I, Craig Hamilton,
hereby submit this work as part of the requirements for the degree of:

Master

in:

Architecture

It is entitled:

Purpose, Place, Experience:
Integrating the Rational and the Poetic in the Design of a Napa Valley Winery

This work and its defense approved by:

Chair: Aarati Kanekar
       Michael McInturf
PURPOSE, PLACE, EXPERIENCE

Integrating the Rational and the Poetic in the design of
A Napa Valley Winery

Craig Hamilton
2006
# TABLE of CONTENTS

## ABSTRACT

<table>
<thead>
<tr>
<th>TABLE of CONTENTS</th>
<th>ABSTRACT</th>
<th>SUMMARY</th>
<th>APPENDIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>65</td>
<td>66</td>
</tr>
</tbody>
</table>

## LIST of ILLUSTRATIONS

<table>
<thead>
<tr>
<th>LIST of ILLUSTRATIONS</th>
<th>2</th>
</tr>
</thead>
</table>

## ILLUSTRATION CREDITS

<table>
<thead>
<tr>
<th>ILLUSTRATION CREDITS</th>
<th>3</th>
</tr>
</thead>
</table>

## Chapter 1: INTRODUCTION

<table>
<thead>
<tr>
<th>Chapter 1: INTRODUCTION</th>
<th>4</th>
</tr>
</thead>
</table>

## Chapter 2: POETRY, PURPOSE, PLACE

<table>
<thead>
<tr>
<th>Chapter 2: POETRY, PURPOSE, PLACE</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Architecture as Purpose-Driven Art</td>
<td>9</td>
</tr>
<tr>
<td>2.2 Redefining Functionalism</td>
<td>12</td>
</tr>
<tr>
<td>2.3 The Influence of Place</td>
<td>26</td>
</tr>
<tr>
<td>2.4 Integration</td>
<td>32</td>
</tr>
</tbody>
</table>

## Chapter 3: The ART and SCIENCE of WINEMAKING

<table>
<thead>
<tr>
<th>Chapter 3: The ART and SCIENCE of WINEMAKING</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Terroir: Distinctive Characteristics of Place</td>
<td>45</td>
</tr>
<tr>
<td>3.2 The Napa Valley</td>
<td>50</td>
</tr>
</tbody>
</table>

## Chapter 4: APPLIED INTERPRETATIONS of WINEMAKING

<table>
<thead>
<tr>
<th>CHAPTER 4: APPLIED INTERPRETATIONS of WINEMAKING</th>
<th>53</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Issues of Winemaking and Place</td>
<td>53</td>
</tr>
<tr>
<td>4.2 Complexities of Process</td>
<td>55</td>
</tr>
</tbody>
</table>

## SUMMARY

<table>
<thead>
<tr>
<th>SUMMARY</th>
<th>65</th>
</tr>
</thead>
</table>

## APPENDIX

<table>
<thead>
<tr>
<th>APPENDIX</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. History of Winemaking</td>
<td>66</td>
</tr>
<tr>
<td>B. The Winemaking Process</td>
<td>70</td>
</tr>
<tr>
<td>C. A Brief History of Functionalist Thought</td>
<td>75</td>
</tr>
</tbody>
</table>

## SOURCES CITED

<table>
<thead>
<tr>
<th>SOURCES CITED</th>
<th>61</th>
</tr>
</thead>
</table>
LIST of ILLUSTRATIONS

1. Diagram by author
2. Carson Pirie Scott Building, Louis Sullivan, 1889
3. Wainwright Building, Louis Sullivan, 1890
4. Peterschule Basel, Hannes Meyer, 1926
5. Villa Muller, Adolf Loos, 1929-30
6. Paimio Sanitorium, Alvar Aalto, 1929-33
7. Seinajoki Town Hall, Alvar Aalto, 1963
8. Ring, Square, Mobius strip
9. Courtyard from above, Naoshima Contemporary Art Museum, Tadao Ando, 1988-95
10. Interior courtyard, Naoshima Contemporary Art Museum, Tadao Ando, 1988-95
11. Analysis of Helsinki Auditorium
12. Analysis of Helsinki Auditorium
13. Analysis of Helsinki Auditorium
14. Interior view, Helsinki Auditorium
15. Section, Helsinki Auditorium
16. Chichu Art Museum, Axon
17. Chichu Art Museum, Interior
18. Chichu Art Museum, Interior
19. Chichu Art Museum, sketch
20. Villa Savoye, Chichu Aerial
21. Daily activity study
22. Mobius Diagram
23. Orientable surface diagram
24. Exterior, Mobius House
25. Floor plans, Mobius House
26. Dominus Exterior
27. Dominus Interior/Exterior
28. Dominus Wall System
29. Terroir: Connection with earth through wine
30. Panorama of Vaca Mountains
31. Erosion/Sedimentation Diagram
32. Aerial Photo of Napa County
33. Aerial of Pine Ridge site
34. Pine Ridge site study
35. Winery Program
36. Stag’s Leap District
37. Process diagrams
38. Longitudinal section through building
39. Site diagrams, drainage, circulation
40. Renderings of walls and roofs
41. Detail rendering of wall system
ILLUSTRATION CREDITS

