Norwegian houses (Fig 15).<sup>6</sup> I had the opportunity to meet with the Visitor Center's project manager at Reiulf Ramstad Arkitekter, Christian Fuglset. Fuglset stressed the importance of two design considerations for the site; the need to mitigate harsh sub-zero winter conditions and the necessity for a clear, yet deft touch on the landscape. As he explained it, the Trollstigen Visitor Center, and the tourist route as a whole, sought to artfully combine manmade intervention—something necessary to inhabit Norway's fjords—and a respect for the environment. These two seemingly contradictory elements work together at Trollstigen, where the philosophy of *allmannsretten* is spatialized. The Visitor Center makes expressive use of board-form concrete and COR-TEN steel as a contrast to its natural surroundings. The birch wood imprints of the

board-form concrete remind visitors of the natural materials used to construct the building. Reflective glass mirrors views of the surrounding topography, constantly refocusing attention onto the Norwegian landscape. The Visitor Center acknowledges the constructed streams and waterfalls needed to prevent flooding through clear formal delineation. The formal and material honesty of the site makes no attempt to hide the fact that the courses of these alpine streams have been altered. As a protective measure, the stone-lined streams straddle the site in the same manner of the vernacular anti-avalanche infrastructure utilized along the highway, yet again referencing the National Tourist route.



Fig. 15. Traditional Norwegian barn with sod roof accessed via a public trail on private farmland, a prime example of *allmannsretten* in action, Westeras Farm and Cabin, Geiranger, Norway, construction date unknown.



Fig. 16-18. Various interventions along the tourist route maintain a similar material palette and method of lightly touching the landscape, More og Romsdal, Norway.

This fundamental principle of the Visitor Center is replicated at the larger scale of the Geiranger-Trollstigen National Tourist Route, which boasts numerous overlooks, turn-offs, and works of architecture that move visitors out of their cars and into the Norwegian landscape.<sup>7</sup> Each stop along the route maintains a simple material palette of concrete, locally-sourced wood, reflective glazing, and durable steel products (Fig. 16-18). Relating back to the concept of *allmannsretten*, these materials are utilized for their durability, but also clearly highlight the distinction between what is built and what is unbuilt. Rather than a contrived, top-down parkway approach, where access is restricted and architectural follies abound, the Geiranger-Trollstigen route grafts onto the existing historic roads that have sustained these fjord communities for centuries. Through the highway and its many overlooks, the area's past is highlighted at various moments along the route. In this capacity the route serves a larger purpose for the preservation of the area's cultural identity; one that is closely tied to its surrounding environment.

At both the scale of the region and the scale of the Trollstigen Visitor Center the goal of *allmannsretten* is achieved, fostering greater access and appreciation for the Norwegian landscape. In Ramstad's words, the Trollstigen Visitor Center acts as "a kind of

surgical urbanism, where we use precise design interventions to implant various urban programs in completely remote areas.”<sup>8</sup> After spending multiple days hiking in and around the Visitor Center, I began to comprehend the complex spatial interplay between road, architecture, and environment at Trollstigen (Fig. 19). The Visitor Center’s formal clarity and material simplicity betray an intricate arrangement of infrastructure and architecture at multiple scales meant to encourage individuals’ connections with Norway’s breathtaking landscapes (Fig. 20). That the achieved goal was to mask this complexity and focus attention on the natural landscape makes the Trollstigen Visitor Center, and the Geiranger-Trollstigen Tourist Route, that much more of a triumph.



Fig. 19. Reiulf Ramstad Arkitekter, view of the Trollstigen overlook, hiking paths, and tourist highway bridge from below, allowing a new appreciation of the Nordic landscape, Trollstigen, Norway, 2005-2012.

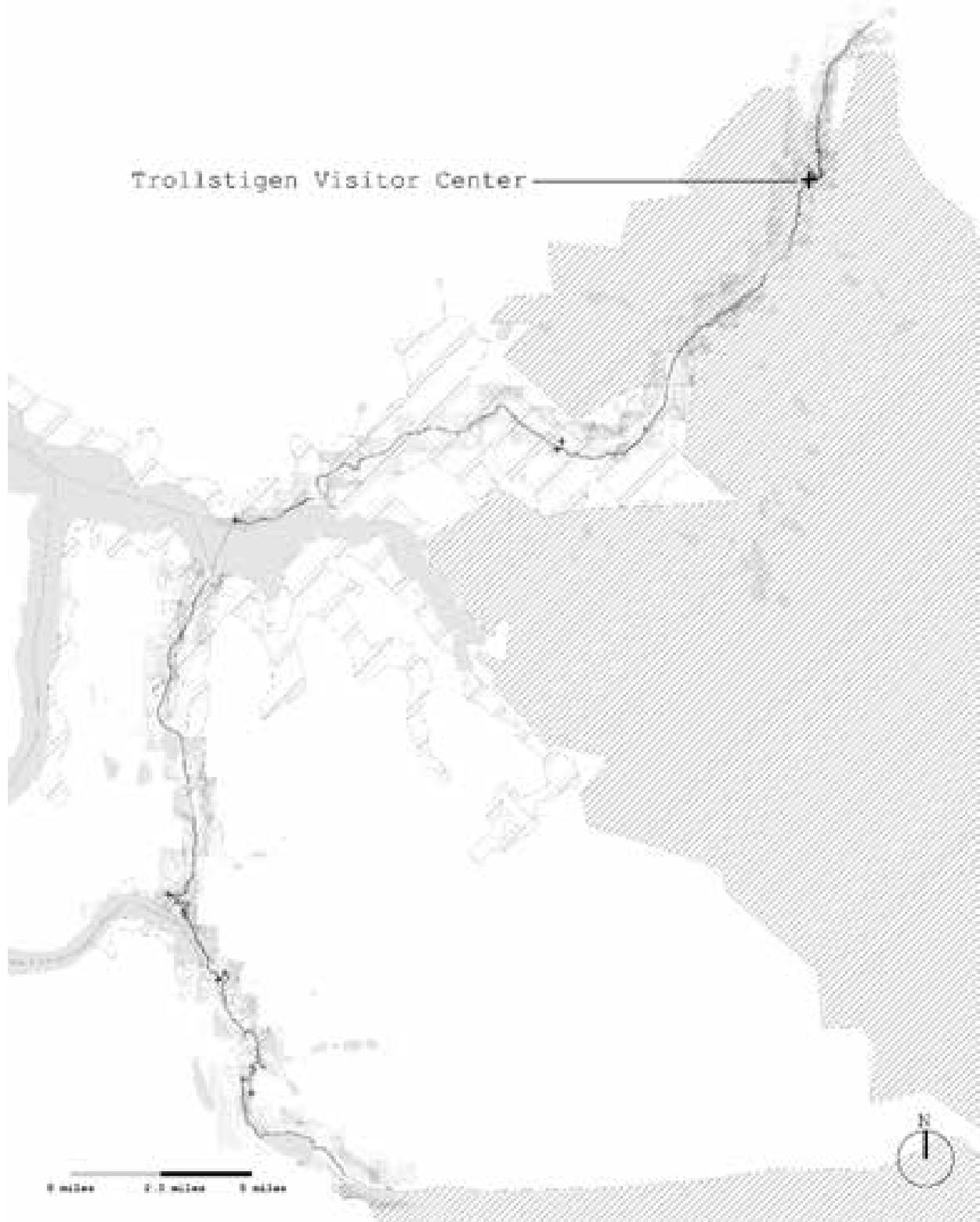


Fig. 20. Map of the Geiranger-Trollstigen National Tourist Route, with various stops denoted in plus signs; diagonal hatch denotes local and national parks that intersect with the Tourist Route while gray fill denotes bodies of water (fjords, glaciers, and lakes), More og Romsdal, Norway, 1998-present (drawing by author).

Notes

1. "Trollstigen Hike: Kløvstien Path (858 M.a.s.l.)." Official Travel Guide to Norway. Accessed October 15, 2018.  
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Notes

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<https://www.visitnorway.com/plan-your-trip/travel-tips-a-z/right-of-access/>.
6. Carsten Thau, "Significant Yet Discrete: The Architecture of RRA," in *Reiulf Ramstad Architects: Selected Works*, ed. Boris Jensen. (Ostfildern: Hatje Cantz, 2013): 112-113.
7. Karl Otto Ellefsen, "Detoured Installations: The Policies and Architecture of the Norwegian National Tourist Routes Project," *Architectural Design* 85, no. 2 (2015): 64-75.
8. Boris Jensen, *Reiulf Ramstad Architects: Selected Works*. (Ostfildern: Hatje Cantz, 2013): 247.