1. Diagram by author
2. www.bergen.org
3. Curtis, 48
4. Curtis, 199
5. www.architecture.com
6. icar.poliba.it
7. www.buildlab.com
8. Diagram by author
9. www.haukedresser.com
10. Blaser
11. Diagram by author
12. Diagram by author
13. Diagram by author
14. Photo by author
15. Sketch by author
16. www.archrecord.com
17. www.archrecord.com
18. www.archrecord.com
19. www.archrecord.com
20. www.archrecord.com
21. Van Berkel, MOVE
22. Van Berkel, MOVE
23. Van Berkel, MOVE
24. www.architect.com
25. Van Berkel, MOVE
26. www.floornature.com
27. www.floornature.com
28. www.floornature.com
29. Diagram by author
30. Swinchant and Howell, 159
31. Diagram by author
32. Swinchant and Howell, preface
33. Photo by Google earth
34. Diagram by author, photo by Google earth
35. Diagram by author
36. Rendering by author, photo by Google earth
37. Diagram by author
38. Rendering by author
39. Diagram by author
40. Rendering by author
41. Rendering by author
Chapter 1: INTRODUCTION

The winery was born in the exact moment that wine was intentionally created by humans. Based on this conception, the first winery could be considered the clay vessels that grapes were stored in dating back to Mesopotamia in 4000 B.C. Not coincidentally, these vessels became the apparatus in which “wine” was first created. As understanding of fermentation and grape chemistry evolved over centuries, the apparatus became more complex, employing new equipment and techniques such as pressing to release the juice, filtering to remove sediment, and various types of new containers for storage. Now fast-forward to the twentieth century where a technologically advanced version of this archaic system is the standard in winemaking. Although the current system is typically larger and enclosed within a structure, it is not far removed from its primitive counterpart from over 3000 years ago. Fundamentally, the winery has remained in its simplest form, nothing more than an apparatus created by man for the purpose of turning grapes into wine. The technical requirements of the winemaking process should therefore be of utmost concern in the design of any winery. However, due to recent changes in the role of the winery within the business of wine, the strict rationality used in designing most other production facilities will not suffice in the design of the Napa Valley winery. The winery as a general typology has evolved beyond its role of serving only as an object of utility.

The twentieth century brought more than just advanced technology to winemaking. It introduced the influence of winery tourism into the equation, especially in the Napa Valley region of California. Tourism, and the resulting consumerist logic that has been proliferating the industry, have transformed the winery from a behind the scenes production facility into an iconic symbol for the wine as a product and generator of the ever-important public image of the company. As a result, the winery has evolved from what was essentially a rationally designed machine to become an expressive architectural statement about wine and wine culture. An important function of the modern winery is to create a unique place to bring people together with wine in a pleasurable experience. The fact the winery has become a source of product identity and image is indisputable, however the ways in which this is executed architecturally is of greater concern.
The addition of image and experience to the winery’s functions resulted in a design mentality that dealt with the winemaking process and the experiential realm as two totally separate issues. Many Napa wineries, particularly those which have surrendered to Napa Valley’s proliferate tourism, resorted to using replicated historic imagery to recall a narrow and limited thread of winemaking’s past, with the intent of creating a unique, fantasy-like experience for the winery tourist. Winery functions are placed in rationally designed warehouses in the back, while public areas are extravagantly designed to mimic a French chateau, Tuscan villa, or even an Egyptian temple. But too often emphasis is put on this historic imagery, forcing the industry-like inner workings of the winery into a predetermined stylistic container. Alternately, some wineries segregate production areas from the public realm altogether, creating only false impressions of the process of winemaking in disjointed, architectural solutions. These common occurrences compromise or even disregard the winery’s function as a place to unite people with the process of making wine by creating a physical and literal separation between the functions of the winery and the architectural expression. Eliminating the use of predetermined forms and imagery is the first step in allowing the integration of the technical functions of the winemaking process with the experiential needs of the winery into a single comprehensive architectural gesture.

To truly integrate the technical with the experiential functions of the public realm, function needs to be viewed rationally as well as poetically. Because the specific place in which the winery exists will have an impact on both its technical functions as well as on the spatial experience of the visitors, the concept of function must be expanded to include notions of a building’s interaction with its surroundings, and way it is experienced in its specific context. Issues of place and experience immediately begin to cross into the realm of the poetic. Function-based architecture can be elevated well above traditional rational functionalism by considering site and experience as part of the building’s inherent functional concerns, suggesting the need for a design methodology that deals with this expanded concept of function in a rational as well as an irrational, or expressive manner.

Poetry, Purpose, Place will explore an array of ideas that begin to question the essential core of architecture itself, namely issues of function, place, and experience. This potentially vast area of inquiry will become manageable by focusing the research on three specific areas, writings, representational methods, and built works. First, critical and theoretical writings will provide the context for analysis of
architecture as both the purpose-driven art of building, and the experience-driven art of creating place. Specific representational methods will be analyzed for their ability to effectively mediate the rationalities and irrationalities of function in the design process. Finally, analyses of several completed structures will serve as case studies for the materialization of design methodologies that I feel have effectively achieved an integration of function, place, and experience on a level beyond the purely rational.

Architectural as Purpose-Driven Art reduces architecture to its simplest form, viewing it as an object of utility as well as an object of poetic expression. Selected writings first establish two key aspects, building function and the creation of place, as possible origins for architecture itself. The chapter then discusses architecture as a form of art, attempting to prove the necessity for an inherent level of irrationality when dealing with issues of function on a poetic level, and the need for the irrational to be continuously reference the rational in the process.

Accepting function as essential to architecture, it is then necessary to question how function is defined, as well as how this clearer definition can eventually be addressed through design methodologies. Redefining Functionalism examines the varying ways in which function has been defined throughout recent architectural history. This includes theoretical foundations for function-based architecture, as well as ways in which these ideas are applied. Special consideration will be given to views on the articulation of function, and to the ways in which metaphorical or conceptual ideas are integrated with technical functional requirements. It concludes with the thought that issues of place and experience can be considered functional issues within a broadened idea of function, and these

Influence of Place views the physical properties of place such as climate and topography as requirements that must be dealt with accordingly in order to assure the functioning of the winery within its specific context. Poetic aspects of place give rise to questions concerning the phenomenological way in which space is perceived, becoming important to the experiential functioning of the winery for its visitors.
In the subchapter entitled **Integration**, the work of several architects is studied for its effectiveness in dealing with the integration of function, place, and experience in form. Methods of representation, both analytical and conceptual diagrams, will be examined to gain an understanding of the critical point in the design process where the objective data is creatively synthesized, and begins to take on form and structure. The main focus of this section deals with UN Studio’s method of “inclusiveness”. Constructed buildings will be analyzed to discern ways in which function, place, and experience are seamlessly integrated. Tadao Ando’s Chichu Art Museum, Alvar Aalto’s auditorium design for Helsinki Technical University, and UN Studio’s Mobius House will serve as precedents for buildings that rationally and expressively synthesize program, circulation, site, and experience into a singular formal gesture.

**Art and Science of Wine** will provide an explanation of the important concept of terroir. This will be followed by a description of the history and current scenario in the Napa Valley, and more specifically the Stag’s Leap district.

Finally, **Applied Interpretations of Winemaking** begins to synthesize key ideas gathered from the research and analysis into an organized strategy for the design solution.
Chapter 2: POETRY, PURPOSE, PLACE

“There is a need to distinguish between our methodical and conceptual differences, in as much as architecture is founded on neither function nor the pure will to express.” – Jacques Herzog

Architecture, like any other purpose-driven art, is both a technical and a creative endeavor. It is not pure expression, art for art’s sake, but art that is created in response to some intended purpose, or function. These functions may be physical, emotional, or even spiritual, but are nevertheless essential to architecture. On the other hand, some would argue that place making, the act of building or creating a place, is the true essential element of architecture. Both function and place have been identified separately as possible origins of architecture. But architecture cannot create place without responding to some intended purpose.

Conversely, architecture cannot create purpose-driven space without also creating some sense of place, whether conscious or inadvertent. The abstract concept of purpose cannot become physical reality without occupying space, thereby creating or at least marking a place. Space as architecture cannot serve a purpose and possess a sense of place without human interaction. Experience then becomes an issue. It follows, then, that purpose, place, and experience are inextricably linked through architecture. Furthermore, purpose can only become place by means of the human will to form, subjecting it to the constructs of the creative human mind.
2.1 Architecture as Purpose-Driven Art

“In its simplest form, architecture is rooted entirely in functional considerations, but it can reach up through all degrees of value to the highest sphere of spiritual existence, into the realm of pure art.”

-Mies van der Rohe

In a 1959 essay Theodor Adorno reduced the concept of architecture down to its simplest form by viewing it as a purpose materialized in space, brought into form by the human imagination. This was a readily accepted view at the time, a view that finds its origins in the functionalist mentality proliferating architecture through the early twentieth century. Adorno described architectonic imagination as the ability to articulate space “purposefully”, in other words constructing forms according to purposes. However, the process of forming space based on purpose cannot be purely objective. Adorno clearly states that “No form can be said to be determined exhaustively by its purpose,” although many of the architects of Modernism had been striving for this pure objectivity. Even the most pure forms of purpose are nourished by ideas, which are in fact derived from artistic experiences, and therefore are subjective, by nature of their human origin. Pure objectivity, he claims, contains no element of truth, and therefore cannot exist in material form. On the other hand, “unmediated subjective expression” is inadequate for any form of purpose-driven art. Adorno has essentially undermined the functionalist notion of pure objectivity by acknowledging an imperative aspect of imagination in the creation of all purpose-driven form. The presence of imagination in architecture proves that architecture is a process based not only on intellectually based rationality, but on the poetics of intuition as well.

Bergson’s 1908 essay Creative Evolution more generally studied the division between intellect and intuition as it pertained to the creative manipulation of matter into form (in any means of physical creation). While not strictly discussing the topics of function or architecture, through a theoretical analysis of the constructs of the human mind, Bergson established an essential interrelationship between the rational mode of thought, and the more poetic, irrational, or metaphysical aspects of the mind.

Bergson describes how the intuition to “decompose and recompose matter” would not exist without the intellectual knowledge of the properties of the matter. Conversely, this intellect would not exist, if not for the intuition to obtain that knowledge, and so on. Intellect and intuition are capable of different kinds of knowledge, synonymous with the rationality of the left-brain and the creativity of the right. Scientific principles are intellectual, while metaphysical principles are intuitive. He asserts that the tendency of the human to fabricate comes from our scientific understanding of matter, which comes in the form of intellect. Intuition, however, is the “intention of life”, the metaphysical, which enables us to grasp what intelligence does not. Intuition is not the same as instinct or feeling, but a mode of reflection upon the intellectual. Intuition is not a single act, but is a fluidity of psychological action. According to Bergson, the intuitive method transcends the limits of idealism or realism, hence the subjective nature of all art. The connection between these two faculties of knowledge is not linear or ordered, but is one of continuous mutual dependency. ² Knowledge depends on the metaphysical, and the metaphysical depends upon knowledge. This continuous oscillation inherently exists in the creation of any form of art.

Bergson has claimed that in art there is always an objective set of parameters that can be intellectually understood, and this alone is insufficient in creating a work of art because it can exist only ephemerally in the mind. In order for the intellectually founded idea to become physical reality, it must at some point be processed by the intuitive mode of thought, a crucial part of the creative process. Furthermore, Bergson claims that the act of creation is dependent not only on the presence of these two polarities, but more importantly their continuous interaction with one another. In other words, a constant interaction between rationalities of intellect and the irrationalities of imagination is present in any form of creation.