Ouvrage Hackenberg | Maginot Line

Unlike Norway's striking fjord landscape, the hills of Lorraine in northeastern France are gentle, barely revealing the forts of the subterranean Maginot Line. Here the low-slung escarpments of the Vosges Mountains are perceptible if only for the mere fact that they are forested, a rare occurrence in this heavily cultivated region. It was this fertile soil along the Moselle River, in addition to plentiful deposits of iron ore and coal, that attracted competing claims to the region for thousands of years. Today almost all the mineral mines are closed, but the connection between the people and the vast underground is readily apparent across Lorraine's numerous valleys. The many World War II bunkers that comprise the Maginot Line have continued this relationship between *Lorrainers* and their underground past. One of my first experiences in *Ouvrage Hackenberg*, the largest fortification along the Maginot Line, revealed how the subterranean infrastructural system informs the landscape aboveground. There I met Paul, a gregarious Englishman who moved to the area twenty years ago and serves as a volunteer for the organization that preserves the memory of the Hackenberg fortress. We were at the *Ouvrage Hackenberg's* Block 9 artillery turret facing the German border, a little over 10 miles in the distance. Paul engaged one of the enormous hydraulic turrets, which slowly emerged from its concave concrete shell, calmly unsheathed its two 135mm Howitzer batteries, and whirled in a full 360 clockwise turn (Fig. 1). Within the clutches of the massive steel contraption sat Paul in a condition that engaged man, machine, and architecture so intensely.



Fig. 1. Paul Painleve & C.O.R.F., view onto the German border as the Block 9 iron-clad turret rises from its concrete shell, Ouvrage Hackenberg, Vekring, France, 1929-1932.

The batteries and gun turrets that line the hill of the Hackenberg fortress are particularly important in understanding the architectural and infrastructural consequences of the greater Maginot Line, a system of underground fortifications across France's eastern border from Belgium in the north to its southern alpine boundary with Italy. Named after Andre Maginot, the French general who vigorously supported its construction, the Line was created after World War I to prevent another German invasion of France. The Maginot Line was conceived and built in the 1920s and 1930s as a defensive wall, with the heaviest concentration of fortifications along the hotly contested border with Germany. This region maintains a mixed Franco-German population and a cultural schizophrenia born from years of back and forth fighting (Fig. 2-3). The militarized zone was comprised of a

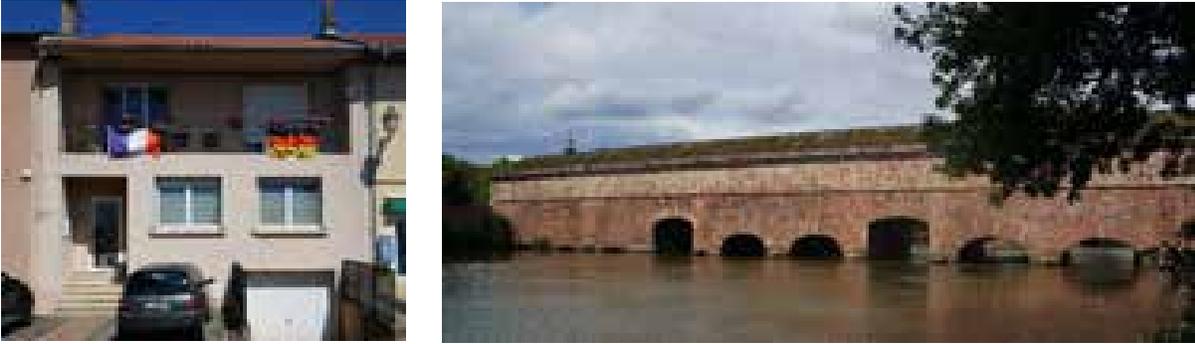


Fig. 2-3. The contentious Alsace-Lorraine region is illustrated by dueling French (left) and German (right) flags; the Barrage Vauban (right) is a 17<sup>th</sup> century defensive wall and dam built by the French to stop a German invasion, Alsace-Lorraine, France.

300-mile-long, 16-mile-deep system of command centers, minefields, barracks, supply depots, watchtowers, roadblocks, and levees (intended to flood any potential invaders). While the Maginot Line may seem monumental in size, it is in fact a series of physically disconnected, subterranean concrete fortifications categorized into *gros ouvrages* (large works) and *petit ouvrages* (small works). These fortifications used the most advanced technology of their time, directly reflecting the new speed and geographic reach of warfare in post-World War I Europe. In 1930s French propaganda videos, the Line represented a definitive and physical claim to territory amid a period of mounting tensions with Germany. Yet their hidden, rationalist architectural forms and hierarchical system of movement and communication reveal a new conceptualization of territory whose repercussions are still felt today.

The consequences of the Maginot Line's technological advances were not completely obvious upon my first visit to Hackenberg, located just north of the small village of Vekring. The *Ouvrage Hackenberg* is situated 100 feet under the shaded hillside of the same name (Fig. 4). It was a prototype Maginot *gros ouvrage*, built between 1929 and 1932

amid heightening Franco-German tensions, and consisting of a record 19 artillery blocks, a mile of anti-tank fortifications, and barracks for over a thousand soldiers.<sup>1</sup> The Hackenberg fortress was funded by the French state and designed by Paul Painlevé, the Minister of War, and the *Commission d'Organisation des Régions Fortifiées* (Commission for the Organization of the Fortified Regions), a group of military engineers, which would go on to design the other Maginot Line forts. The *Ouvrage* had every modern convenience: back-up diesel generators, independent HVAC systems, an underground train system, a post office, a tanning room (for vitamin D deficiency), medic stations, an industrial kitchen, wine cellar, bathing facilities, and space for thousands of tons of munitions. These facilities all sit underground. What the visitor sees aboveground—a handful of artillery turrets, concrete blocks, and overgrown trenches—is only a small footprint of the entire fortress, which is linked by tunnels (Fig. 5).



Fig. 4. The pastoral approach to the now forested Hackenberg hill under which sits the fortification, Vekring, France.



Fig. 5. Paul Painleve & C.O.R.F., view showing an artillery turret (left), infantry cloche (right), and fixed artillery block (center), Ouvrage Hackenberg, Vekring, France, 1929-1932.

Though the fort is concealed under a dense canopy of oak and hemlock trees, the turn from the highway to Hackenberg is hard to miss—an original German Panzer M10 tank stands as a silent sentinel on Vekring's main thoroughfare, the *Route de Helling*. A few minutes of gentle driving up the Hackenberg hill and the visitor is met with the imposing façade of the munitions entrance. The façade is typical of Maginot Line forts, a steel-reinforced single concrete block delicately curved at its corners to deflect artillery fire. Turrets are sunken into consecutive square subtractions of concrete, an ingenious solution to prevent ricocheting bullets. The overall effect is imposing, yet its formal abstraction belies a more critical understanding of the Maginot Line's complex architectural impact. The form of these imposing blocks is directly calculated to withstand a long-range artillery assault or repeated aerial bombing. Save for the lone French flag that flies above its oxidized metal gates, there is

no recognizable architectural ornament that gives cultural meaning to the building (Fig. 6). The *Ouvrage's* exterior proves a larger point about its relationship to the landscape; that by the 20<sup>th</sup> century the scope of war had so outgrown the scale of a human that decorative features were no longer needed. Fighter planes, heavy bombers, and long-range rockets meant that battles were no longer fought face to face, but at a previously incomprehensible distance high above, or below, the ground plane.