Adorno supports this idea, more specifically dealing with form and function, by stating, “architecture would thus attain a higher level the more intensely it reciprocally mediated the two extremes, formal construction and function.” In this case, function is considered to be the intellectual rationality at one extreme, while formal construction is the irrational intuition applied in bringing function into architectural form, the opposite end of the spectrum. There is not a definitive line to be found between

the rational and irrational, hence Bergson’s insistence upon the ever-changing oscillation between the two extremes.

If we acknowledge and embrace the role of the intellectual and intuitive in creating architecture, as well as the need for their continuous interaction, then the question becomes how can the design process guarantee the effective mediation between the rationalities of function and the poetic expression of art? Failure to achieve a successful mediation between function and expression leads to disjointed solutions, which compromise both the building’s function and its expression of that function. In order to understand how the design process can deal with function, we must first develop a clearer definition for the notion of function itself.
2.2 Redefining Functionalism

(See APPENDIX C for a brief history of functionalist thought)

We may assume as a basis that the idea of doing something came into being before the idea of creating something. – Louis Sullivan

Functionalist theories are traditionally those who make a strict adaptation of form to function the basic guiding principle by which to measure the excellence or beauty of architecture. Any discussion on functionalism leads us to question the notion the function itself, discover its complexity and vagueness, and therefore understand the difficulty in clearly defining its use in the creation of architectural form. Some functions may be as simple as fulfilling the necessities of the building's operations, its program, and the physical needs of the users. But as we will see, function can take on much broader and less tangible definitions than these physical factors. The word function can entail any of a multitude of various requirements that the design process must address, and can occur on an almost infinite number of levels within the design. Examining the spectrum of building functions may begin to help us understand how function can be approached through design methodology.

Architectural functions can be generally grouped into four informal categories, physical functions (environmental factors, circulation, and space requirements), psychological functions (feeling or emotions evoked, way finding, comfort, and refuge issues), social functions (sense of community, values of the specific place or time), and existential functions (universal human values, subconscious structures of the mind).

Most traditional function-based theories attempt to address physical functions. Someone would most likely not be labeled a functionalist if they dealt mainly with social and existential functions.

---

Louis Sullivan and Twentieth Century Rationalism

Louis Sullivan coined the term “Form follows Function” in his 1896 article The Tall Office Building Considered Artistically, where he examined the design process and imagery employed in the “skyscraper” as an emerging building type. The foundation for Sullivan’s ideas lies in the concept of function as determiner of form, inspired by nature in an Aristotelian sense. While his thinking is closely tied with other rational theory of the late 19th century, a metaphysical frame of reference was clearly present in his work. Sullivan closely followed the writings of architecture and design theorist Horatio Greenough and transcendentalist Ralph Waldo Emerson. Emerson claimed to be interested in what he called “metaphysics of architecture” by which he meant an architecture that was a result of necessity, in contrast with architecture based on arbitrary and capricious choices.\(^6\)

---

His almost religious respect for nature comes through in his statements regarding function and form, where he states, “It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that life is recognizable in its expression, that form ever follows function. This is the law.”7 This poetic statement became the foundation for Sullivan’s organic take on functionalism, or functionalism based on the principles of nature. The premise is also closely connected with Darwinian thought proliferating around the same time.

Sullivan believed, “There is a function, a purpose for each building. There should be a definite relationship between the form, the development of each building, and the causes that bring it into that particular shape. A building must, first of all, clearly correspond with its function, must be its image.”

For example, he regarded ornament as essential to architecture, but stressed that the ornament must justify its existence by means of some tangible or practical function. It was not sufficient to try to merely delight the eye. It must articulate structure, symbolize or describe some function of the building, or serve some useful purpose. The poetic side of Sullivan’s seemingly rational theory is revealed through his use of ornament to satisfy or express some function of the building.

Sullivan established through his writings a strong argument for the basing form on function, an argument that would prove to be influential on architecture theory for the next several decades. He also acknowledged, however, the importance of the role of imagination in the process of bringing function into form. Acknowledging the imagination is synonymous with accepting a certain level of irrationality inherent in the creative process. This irrationality was precisely what Modernism was attempting to remove from architecture in its search for pure objectivity, led by the Neue Sachlichkeit movement.

---

The Search for Pure Objectivity

The rationality of 19th century philosophical thinking, supplemented by social change in Europe, led to a search for pure objectivity in architecture in the early 20th century. There was an attempt at removing the subjective artistic tendency from purpose-driven objects. In the 1908 essay Ornament and Crime, Adolf Loos made the claim that purposeful objects should be absolutely separated from aesthetically autonomous objects, and there should be no dialogue whatsoever between the two modes of man-made objects. In his mind, all purpose-driven arts, such as furniture design and architecture, should be purely functional, free from any aesthetic adornment that would eventually render the object “out of style.” The writings of Adolf Loos and his functionalist contemporaries had a profound impact on rational functionalist thinking for the next several decades.

Such strict rationalist thinking can also be found in the work of Hannes Meyer, who took over the Bauhaus in 1928 after Walter Gropius left. Meyer rejected the formalism and ‘false’ humanism of his predecessors, instead reducing architecture down to the equation “function x economics.” He proposed that design decisions be made around consistency, uniformity, or anything that allows structures to be built quicker and cheaper. By removing expressive qualities from form and material, these things can be determined by the only remaining physical influences, usually economical and structural in nature. Aesthetics then become somewhat
accidental, or the result of some predetermined aesthetic value system, which was often the case. Removing issues of experience from the design mentality means that the way in which the architecture is experienced becomes a sort of secondary consequence to the rational motives that drove the design. The result is architecture which satisfies its physical functions structurally and economically, but whose “accidental” aesthetics are able to “enrich the human spirit” through experience only by chance. Sigfried Giedion called this removing the “artistic function” from architecture. While these strict functionalists were claiming they had achieved pure objectivity, or a lack of style, they were essentially creating a new style, one that emphasized the rationality of structure, manufacturing, and construction procedures over issues of meaning and experience. Adorno provides a counter to Adolf Loos’s idea that functionalism should be an utter rejection of style, arguing that the complete rejection of style becomes a style in itself.10 Like many postmodern theorists, Adorno was questioning the legitimacy of a theoretical viewpoint that removed people’s psychological needs from the architectural equation.