The new global theater of war directly resulted from the rapid development of industrial technology in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. The issue of supplying a national network of forts, including the *Ouvrage Hackenberg*, was solved by connecting the Maginot Line with an extensive logistical system. Steam-powered trains connect



Fig. 6. Paul Painleve & C.O.R.F., view of *Ouvrage Hackenberg's* munitions entrance with rail gauge, electrical lines, and radio antenna at center, *Ouvrage Hackenberg*, Vekring, France, 1929-1932.

the *Ouvrage Hackenberg* with its supply depot in Vekring by way of a rail gauge running through the middle of the munitions entrance. The artillery equipment would be transported through the fort's 2-foot-thick steel door to a cavernous switching station. There, materials and munitions from the diesel-powered railway would be loaded onto electric-powered trains. These underground trains trace the crest of the ridge, spanning the entire hill and connecting artillery blocks with the munitions facility (Fig. 7). My tour with Paul began with the whirl of the near century-old railcars as they hurtled towards the munitions magazine (Fig. 8). Both the national supply system and subterranean rail network found at Hackenberg represented the rapid advancement of technology that had occurred since World War I's end.



Fig. 7. Paul Painleve & C.O.R.F., plan under the hill with the white denoting aboveground artillery blocks, munitions and infantry entrance, dashed lines from thickest to thinnest lineweight represent anti-tank installations, electrical cables, and barbed wire, *Ouvrage Hackenberg*, Vekring, France, 1929-1932 (drawn by author).



Fig. 8. Paul Painleve & C.O.R.F., on the train from the magazines to artillery blocks, Ouvrage Hackenberg, Vekring, France, 1929-1932.

The train system that connected the *ouvrages* is the most highly visible (and audible) expression of modernity's technological encroachment into military architecture, but it is not the only one. The Ouvrage Hackenberg maintained a hierarchical network of operation, typologically mirroring the larger Maginot Line which consisted of various *gros* and *petit ouvrages*. Set against the dimly lit tunnels of the Ouvrage Hackenberg are hundreds of electrical lines, running the fort's length linking every blockhouse, outpost, barrack, and magazine and the entire Ouvrage to the Maginot Line system via buried cables (Fig. 9).<sup>2</sup> These electrical lines were attached to the national electrical grid. Electrical signaling and metal tubes that transmit speech allowed turret operators at the artillery blocks to reliably communicate with the munitions suppliers situated 100 feet below them. Telephone lines connected the artillerymen at the casemates with their

superiors in the observation posts on the ridge. Should the national radio system be incapacitated, radio communications were controlled at entrance blocks with a maximum range of 12 miles, more than enough to reach the nearest *ouvrage*.<sup>3</sup> Nowhere had such a sophisticated technological system of infrastructure ever been implemented to work within architecture, heralding a titanic shift in the speed and rapidity with which a nation could definitively control a wide territory while remaining almost totally hidden. This fundamental change in the space of warfare, from that of a localized, pre-World War I territory to a much larger field of operations is exemplary of the Hackenberg fort. The *Ouvrage* is an early architectural attempt to come to terms with the new reality of modern warfare, where speed and technology necessitated the defense of an entire nation via an interconnected network of defensive structures.<sup>4</sup>



Fig. 9. Paul Painleve & C.O.R.F., the lifeblood of the fort, telephone and electrical lines run the length of the tunnel, *Ouvrage Hackenberg*, Vekring, France, 1929-1932.

Following the train ride, we stopped at the munitions' magazine, a series of plastered bays with massive metal gantries for transporting ordinance to and from the artillery blocks. The bays are organized in a track formation, with their entrances strategically placed at a curve opposite an armored blast-proof door that leads to the infantry barracks. The munitions here are standardized: sections are marked for 75mm, 81mm, and 135mm artillery. Each ordinance corresponds to specific geographic ranges and artillery batteries that, when used together, form interlocking lines of fire, subjecting invaders to a near constant barrage from all sides. The arrangement of these artillery blocks and ironclad turrets was specifically made in relation to both the contours of the land and the battery's proximity to adjacent turrets.

Tracing the metal gantries used to carry munitions to the Block 9 135mm turret, one can finally appreciate what a complex undertaking it was to design the *Ouvrage Hackenberg* to meet the ground plane. It was at Block 9 that Paul operated the fort's last functioning turret, raising a 6-inch-thick metal turret above its massive concave steel base (Fig. 10-11). The *Ouvrage's* turrets are all blind, in that they do not physically allow the artillerymen a line of sight on the landscape, only relying on coordinate points to direct ordinance, essentially reducing the subtle curves of Lorraine into a series of latitudinal and longitudinal target points. In studying the Atlantic Wall, Nazi Germany's defensive fortifications across northern France's littoral in *Bunker Archaeology*, Paul Virilio emphasizes the "transformation of the world into a *carpet of trajectories* [emphasis

by the author]” and the subsequent collapsing of the conceptual and physical difference between military tactics and instruments of warfare.<sup>5</sup> As a precursor of the Atlantic Wall, the Maginot Line functions much in the same way, rendering the borderland between France and Germany as a field of coordinates. This change, as Virilio recognizes, dictated the architectural form of the *Ouvrage* (such as abstract, curved concrete facades) and the way it uses the landscape, primarily by occupying an entire hill underground.



Fig. 10-11. Paul Painleve & C.O.R.F., Block 9's hydraulic turret and gantry; Block 9's 360 views of the valley, *Ouvrage Hackenberg*, Vekring, France, 1929-1932.

The *Ouvrage Hackenberg* operates simultaneously at the scale of architecture and the scale of the region, as it was intended to work in concert with all the Maginot Line forts. The fort is not merely an isolated series of bunkers, rather it is a coordinated architecture that is intrinsically connected to a much larger infrastructural system whose effect on its surrounding landscape is made possible by the elements that it hides: tank and infantry defenses, underground electrical cables, supply railways, switching stations, and most importantly, its batteries' range and firepower.

After exiting the fort during my visit, I was struck by how exceptional the view onto the valley floor is, even if by now the oaks and hemlocks have ensconced the hill in a deep shade. Some firing lines remain, forming carefully intersecting views onto the landscape. We stopped at the rubble-strewn Block 8 to see the damage inflicted by American forces from the Texas-Oklahoma division as they recaptured the fort from the Germans in the autumn of 1944 (Fig. 12-14). Block 8's curved exterior lies crumbling, its steel reinforcing contorted in agony. Still, the rationalist concrete façade is an example of abstraction in the machine age, reminiscent of Le Corbusier's early work. The functional form, machine-like planning, utilitarian use of concrete, and absence of architectural motifs reveal a building entirely dictated by technology and topography.



Fig. 12-14. Paul Painleve & C.O.R.F., views of Block 8's façade and adjacent American memorial with steel reinforcement exposed from the Allied assault, Ouvrage Hackenberg, Vekring, France, 1929-1932.



Fig. 15. Paul Painleve & C.O.R.F., overgrown anti-tank trench between Blocks 24 and 25 with Germany in the distance, *Ouvrage Hackenberg*, Vekring, France, 1929-1932.

I spent the next few days traversing the Hackenberg ridge by foot, exploring its vine-covered artillery blocks and turrets. Hackenberg has had an ironic fate, having been turned into a local park with trails that run along the hill's crest. Originally meant to protect France from a devastating war with Germany, the *Ouvrage* now preserves the native flora and fauna of Lorraine. On the surface, the fortification is much subtler than one would expect from such a seemingly heavy-handed architecture. The rare moment when the occasional turret, bunker, or casemate pops out from the verdant understory that has engulfed the ridge is quite special. The grass has obscured the lengthy anti-tank trench linking Block 24 with Block 25, making it barely recognizable (Fig. 15). From the exterior one gets

the sense that the *Ouvrage Hackenberg* is no clumsy engineer's design; it is a highly contrived entity, dancing between topographic reality and military necessity. Apart from the ridge's high point, which is marked by a small chapel dedicated to the soldiers who died there, the *Ouvrage's* aboveground footprint is minor (Fig. 16). Although it is not apparent, the underground spaces of the *Ouvrage Hackenberg* shape the ground plane. This intimacy between landscape and architecture, additive and subtractive space, bucolic woodland and brute concrete is found across Lorraine's other Maginot forts.



Fig. 16. Paul Painleve & C.O.R.F., looking towards the Hackenberg Chapel with two armored cloches in the foreground, *Ouvrage Hackenberg*, Vekring, France, 1929-1932.

Like Hackenberg, many *ouvrages* have been turned into parks, yet they are all quite hidden, recognizable only by a sudden copse of trees and shrubs in farmers' fields (Fig. 17). They often serve as

gathering places for the rural communities they were supposed to protect. At *Ouvrage Guentrange*, another fort along the Maginot Line, Michel, a teen volunteer passionate about the area's long and storied military history, proudly presented me with the fort's brick oven used by the community during holidays for baking French baguettes. To the north of Hackenberg at *Ouvrage Galgenberg* and *Kobenbusch*, Jules, a 76-year-old retired engineer, who himself served in the Belgian army, preserves many fortifications across several ridges, diligently repairing the forts' ailing infrastructure. He showed me the hallway inside the *Galgenberg* fort that had just hosted a local artist's show the week before.



Fig. 17. Paul Painleve & C.O.R.F., an artillery block emerges from a wheat field at one of Hackenberg's adjacent forts, *Ouvrage Anzeling*, Anzeling, France, 1930-1938.



Fig. 18-19. Paul Painleve & C.O.R.F., butterflies inhabit reinforced concrete; Block 24 stands over an open border, *Ouvrage Hackenberg*, Vekring, France, 1929-1932.

Vines have now created a filigree on the hard, gray surface of the *Ouvrage Hackenberg*: where soldiers anxiously awaited the next Great War now is home to butterfly nests (Fig. 18-19). The footprint of the *Ouvrage Hackenberg* and the many other remnants of the Maginot Line remain physically hidden, yet experientially they are writ large across the land in the minds of the people who inhabit the area. The fortifications were designed to anticipate the new speed and geography of warfare by sinking deep into the earth. Advances in technology allowed this complex, hierarchical network to operate, fundamentally reimagining the landscape around it. In the past, its large infrastructural system of electrical cables, telephone lines, railways, and artillery turrets unconventionally defined the border with Germany (Fig. 20). It was a source of national pride for the French people. Today, the *Ouvrage Hackenberg* preserves the landscape and commemorates the storied history of the region.



Fig. 20. Map of the Maginot Line forts in Lorraine shown with plus signs while their respective artillery range in the surrounding circles, German border is denoted by a dashed line, areas with diagonal hatch signify local parks surrounding forts, Maginot Line, France, 1929-1939 (drawn by author).

Notes

1. J. E. Kaufmann, H. W. Kaufmann, and Tomasz Idzikowski, *Fortress France: The Maginot Line and French Defenses in World War II*. (Westport, CT: Praeger Security International, 2006), 45.
2. Ibid, 47-49.
3. Ibid, 47-49.
4. Paul Hirst, "The Defense of Places: Fortifications as Architecture [Part 2]." *Architectural Association School of Architecture AA Files*, No. 34 (1997): 6-17.
5. Paul Virilio, *Bunker Archeology*. (Paris: Les Editions Du Demi-Cercle, 1994), 17-23.

Humble Administrator's Garden | Classical Gardens of Suzhou

The first thing you realize when hopping off the train at Suzhou in July, apart from the city's distinct bean curd smell, is the utter wetness of the air within the ancient city. As I headed towards the Humble Administrator's Garden, I was rapidly engulfed by the watery embrace of this ancient canal city in the form of an unrelenting and ever-present humidity. The magnitude of Suzhou's history and population size is shockingly squeezed into the confines of its moat, which encircles the city on all four sides. This compression is readily felt while walking the narrow, cramped streets of the city. One can easily lose a sense of direction amid the dimly lit backstreets which seem to divide infinitely into smaller alleyways, as I did many times on my way to the Humble Administrator's Garden (Fig. 1). My urban disorientation was further intensified by the lack of any recognizable public spaces within the city. Suzhou's skyline is rather uniform: black terra cotta roofs expand into infinitude with only two or three pagodas' towers piercing the horizon. The smells are robust and perplexing as well. Nearly everywhere the wafting odor of fresh fish caught in the canals fills the air, punctured by the sulfurous stench of the morning's half-eaten tea eggs strewn along the city's streets. Smog, an unfortunate and telling reminder of China's recent and rapid industrialization, often obscures vistas from the few wide avenues cut into the city. To navigate Suzhou and get to my destination, I soon found myself gravitating towards the city's canals, which pierce into the rectangular urban plan from the surrounding moat with surprising intensity. These canals are cool

oases in Suzhou's intense heat. The Suzhouese congregate around the canals as well. It was alongside Pingjiang Canal, with the early morning sunlight filtering through the adjoining street's willow trees, that I met Lu, a local architect, who directed me to the Humble Administrator's Garden, the most famous garden of Suzhou (Fig. 2).



Fig. 1-2. Typical urbanism of Suzhou at dawn; view of Pingjiang canal near the Humble Administrator's Garden, Suzhou, China.

Compact and confusing as it is, Suzhou's canals and its equally famous gardens provide locals the means to understand their position in urban space. Canal and garden are inextricably linked at the Humble Administrator's Garden, which utilizes the city's canal infrastructure as a generator for its own architectural spaces. The Humble Administrator's Garden is placed in the urban fabric in the same way that Suzhou sits within its city-wide moat; the garden is encircled on all four sides by a high wall, denying any glimpse into its leafy enclosure. This theme of miniaturization of the natural environment within the bustling city is essential to the complexity and beauty of the UNESCO-protected Classical Gardens of Suzhou, of which the Humble

Administrator's Garden is a part of. The Humble Administrator's Garden is a singular entity; however, it consists of multiple pools, pavilions, walls, bridges, libraries, and a sprawling residential complex (Fig. 3). The site of the current garden, measures about thirteen acres and is divided into western, central, and eastern sections. Construction began on the original garden in 1509 CE, located between the eastern and central portions of the existing site. The Garden of the Humble Administrator is one of many private parks in the city that were constructed by retired government officials. The garden's name is derived from a book verse by Pan Yue, a 3<sup>rd</sup>-century Chinese poet, which states, "I enjoy a carefree life by planting trees and building my own house... I irrigate my garden and grow vegetables for me to eat... such administrative work suits a retired official like me well."<sup>1</sup> Wang Xianchen, a retired imperial bureaucrat and the owner of this garden, must have felt the title of the Humble Administrator was appropriate to the autumn years of his life. He invited his close friend Wen Zhengming, a famous Ming poet, calligrapher, and painter to help design his new retirement home in the early 16<sup>th</sup> century.



Fig. 3. Wang Xianchen and Wen Zhengming, view of the waterside gallery and wall connecting the central and western portions of the garden, Humble Administrator's Garden, Suzhou, China, 1509.

It is from Zhengming that we know so much about the Garden's early history, and it was with the gestural strokes of his paintings and his detailed, poetic description of the Humble Administrator's Garden that achieved renown in his time and ours (Fig. 4-11).<sup>2</sup> His collection of paintings and associated calligraphic poems were both artistic and architectural; he used the drawings as a generative tactic in designing the Garden at the same time as it was being built. His recollections of the Garden describe a place of hyper-sensory experiences, "I love the smells that fill my bosom and sleeves, I do not let the wind and dew wet my clothes, my thoughts fly high beyond the flowery world. Quietly, I watch the bees dance up and down."<sup>3</sup> What Wen Zhengming offers in his poems and paintings is a space constructed almost entirely out of the senses rather than the garden's physical,

architectonic form which has always been understood as malleable. While the Garden has changed greatly over the centuries, reflecting the tastes of its many owners, the essence of Classical Suzhou-style gardens remain: carefully planned expansion and contraction of space, emphasis on constructed views, a formal abstraction of the countryside's mountains and lakes, and an asymmetrical balance of architectural elements. This culminates in a miniaturized environment that encapsulated the idealized Chinese landscape outside Suzhou's gates. The willingness to abstract the Garden's form to heighten the visual, tactile, olfactory, auditory, and gustatory senses (in many instances due to the bounty of vegetables grown in these spaces) connected officials and intellectuals like Xianchen and Zhengming with the wildly beautiful Chinese landscape outside of the city's walls.



Fig. 4-11. Wen Zhengming, the first four of eight album paintings with their associated poetry written in detailed Chinese calligraphic script describing the Humble Administrator's Garden, Suzhou, China, 1551. Courtesy of the Metropolitan Museum of Art.