Aalto’s Poetic Functionalism

Alvar Aalto expressed a similar dissatisfaction with the ways in which the rationality was being applied in Modernism. As he stated, “It is not the rationalization itself that was wrong in the first and now past period of Modernism. The wrongness lies in the fact that the rationalization has not gone deep enough.” He explains, “Technical functionalism is correct only if enlarged to cover even the psychological field. This is the only way to humanize architecture.” He did not arrive at this conclusion without first experimenting with strict functionalist ideas.

Figure 6: Alvar Aalto, Paimio Sanitorium, Paimio, Finland, 1929-33.
 Soon after his education Aalto became associated with the liberal ideals of the Modern movement that were sweeping across Europe in the 1920's, as can be seen in his earlier projects like the Paimio Sanatorium (Fig ?). Its rigid form, white walls, and hard edges echo the minimalism seen in the work of Adolf Loos or Le Corbusier from the same era. Aalto was also a friend to figures such as Walter Gropius, Lazlo Moholy-Nagy, Max Ernst, and Hans Arp, all of which proved to be a great intellectual influence on his early philosophy. His functionalist sentiment can be summed up in his 1928 statement, “The new architecture strives to assess the content of the work, on which its form depends, and to make it the only departure in creating forms.” He goes on to elaborate, “Instead of form-based design, which starts exclusively from forms and then attempts to serve the practical purposes to the extent permitted by this constraint, the functionalist method starts from real demands of life, and then creates forms to suit those needs.”

By looking at how Aalto’s work progressed over his career, it is easy to see how his opinions concerning rational functionalism had changed. Ten years after he had made the statements regarding a purely function-based method, Aalto had altered his viewpoint to conclude, “An object can be functional from one viewpoint and dysfunctional from another. Technical functionalism is correct only if enlarged to cover even the psychological field.” He gradually came to the conclusion that by limiting the level of human expression in search of a pure objectivity, designers were also removing much of the human aspect of experiencing architecture on a higher level than physical function. Aalto had arrived at the predicament of functionalism in the Modernist sense, where often a universal formal language was being applied to situations that were not at all universal, but were uniquely diverse and specific. In the process, they were also denying a response to the

---

Figure 7: Alvar Aalto, Seinajoki Town Hall, 1963. An example of Aalto’s divergence from Modernist ideals late in his career.

Aalto’s concept of function early in his career was limited to pragmatics of utility. He emphasized efficiency of circulation and the ordered repetition of programmatic spaces. His later work did not seem to be as concerned with conceptual or geometric purity or the organization of the design. His new interest was in the experiential and material encounter with the actual building.”  

Aalto grasped onto his functionalist roots, yet showed an interest in the phenomenological by including issues of perception in his definition of function.

---

12 Pallasmaa, Juhani. “Alvar Aalto: Towards a Synthetic Functionalism.” 1957. p. 31
Post-Modern Transitions

It has been common for functionalist theories to address the more tangible aspects of physical function, structure, and economy, ignoring the facets that contribute to intangibles such as psychological experience, emotional response, or a sense of space, things which are undeniably an important part of the experiential functioning of architecture. Sigfried Giedion, in his 1941 book *Space, Time, Architecture*, described this separation of the rational and poetic in architecture as a split between thinking and feeling, which originated in 19th century rationalism and permeated through to the Modernist tradition. He explains, “At the moment there is a schism, the inner kernel of personality is split by a difference of level between the methods of thinking and those of feeling.” He attributes this condition to the fact that in a rational, technologically minded world it is far easier to forward the most difficult of scientific theories than the simplest of new artistic means. 13

The difficult task of Post-Modernism became how to bring thinking and feeling, or the rational and poetic together again in architecture. Functionalism was more or less abandoned with the coming of Post-Modernism. Theory became focused on discussions of linguistics, semantics, and iconography, and the topic of function, which had become representative of everything that Post-Modernism was against, was no longer a primary theoretical concern. An exception would be Umberto Eco, an Italian semiotic theorist who approached the idea of function from a communicative viewpoint.

Umberto Eco discusses two distinct types of function, primary functions that are denotative, and secondary functions that are connotative. Primary functions, by his definition, are technical obligations that architecture must fulfill, and therefore are rational by nature of their tangibility. Secondary functions deal more with the semantic issues of architectural meaning, and so cross into the realm of the intangible. While this thesis does not attempt to make an argument based on semantics, what is important is that Eco is identifying an imperative level of irrationality in architecture. Where Eco seems to fail is in drawing a clear distinction between these two types of function. His delineation could lead to architecture that deals with function and expression in isolation, rather than integrally.