Most of these imperial officials who built Suzhou's gardens came from the distant countryside of the region. Like Wang Xianchen, they were often progeny of landed gentry, sent to work as bureaucrats of the state in Suzhou. These politicians were intrinsically connected to the rural landscape they left behind and sought to recreate it in their newly assigned urban space.<sup>4</sup> This was achieved by a series of entrances, with each successive layer distancing the garden from the city's clamor. At the Humble Administrator's Garden, the transition is especially forceful from Suzhou's loud and busy streets, beginning at a large gate and walled antechamber for the reception of visitors. This simple vestibule has the striking effect of quieting everyone who enters, suddenly engulfing the visitor in tall white-washed walls on all sides. Following the antechamber you are whisked into the Garden through a pavilion that further masks a direct view into the park. After this small pavilion the visitor is confronted with the miniaturized pool of the eastern garden, meant to imitate the ocean encircling Earth, a traditional concept in Chinese philosophy (Fig. 12). Here, visitors understand the metaphorical allusion to the



Fig. 12. Wang Xianchen and Wen Zhengming, a quiet pause at the eastern garden's pond before disappearing past a bridge, Humble Administrator's Garden, Suzhou, China, 1509.

Chinese worldview, albeit now in a miniaturized state. Pine trees, bamboo stalks, and riparian shrubs obscure any expansive view. This is intentional: the gardener, like nature, need not divulge the entire space in one fell swoop. The procession, as my friend Lu explained, unfolds gradually across the site much like a countryside hike slowly reveals vistas.

A wall, inset with windows cut out into various geometries, separates the eastern and central gardens (Fig. 13). Wall and fenestration operate philosophically between solid and void, allowing brief moments of visual intrigue beyond the partition. Rather than being an obtrusive element, the garden's white walls highlight the fervent greens and bright floral colors set in front of it, recalling a rural landscape painting's canvas.<sup>5</sup> Suddenly, turning the corner and passing through a circular doorway, I was greeted with a perfect view of the Beisita pagoda, a Buddhist structure outside of the garden in the heart of downtown Suzhou (Fig. 14). The pagoda, framed by willow and mulberry trees, reminds the viewer of the city's inevitable presence, a popular conceit in Chinese garden design.



Fig. 13-14. Wang Xianchen and Wen Zhengming, walls with windows separate the garden; "borrowed" view of the Beisita pagoda from the Garden, Humble Administrator's Garden, Suzhou, China, 1509.



Fig. 15. Wang Xianchen and Wen Zhengming, water is seen as a miniaturization of Lake Taihu, Humble Administrator's Garden, Suzhou, China, 1509.

Following the view of the pagoda, the foreground of the central Garden reveals a large pool. The pool extends into seemingly randomized directions, appearing in front of a wooden pavilion before vanishing around the corner of an artificial island (Fig. 15). In fact, the water in the central pool touches nearly every corner of the garden, moving stealthily between constructed islands of rock and dense tufts of flowering lotuses. Water is perhaps the most important element of the Humble Administrator's Garden, comprising a significant percentage of the Garden's surface area. It is not surprising that a city which owed its agricultural and commercial prosperity to its canals revered water as a lifegiving element. Mirroring the many lakes that irrigate the region's rice fields, the Humble Administrator Garden makes expressive use of this essential landscape element. The

construction of the Garden by diverting water from nearby public canals, certainly denoted the owner's societal clout. Water serves as the primary organizer of space in the Garden. The pools appear randomly arranged but are in fact delicately construed to appear like the boundless and placid horizon of nearby Lake Taihu. Bright fish and submergent plants dot the water's edge, all serving to shrink the nearby open expanses of water into an urban park.

The water is in stark contrast to the Garden's additive element; the rocks that create the islands and walkways add visual and metaphorical balance to this landscape composition. Rocks signify the mountains of China's interior, acting in direct opposition to the calm lakes they surround. The islands and pathways of the Garden are constructed from the dredged earth removed to create the bodies of water, inextricably uniting these two opposing forces. Special rocks were also imported, via Suzhou's canals, for their visual effects. Stones from Lake Taihu, whose eons of erosion have created geologic formations with numerous voids, were particularly prized (Fig. 16). *Rockeries* (constructed sculptures of found rocks) represent artful compositions of these stones, often serving a structural purpose (Fig. 17). These rock formations are intended as stand-ins for mountains, often creating smaller gardens inside the Garden itself, miniaturizing the jagged Yellow Mountains west of Suzhou in expressive, grotesque form.<sup>6</sup> Often, they are placed at the center of a garden-side pavilion for viewing; their forms always change with the adjustment of the viewer's gaze.



Fig. 16-17. Wang Xianchen and Wen Zhengming, *rockeries* create an abstract representation of mountains; stones support a waterside ambulatory, Humble Administrator's Garden, Suzhou, China, 1509.

The Humble Administrator's Garden presents a contradicting, yet complimentary dichotomy, between mountain and water throughout its length. The resulting form is harmonious and continuously in flux; where the rock pierces the water and the water floods the rock there is always a moment of visual tension. These features bring the landscape of Suzhou's hinterland into the urban area, exaggerating their forms so that the owner may be immersed in nature. Seemingly unorganized, the interplay between rock and water is in fact carefully constructed.

In direct opposition to the randomized landscape elements of the Garden, the central section's pavilions and living quarters are explicitly geometric and orthogonal. These served as vehicles for the admiration of the natural landscape for the owner and his invited guests. The Garden's architecture presents highly rectilinear and symmetrical forms (Fig. 18). In a city of little public space, the spacious libraries and reception rooms of the Humble Administrator's Garden and Suzhou's other private parks presented one of the few

opportunities to engage in a civic and social manner.<sup>7</sup> Even today, Lu emphasized how vital the gardens are to the city as places for socialization and scholarly activity. Elaborate names derived from literature such as the "Good for Both Families Pavilion" and the "Keep and Listen Hall" were given to buildings to display the owner's erudition. Through the writing of poetry, Xianchen and his contemporaries would focus on the Garden's philosophical contradictions (water and rock, man and nature, artificial and natural, orthogonal and random). It was at the Humble Administrator's Garden where the Chinese concept of "civilization," translated from the word *wen ha* meaning "the transforming power of writing" was practiced and realized.<sup>8</sup> Thus the Garden was a place for the cultivation and preservation of Chinese culture. By participating in literary, artistic, horticultural, and architectural pursuits (all of which a garden required), members of the elite could communicate within the narrow confines of this public sphere.



Fig. 18. Wang Xianchen and Wen Zhengming, the orthogonal Mandarin Duck Hall stands opposite the curvilinear pond, Humble Administrator's Garden, Suzhou, China, 1509.

The organization of the Garden's residential section seems to be formally at odds with the its organic landscape, but it underscores the Chinese concept of miniaturization. At a larger scale, Suzhou's private gardens are in total contrast with the city's rectilinear urban plan of canals and alleyways (Fig. 19). Like the Humble Administrator's Garden, the nearby Lion Forest Garden and Garden of Cultivation are located near canals that pierce Suzhou's interior, but their placement appears devoid of any formal logic. The gardens dotting the cityscape eschew Suzhou's orthogonal order in favor of a randomized composition; however, this distinction reinforces the Chinese conceptualization of the built and natural environment, which constantly shift between one another at each scale.



Fig. 19. Wang Xianchen and Wen Zhengming, the lines denote Garden's three sections and exterior wall while dashed lines highlight the path of adjacent urban canals, Humble Administrator's Garden, Suzhou, China, 1509 (drawn by author).

Seen from this perspective, the Garden of the Humble Administrator's residential buildings, surrounded by natural scenery, act as a miniaturization of the city and countryside itself. In this way the many gardens of Suzhou represent, at a larger scale, the Chinese interplay between solid and void, as they reveal openings of nature in their dense urban setting. Suzhou, surrounded by a massive moat, realizes this solid/void relationship at an even larger, regional scale, revealing a deep cultural connection between gardens, the city proper, and its agricultural hinterland with which it is intimately linked.

Suzhou is at once connected to its hinterland's rice fields, lakes, and rivers as it is with the gardens of its cosmopolitan center. The ancient walls and moat that still surround the old town are permeable and punctured by various gates. They serve to connect the city with the many canals that extend outward in every direction. Despite Suzhou's rapid 21<sup>st</sup>-century growth, to this day fresh vegetable produce, grown on the embankments of the moat and in small plots along the canals that dot the metropolitan area, are brought to the city's market stalls to be sold. This daily connection between city and country is typical of traditional Chinese economic and cultural systems.<sup>9</sup> It is made especially poetic and visual by Suzhou's unique canals, plied daily by local farmers who glide between the city walls and their rural homes. These canals are also the vital link between the city's system of gardens and the countryside (Fig. 20-21).



Fig. 20-21. View from the East Gate with agricultural fields in the zone between the walls and the city; looking at the East Gate with the cultivated area and city to the right, Suzhou, China.

The Humble Administrator's Garden is not an isolated and cordoned park, rather it is intrinsically connected to the city and greater region it inhabits. Like many retired and wealthy bureaucrats within the city, the official who built the Humble Administrator's Garden desired for a connection to the Chinese landscape of soaring mountains and gentle waters. Despite its apparent aversion to the urban environment, the Humble Administrator's Garden utilizes views out onto the city, as well as Suzhou's vital canals to create its famous pools. Like the other gardens within the city, the Humble Administrator's Garden was connected to a cultural network of literati, retired officials, and artists that visited each other's homes (Fig. 22). Thus, the Garden of the Humble Administrator is deeply connected to the city and landscape that surrounds it both conceptually and physically.



Fig. 22. Map of Suzhou, with its downtown surrounded by a moat and Lake Taihu to the southwest; gray fill denotes lakes and canals while plus signs locate the position of the city's famous gardens which are all located near canals, Suzhou, China (drawn by author).

Notes

1. Zhou Suning, *Classical Gardens of Suzhou*. Edited by Chen Weijing. (Suzhou: Suzhou Garden and Landscape Management Bureau, 2016), 56.
2. Maggie Keswick and Charles Jencks, *The Chinese Garden: History, Art & Architecture*. (New York: Rizzoli, 1978), 108-111.
3. "Garden of the Inept Administrator." The Met's Heilbrunn Timeline of Art History. Accessed November 15, 2018.  
<https://www.metmuseum.org/art/collection/search/39654>
4. Maggie Keswick and Charles Jencks, *The Chinese Garden: History, Art & Architecture*. (New York: Rizzoli, 1978), 73-89.
5. Ibid., 133-136.
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Angkor Wat Temple | Angkor Archaeological Park

My first day at the ancient city of Angkor, Cambodia revealed the cycles of life that tie the people to the land here, even today. Despite jet-lag and against my better judgement, I had agreed to hike to a sacred Hindu spring in the Kulen Mountains, located 18 miles north of the city with my friend Sopheap following an early dawn visit to Angkor Wat. I woke up at 4:30 AM to drive to the temple with the hope of witnessing its world-famous sunrise. The best time to experience this astrological event, one laden with many allegories to Hindu reincarnation and rebirth, is during the spring and autumnal equinoxes of late March and September when the sun rises seamlessly in an east-west arc, a symbol of the perfected cosmos in the sky, if only for a fleeting moment twice a year. Late July's sunrise, while not perfectly cresting at the temple's central *prang*, or spire, remains a transcendent experience (Fig. 1). Dreary eyed, yet renewed from the sunrise, I set out with Sopheap to the mountains. The drive to these ancient foothills, remnants of centuries old limestone deposits, revealed a horizontal countryside of little greenery. I later learned that this is typical of the brief transitional period between the region's dry season and the monsoon rains of late summer and autumn. From January to June rain is scarce, drastically altering the Cambodian landscape, turning flat agricultural land into a dry savannah. During this time the springs located in the Kulen Mountains are the only source of irrigatable water. By July farmers are desperately in need of water to irrigate the two rounds of rice required for their family's sustenance. Finally, by the end of July,

as the country sits on an increasingly low air pressure bubble, a mid-summer miracle gathers to the south and west of the country, carrying evaporation from the warm Indian Ocean and showering the freshly tilled rice paddies with water. For the first few days of my trip there was little to no rain. Over the course of the next week, its presence grew, wailing down water at an ever-increasing pace. Everywhere the dry scrubland gave way to the monsoon's watery embrace, especially the moat surrounding Angkor Wat. My last day in this now lushly saturated country was spent exploring the flooded banks of the Tonle Sap lake south of the ancient temple. It is between these forces, springs and lake, dry and wet, spring and fall, that Cambodia derives a cultural and architectural character all its own. I now understand Angkor Wat, and Cambodia as whole, as a place of dueling dichotomies, where the beauty of the place is found in the mediation between these various astrological, climatic, and agricultural cycles.



Fig. 1. The central enclosure of Angkor Wat, seen here at sunrise, is mirrored in both the sky and earth through two reflection pools, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.



Fig. 2. View of the highly detailed spires of the central temple complex, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.

Angkor Wat, the massive temple complex at the heart of the ancient city of Angkor, maintains a traceable and well-organized infrastructural system that radiates out from its sacred central spire (Fig. 2). Angkor Wat presents itself as an unmistakable symbol of political and religious power. King Suryavarman II built the temple in the first half of the 12<sup>th</sup> century CE to honor the Hindu god Vishnu. Rituals once occurred at the temple complex, some hidden inside and some open for all to see; priests, pilgrims, musicians, dancers, royal families, farmers, and craftspeople operated in an elaborate system facilitating worship to Hindu gods and goddesses. At a larger scale, Angkor Wat is situated along the axis of cosmological and infrastructural structures that accompany its original politico-religious intent. The complex is oriented along the east-west axis,

facing on one end towards the rising sun and the other to the sunset (Fig. 3). Surrounded by a shallow moat, Angkor Wat was the embodied center of the known world, both in the horizontal and vertical direction, since it was thought to be set on axis with the center of the Earth. This centrality is carried out as the innermost galleries of of the Hindu temple are replicated at increasing scale, finally reaching into the ancient city itself, realizing in stone and earth a Hindu diagram of the universe called the *mandala*. Angkor Wat was not a synchronic construction; it was a continuation of an existing architectural grammar already extant to the ancient Khmer city. Nearby, older temple complexes such as Angkor Thom and Baphuon, were almost always based on the *mandala* plan as a method of organizing the landscape into recognizable socio-political units. The temple of Ankgor Wat lies at the center of these historic axes. Outside its moat lies a vast system of irrigated canals connected to water storage reservoirs. These reservoirs controlled access to agricultural production and acted as symbolic markers of the Hindu religion.



fig. 3. The western causeway stretches across the manmade moat to the western gopura in the distance, Angkor Wat, Angkor, Cambodia, 1113-1150.

Angkor, which means "The City" in Khmer, is situated equidistant between the Kulen Mountains' springs and the Tonle Sap Lake's shallow waters. This area is the center of constant human inhabitation for centuries in the face of mercurial climatic and hydrologic circumstances.<sup>1</sup> Angkor Wat lies at the heart of the city, serving as its central temple and seat of royal authority. A massive moat measuring almost a mile in width encircles the temple-island. Angkor Wat is connected to the ancient city by the east-west causeway on either side of the island. Four sacred gates known as *gopuras* are stationed at each cardinal direction, with the western *gopura* serving as the primary ceremonial entrance. Once inside the sacred walls that surround the island, the visitor is confronted with the monumentality of the temple and the precision of its central axis, which is emphasized by a raised stone path (Fig. 4-5). Flanking the east-west platform on either side are balustrades of intricately carved Hindu snake figures called *naga*. After passing two identical libraries,



Fig. 4-5. The raised stone causeway continues the approach to the central tower of the temple, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.

deceptively named structures that hold small shrines, the central enclosure increases in size and visual weight rapidly, soon encompassing the entire horizon with its façade of colonnaded galleries. In perspective, the colonnades seem to run on into infinity, a visual trick employed to remind worshippers of life's circuitry, a central tenet of Hinduism. Each of the four galleries' walls are also carved in relief, depicting scenes from ancient Hindu texts and the triumphal march of the temple's commissioner, King Suryavarman II (Fig. 6).

Following the primary enclosure's entrance is a cruciform gallery, which further elongates and geometrizes the long-awaited entrance into the inner temple complex. Here, the temple is raised on three platforms, each ascending higher than the previous one by way of increasingly steep staircases and separated by voids of stone paving. Within the first enclosure, another two stone libraries sit. They are replicated in miniature yet again within the next smallest enclosure, an example of the *mandala* as it duplicates sacred forms continuously.