Recent progressions in design thinking have shown a renewed interest in the role of function in architecture. Technology has allowed vast new developments in design

methodology, resulting in new and innovative ways to bring function into built form as well as new definitions for the concept of function itself.
UN Studio’s: Inclusiveness

UN Studio, the office of Ben van Berkel and Caroline Bos, represents a renewed interest in the role of function in the design process. Utilizing technology and resources, their methods are able to effectively mediate rational data with the poetics of architectural imagination into an integrated formal, material, structural, and spatial gesture. They describe it as a marriage of utility on one side and philosophy on the other. Through the method they call inclusiveness, UN Studio ensures that the pragmatics of various functions are being satisfied by establishing a set of flexible, abstract relationships early on in the process. This rational set of data becomes the foundation for a diagramming phase that introduces conceptual and spatial ideas to the original data, resulting in expressive solutions that are deeply rooted in pragmatics of function.

Van Berkel’s philosophy embraces complexity, allowing form to “organically” develop into a harmony between the building, people, and the landscape. Their process begins with sets of data associated with the inner workings of the project, such as program, circulation, structure, and site. The multiple layers of information are organized and conceptualized, creating both analytical and conceptual diagrams that are still closely connected with the original input. The diagramming step is a way to deal with vast complexity while moving towards unity and cohesiveness in a solution. Various aspects such as circulation, structure, and spatial requirements can be synthesized into diagrams with material ideas and formal studies. Each additional phase of synthesis allows the abstract set of initial data relationships to become closer and closer to formalization.
Van Berkel stresses that their diagrams do not necessarily represent the formal language of the finished building, but instead help to visualize the complex invisible relationships between the various influences. The diagram is an “abstract machine” that is both content and expression. He explains, “It is not the material composition that matters, but the relational order between the components. The method of proportioning information and linking ideas is not connected to a particular geometry. So long as the relationships and linkages exist, the form can be twisted, stretched, deformed, and manipulated to create numerous different outputs.”¹⁴ (Figure 8)

---

¹⁴ Berkel, Ben van and Caroline Bos. MOVE. Amsterdam: UN Studio and Goose Press, 1999. Imagination, p. 224
When Bergson talked about intellect and intuition, he described their relationship as a “mutual dependency.” He also insisted that intuition must build upon a foundation of intellect, but is able to surpass it to achieve a higher level, a metaphysical level that is inherent in artistic creation. This point in architectural process is the point at which the analysis of the multitude of functional requirements has taken place, and artistic synthesis begins to take place. Adorno has asserted that the architectonic imagination is essential in the formalization of function, or purpose, into space. The difficulty is in defining how imagination is applied in the design process. The methodology used by UN Studio is able to synthesize technical properties of programmatic function, site circulation, and structure into expressive formal solutions through a refined use of diagrams. They have ruled out delineations between various types of functions by dealing with design as a set of complex influences that are layered and synthesized into an integrated solution.

Through the twentieth century we have seen drastic changes in the role of function in architecture. Beginning with Sullivan we saw an almost religious respect for the way in which form follows function in nature, an ancient idea tracing back to Aristotle. Through the first decades of the twentieth century in there was a distinct emphasis on the technical and structural side of function, often with very little consideration for site characteristics of experiential factors. Led by Adolf Loos, and carried on by figures like Le Corbusier, Alvar Aalto, and Hannes Meyer, to name a select few. Aalto and Corbusier to some extent came to reject the strict functionalist mentality for its inability to deal with humanistic needs. With the coming of Postmodernism, there was a general shift away from the idea of function in critical theory, with the exception of Umberto Eco, who focused on the architecture’s function to communicate meaning as a separate entity from traditional denotative function. Only recently has there been a renewed interest in function seen in theory. This new outlook on function is on one hand a contemporary advancement coming about as a result of new methods for dealing with data. On the other hand, it is a return to the sort of organic philosophy promoted by Sullivan. Just as in nature, form is the result of an infinitely complex set of influences that are tested and re-tested over the course of a process of much iteration, where the solution that best satisfies the functional criteria is the one that survives in the end.
2.3 The Influence of Place

“A sense of space is closely connected with purposes. Even when architecture attempts to elevate this realm beyond the sense of purposefulness, it is still simultaneously immanent in the purpose.” - Theodor Adorno

According to Christian Norberg-Shulz, “Functionalism in a narrow, modernist sense leads to alienation.” In other words, it exists within a place, but shows no identification with that specific place. It is essentially lost. Modernists would argue that because culture and society are experiencing a homogenization, architectural style should follow. However, one thing that will never lose its uniqueness is the specificity of place. In architecture, a universal solution cannot be applied to contextual scenarios that are by no means universal. Physical qualities such as climate or topography are unique to each and every specific place. Responding to the physical aspects of place does not mean replicating stylistic forms or details from existing surrounding buildings, however. Its means that like a living organism, a building exists within an environment, and it must interact with and respond to that environment in order to function effectively. First and foremost, a design response to the physical properties of a given locality ensures the building’s effective functioning within its environment. In this sense, physical functioning is associated with place.
Norberg Shulz would agree that place cannot be described or understood using only analytical concepts, and therefore should be dealt with architecturally in such a way that acknowledges this metaphysical quality of physical location. These qualities are less associated with the physical functioning of architecture than with its experiential functioning. This phenomenological view on place attempts to understand the physical qualities of place as more than mere physical things. It begins to speak of the way in which we experience space as a physical thing, revealing a more poetic conception of space beyond its physical properties.

Function and place are inextricably linked through the way a building interacts with its surrounding. Rationally, a building’s response to the physical influences of climate, topography, geography, or geology establishes a functional linkage with site. This linkage is based on the notion that a building cannot truly function effectively in a physical sense unless it takes into account its physical surroundings. If a building is distinguished from its context by the defining elements, walls, ceilings, and floors, then these defining elements become the point of transition between interior and exterior space. The function of this bounding envelope is not determined solely by what occurs on the interior, but rather the way in which it mediates between interior and exterior conditions. A window means nothing until it is oriented in space, located on a site, where it is then able to function in its context, capturing a view or bringing light into the building. Although the connection between building function and place goes far beyond more openings in a wall, they nevertheless provide a clear example of how function in architecture is connected with place.