Fig. 6. The temple's southern gallery depicts King Suryavarman II riding in a military procession, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.

Finally, the innermost sanctuary holds the five towers symbolizing the peaks of Mount Meru, the mythical seat of the Hindu pantheon. At the temple's center and above the dense canopy of the rainforest, stands the central tower of the temple at 213 feet above the flat expanse of the Angkor floodplain (Fig. 7). Separating the visitor from the sacred perch of Vishnu is a series of very steep stairs (Fig. 8). Inside sit four Buddhas (Angkor Wat was converted to a Buddhist temple in the centuries following its construction), but originally the central chamber would have held a statue of Vishnu. Under the central tower is a small shaft which connects to the temple base, marking the supposed burial place of Suryavarman II and the central axis of the Khmer world. The Khmer understanding of the landscape is most readily apparent at the center of Angkor Wat, which radiates in every cardinal direction, representing abstract religious principles coupled with a more pragmatic need for infrastructure to mediate between the area's dramatic seasonal fluctuations.



Fig. 7-8. The central tower is intricately carved with Hindu deities; view looking down the steep staircase, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.



Fig. 9. View looking west from the inner sanctuary of the temple and towards the western causeway, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150.

Angkor Wat's replicable form of concentric squares emits from the spire of Mount Meru and into the ancient city of Angkor in the form of the *mandala*, organizing the region's irrigation, transportation, and governmental apparatus in a unified socio-political entity (Fig. 9). The mandala plan, understood as a cosmic mapping of the universe sacred to both Hindu and Buddhist teaching, is not a rigid, prescriptive technique for delineating space. Rather it was a creative exercise by ancient Hindu builders to identify a sacred cosmology.<sup>2</sup> Typically represented by the form of Vishnu with his navel at its center, these maps vary across time and culture, but maintain three distinct principles: center, symmetry, and cardinal directions.<sup>3</sup> I discovered the power of the *mandala* as a generative tactic at Angkor Wat, where Sopheap pointed to an area within the enclosure and just west of the central temple, given over to small piles of sand organized in a balanced and concentric formation (Fig. 10). These piles of sand are created by Buddhist monks to invoke the spirit of the *mandala*. Even today, the *mandala* plan is utilized at Angkor Wat to

denote sacred space, but like strands of DNA, its form is replicated at increasing scales radiating outward from the central temple enclosure. In the past, the *mandala* acted as a diagram for the construction of a socio-political geography by the Hindu kings of Angkor, with the ruler, assuming the form of Vishnu, as the sacred center of the cosmos. From his body springs the inner temple enclosure, as well as each successive gallery enclosure at Angkor Wat, past its moat, and outwards to the surrounding urbanized area itself in the form of roads and reservoirs, extending to the rectilinear organization of the city's peripheral rice fields, and moving out towards the edge of the Khmer Empire (which itself was administered in accordance with a four-cornered *mandala* plan).<sup>4</sup> This method of orthogonal, centralized spatial organization, augmented the impact of the temple by including the entire Khmer Empire into a sacred formation and irrevocably linked Hinduism to the state. In this way, Angkor Wat's mandalic plan extends out towards the edges of sacred and secular space, an ever-expanding microcosm of the universe (Fig. 11).



Fig. 10. A sacred *mandala* plan made with piles of sand adjacent to the central enclosure of Angkor Wat, Angkor Archaeological Park, Cambodia, 2018.

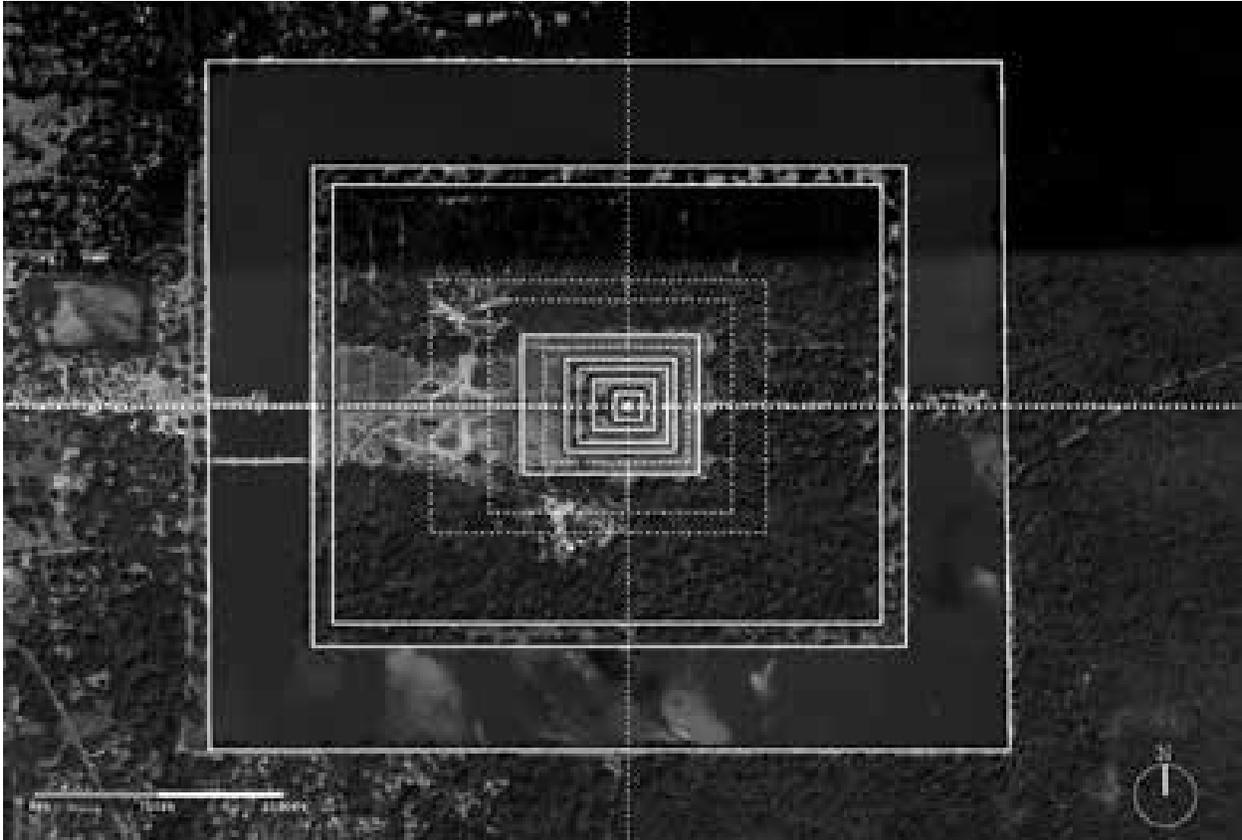


fig. 11. The mandala plan extends outward from the temple's center to the ancient city beyond, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150 (drawn by author).

Many visitors to Angkor Wat hardly recognize this sacred geometry, its scale is so large and its theological underpinnings so esoteric to be comprehended at the human scale, but it is very much there. What visitors do perceive, even if they cannot articulate it, is the centrality of Angkor Wat as the city's *axis mundi*. To visit Angkor Wat, even in its ruined and tourist-trodden state today, is to witness the culmination of the Khmer civilization's sacred and political infrastructure in built form. Angkor Wat is situated on an east-west axis that is aligned with the spring and autumn equinoxes and a north-south axis that relates to the position of the Kulen Mountains and the Tonle Sap Lake. The *mandala* plan, understood planometrically as a replicable series of quadrants expanding further

out towards the hinterlands of the city, is also a sectional device relating to the sky and ground (Fig. 12). The temple is thought to relate to specific constellations, in addition to the location of the northern and southern poles through a complex system of sacred measurements relating to the Hindu pantheon.<sup>5</sup> At Angkor Wat's center, the Earth's axis of rotation is 13.41 degrees north of the equator, which relates exactly to a sacred modular number used to construct the gallery of bas-reliefs depicting Brahma, another major deity in Hinduism.<sup>6</sup> Thus, Angkor Wat situates itself not only as the center of the world in plan, but also as a sectional device for depicting lunar and solar cycles even at the smallest conceivable scale.

The kings and priestly elite did not merely order the building of the city's central temple for religious purposes; they also utilized it as tool for organizing the agricultural production of the empire. At its height in the 1100 and 1200's CE, the city extended outwards for many miles and

contained a population numbering at least in the hundreds of thousands to perhaps over a million.<sup>7</sup> The rapid promulgation of its empire and its dramatic collapse must be partially attributed to a geographic location that requires large-scale mediation between the region's wet and dry seasons. This balance is a central tenet of Khmer conceptualization of space; one that visualizes religion, architecture, infrastructure, and landscape as an integrated system.

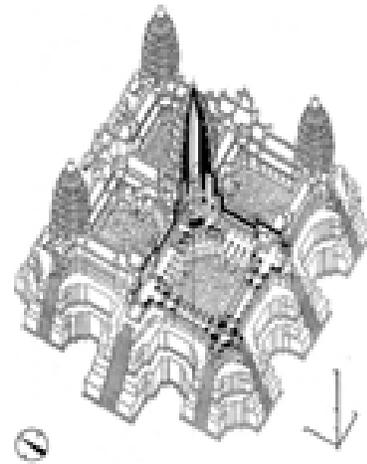


Fig. 12. Illustration showing the extrusion of the mandala, Angkor Wat, Angkor Archaeological Park, Cambodia, 1113-1150 (Courtesy of the National Museum of Cambodia).

Like many Cambodians today, whose agricultural life requires a knowledge of the local ecology, the people who built Angkor Wat and its environs were intensely connected with the region's unique climate, geography, and hydrography (Fig. 13). To control the massive inundation of the monsoon and the dry season's long draught, the Khmer civilization utilized water management on a vast physical and temporal scale, all with Angkor Wat at its center. One of the most striking aspects of the Angkorean landscape is the complex system of dikes, reservoirs, and moats; almost all are aligned at the same 13.41 degrees as the temple precinct. To capture the monsoon's plentiful water, the Khmer Empire built massive *barays*, huge reservoirs for water storage, the largest of which, West Mebon, stretches 1 mile wide by 5 miles long due west of Angkor Wat. These *barays* not only served as water storage and flood control infrastructure, but act symbolically as the Sea of Creation, the Hindu story detailing the creation of the world.



Fig. 13. Locals trawl for fish in the rising waters of the West Mebon baray, West Mebon, Cambodia, approximately 11<sup>th</sup> century.

To this day West Mebon acts as a reservoir for irrigatable water, with a contemporary lock at its southern end (Fig. 14-15). The *barays* are accompanied by an ancient raised road and causeway network, connecting Angkor Wat with the region's many other temples. The system of roads was also essential to the operation of Angkor's spiritual and commercial infrastructure. These roads often serve a dual function: that of paths for the movement of goods and people across the ancient city and that of raised dikes that hold water inside the city's massive reservoirs (Fig. 16). *Barays* would be dug by hand, and the upturned soil would then be used to construct the raised dikes that connected the city and related it back to the central axis of Angkor Wat. Taken as a system, with the roadways as an additive, and the reservoirs as the subtractive element, the two infrastructures act in concert together, framing the city plan as a sacred interplay between solid and void, all centered around Angkor Wat.



Fig. 14-15. The boat ride to center of the man-made reservoir at West Mebon just west of Angkor Wat, West Mebon, Cambodia, approximately 11<sup>th</sup> century.



Fig. 16. A rural road and levee with a modern irrigation sluice doubles as both transportation and agricultural infrastructure, Angkor Archaeological Park, Cambodia.

The construction of these raised dikes, acting as both roadway and levee, allowed Angkor Wat to achieve a highly controlled and centralized infrastructural system in accordance with Hindu theology that related specifically to the *mandala* plan, regulating cosmic and agricultural space outside of its moat. The five peaks of the temple, symbolizing Mount Meru, home of the most sacred gods and goddesses within Hinduism, plunge not just into the sky, but also into the earth via two reflection pools situated west of the central enclosure. At a much larger scale, Angkor Wat organizes the space of the region in accordance with *mandala* plan, uniting road, reservoir, and religion into a singular entity (Fig. 17). As it was a place for spectacle and pilgrimage in the days of the Khmer Empire, Angkor Wat maintains its aura today as the center of both built and natural forces.

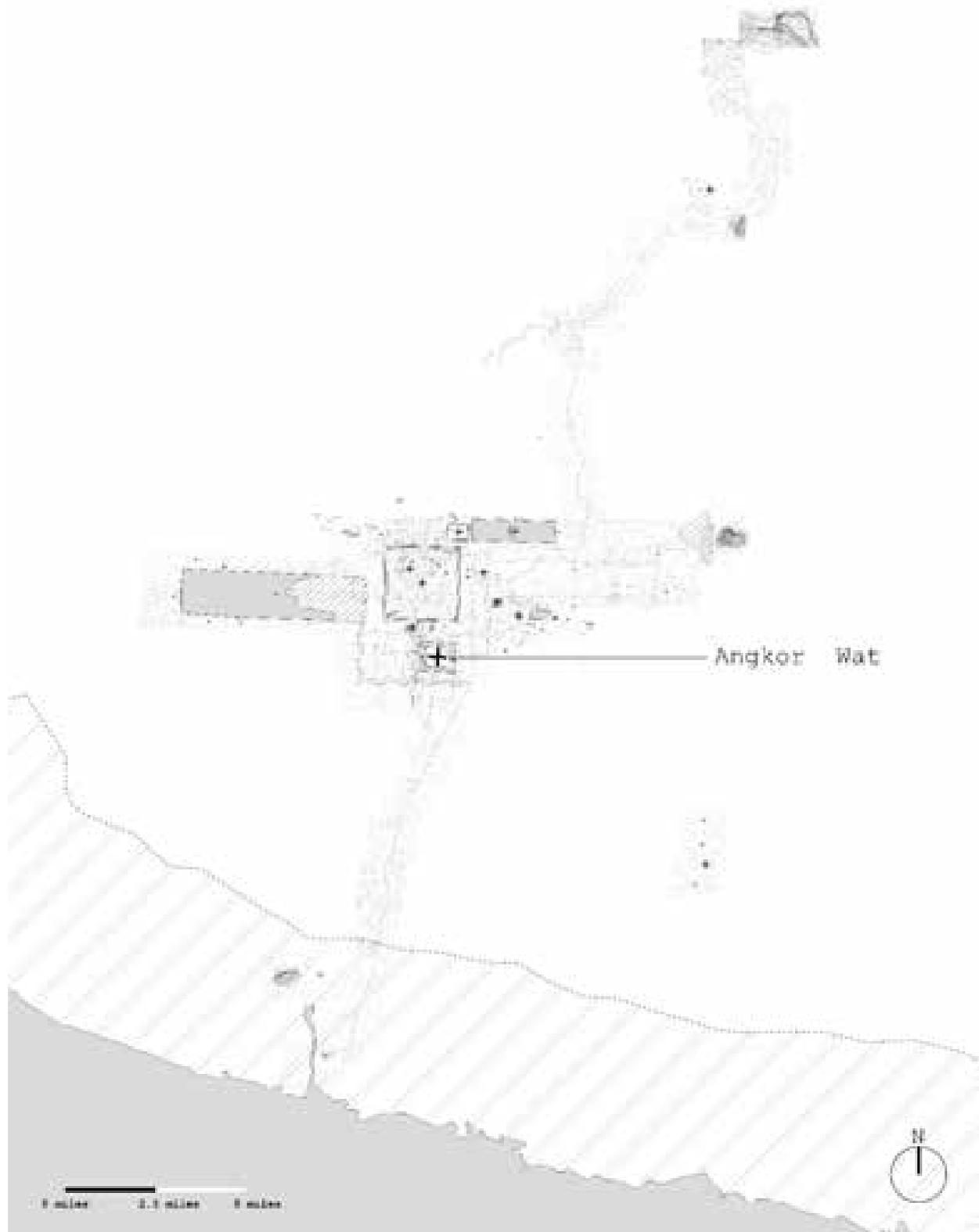


Fig. 17. Map of the ancient city of Angkor with Angkor Wat situated at its center between the northern Kulen Mountains and the Tonle Sap; dashed line shows the of flood zone during monsoon season, Angkor Archaeological Park, Cambodia (drawn by author).

Notes

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