Poetry in fact is able to concretize those totalities which elude science.
- Christian Norberg-Shulz

Although traditional functionalist thought does not usually emphasize experience as a major source of influence, it could be said that experience is also one of architecture’s inherent functions, albeit more poetic than rational. Architecture is linked with place through experience, which is a spatial and perceptual phenomenon. A human being who is occupying a space at the same time perceives their surroundings, and therefore is experiencing the place. The nature of their surroundings, the form and substance of the space defining elements, is what determines that experience. This is where the poetics of place begin to enter the picture. Juhani Pallasmaa explains, “The artistic dimension in a work of art does not lie in the actual physical thing; it exists only in the consciousness of the person experiencing it.”  

The poetics of architecture lie not in the building and its materials, or form and substance, but in the manner in which form and substance are experienced in the mind of the occupant. If it can be agreed upon that architecture is experienced physically and metaphysically through the perceptions of the occupant, then it should also be accepted that part of architect’s job is to determine the exact nature of that experience. This experience is not isolated to the interior of the building, but overlaps into the landscape. Our perception of architecture begins well before we enter the building, and arguably before we even see the building. The sequence of traveling to the site, the revealing of the building in its context, and the rest of the procession leading up to entry are equally important to what happens we experience once inside.

Tadao Ando’s Poetic Space

Tadao Ando often talks about the relationship between architecture, man, and the natural landscape when he describes his buildings. Kenneth Frampton has described Ando’s work as a marriage of the rationalism of Modernist form with the profound respect for nature and craft found in Japanese traditions. In Japanese view on man’s relationship with his environment, nature takes on both a tangible and intangible characteristic. The tangible would constitute the physical objects in the landscape, the predominately static features such as mountains and trees. The intangible encompasses everything else that is ephemeral, sunlight, wind, etc. Ando’s interest in craft comes through in the form of carefully detailed and constructed buildings consisting of basic materials like concrete and wood. These materials find their way into primitive geometric forms. The simplicity of form and material allows the ephemeral qualities of nature, the movement of the sun across the sky or a reflection off the surface of water, to expand and dematerialize the space. This is where the true poetics of Ando’s buildings can be found. Even greater is the way in which he uses these reflective moments to compliment the way in which the circulation through the building is experienced as a sequence.

Ando believes that the presence of architecture, regardless of its self-contained character, inevitably creates a new landscape, and this implies the necessity of discovering the architecture which the site itself is seeking.17 This engagement with and emphasis on the landscape, which is evident in all of Ando’s projects, is evidence of his respect for the tangible qualities of nature, namely the landscape and its pristine beauty.

The way in which a building a situated in its setting, the way it meets the ground and sky, can portray either a sense of isolation from the earth, or an intimate connection with the earth. Formal and spatial gestures begin to make implicit statements about man’s relationship with nature. At first this appears to be an idea reduced down to the physical characteristics of the relationship with site, but upon further examination of the way in which this is experienced goes beyond physicality. For example, when Ando buries a building underground, exposing only select spaces to the sky, he is physically engaging the building with the earth as a tangible element of nature. The subterranean elliptical courtyard of his Naoshima Contemporary Art Museum is a prime example.

When experiencing this space from within there is a metaphysical feeling of connection with the earth, determined by the sense of enclosure from all sides that opens to above. The subtleties of the sky are emphasized, and the feeling of being contained by the earth is enhanced. Treatment of the extreme edge of the opening with visible vegetation reinforces the subterranean effect by creating a visual/spatial relationship with the ground plane (Figure 10). Here, physical engagement with the landscape translates into a more poetic connection with the earth through the actual experiencing of the qualities of space.

Figure 9: A view of Ando's Naoshima Art Museum from above shows its physical incorporation into the topography.

Figure 10: View from inside the courtyard can only begin to convey the sense of enclosure created by the spatial configuration and detailing.
Extension and Accentuation of the Landscape

Alvar Aalto shared similar concerns for place and experience, especially in his later works. His architecture always emphasized the qualities of the landscape, creating an inextricable bond between building and site. His interest in preserving and at the same time constructing the landscape begins with a respect for existing topography. When preserving nature, he often emphasized existing convex and concave landforms, for example the hill and the “amphitheatre”, to create a resonance between the building’s form, the program, and the given landform. When preserving the landscape was not possible, he attempted to “recreate the perceptual feeling of the relationship between man and nature” on the interior and exterior of the building.18 These interior spatial moves begin to move outside the realm of physical response to place to a phenomenological realm, with an emphasis on experience. The effects of this are an experiential tie between the building and its place of existence, and are often so closely tied with the physical response to site and context that they are indiscernible. Spatial conditions from the surrounding were carried into the building. For example a grove of birch trees may find its way to the interior in the form of a collection of columns. The sequence of approaching an auditorium through the woods is extended into the interior lobby, thereby making a statement on the ceremonial process of traversing the forest and arriving at a clearing as a place of gathering (the auditorium itself).

2.4 Integration

After looking at issues of function, place, and experience as separate issues, the legitimacy of the concept of integration can be tested by examining built works by chosen architects that are able to achieve the goal of comprehensive design assimilation.

Alvar Aalto: Helsinki Technical University

[Aalto’s] architecture transforms program and site into direct and metaphorical continuities between landscape and construction.19 - Juhani Pallasmaa

Aalto’s auditorium at the Helsinki Technical University is a great example of how he diverged from International Modernism later in his career towards a more poetic architecture that is deeply rooted place, as well as function. Although he designed the entire wing of the campus complex, the main auditorium is without a doubt the focal point, denoting this gathering space as a place of importance. Aalto was a firm believer in the social power of gathering. His response to site begins with locating the auditorium on an already existing amphitheatre-like recession in the topography. A rational functionalist would probably force the auditorium space into a rectilinear box in order to achieve a uniformity of structure and volumes. Aalto chose to echo the concave shape of the interior auditorium seating through the exterior

form, a strategy for expressing interior programmatic functions through massing. He also calls upon a reference to the amphitheatre as an ancient typology that has changed very little over the course of history. A small stepped seating area at the center of the form again expresses interior function as well as reinforces the gesture of the gathering place as focal point. He used horizontal band windows to further connect to the interior seating. Responding to the Southwest exposure, these windows are detailed on the interior to light the space with a diffuse ambient light. Through this effective daylighting technique, he has responded to local environmental conditions and fulfilled the lighting requirements in a single move. The structure for the auditorium is a series of radiating concrete ribs that follow the gesture of the massing. HVAC diffusers are seamlessly integrated into these structural members.

Figure 11: The amphitheatre is placed on an existing recession in the site (left). Light diffusers echo the arrangement of the seating and respond functionally to the southwest exposure (right).

Figure 12: Structure both creates and expresses the interior space (left). An outdoor seating area and copper roof complete the expressive formal gesture (right).

Figure 13: The overall massing denotes the auditorium as a place of importance within the University complex.
In every case one must achieve a simultaneous solution of opposites. Nearly every design task involves tens, often hundreds, sometimes thousands of different contradictory elements, which are forced into a functional harmony only by man’s will. This harmony cannot be achieved by any other means than those of art. – Alvar Aalto²⁰

Through a cohesive formal, structural, and spatial gesture Aalto was able to integrate the physical functions of the auditorium and responses to light, topography, and context with expressive statements of function and the poetic gesture of the gathering place. The Helsinki Technical University auditorium shows how function and place can be rationally responded to and poetically expressed in an inclusive architectural solution, where function is fulfilled and artistically expressed simultaneously.

**Tadao Ando: Chichu Art Museum**

The most relevant aspect of the Chichu Art Museum is its connection with the earth. Beyond merely responding to the landscape, the building finds itself physically engaged with the landscape. The building is sited on a hill near a body of water (see Figure 20). The entire program is submerged under the surface of the hillside, with only minimal penetrations for the entry and light wells. The effects of this positioning go beyond the physical to the experiential qualities of the space. Because the spatial ordering of the building cannot be deciphered from the approach and entry, it leaves everything to be discovered through the experience from within. The program is formalized into a series of rectilinear voids inside the earth, situated just below the surface. This geometric ordering is hinted at through small protrusions of the concrete walls bounding the volumes, but becomes fully legible only when occupying the space.

Figure 16: The programmatic breakdown of the Chichu Art Museum is rigidly geometric. Major spaces and corridors are articulated as a collection of rectilinear voids in the earth.
Figure 17: The minimal treatment of surfaces in smooth concrete allows the subtle nuances of light and shadow to be perceived.

Figure 18: Interior, staircase in courtyard.

Figure 19: Ando’s sketch showing volumetric voids in the earth.
There lies an implicit statement in the way in which a building meets the ground. Villa Savoye seems to be implying a separation, or even dominance over nature by raising the volume of the building above the ground plane. The void of space under the building mass creates a physical and literal detachment from the earth. In stark contrast to this tactic, Ando’s Chichu Art Museum portrays a sense of submission to nature by its physical engagement with the earth, blurring boundaries between architecture and landscape. The two designs share similarities in their minimalist treatments and geometric forms, however their physical proximity and interaction with the landscape make two very different statements on the relationship between man and nature.

In addition to the experiential ramifications, the engagement of the program with the earth provides the obvious functional benefits associated with earth sheltering. The temperature and humidity within the space is mediated by the nearly constant temperature of the surrounding soil. Although beneficial to almost every building type, this energy-efficient strategy will becomes crucial when responding the climatic requirements in the winery.

Figure 20: Both geometrically formed and relatively minimal in their expression, Le Corbusier’s Villa Savoye (top) and Tadao Ando’s Chichu Art Museum (bottom) represent polar opposites in their juxtaposition of building and landscape.
**UN Studio: Mobius House**

Although UN Studio typically applies their function-based strategies to large, complex structures such as transportation hubs and museums where circulation and organization take on crucial functional roles, a small residential project with a simple program, such as their Mobius House should allow for clearer insight into the execution of their “inclusive” methodology. The design began with an analysis of the how time is spent in the dwelling for two occupants, looking at the “infinite trajectories of time and movement.”

From this analysis came a set of relationships for the house’s circulation and proximity of spaces. Sequences of diagrams were created which encompass these various aspects of time, movement, and spatial organization.

The Mobius analogy not only incorporates an aspect related to the conceptual continuity of time in the home, but it also addresses the physical organization of circulation and space use, which was inherent in the house’s program. Stemming from the program of the house was the notion that the two occupants diverge to the sleeping areas for privacy at night, and re-converge in the central living and working space during the day, repeating this circulation infinitely over time.

---

21 Berkel, Ben van and Caroline Bos. MOVE. Amsterdam: UN Studio and Goose Press, 1999. Techniques, p. 49

---

The Mobius becomes a way to metaphorically represent the cyclical nature of the house’s program, while the convergence in the center of the strip represents the more public shared spaces in the house.

---

Figure 21: The diagramming process begins with an analysis of the utilization of space over the course of the day.
Ben van Berkel also stresses the relationship of building to site in the design, linking the program-driven diagram to the physicality of the place. He maintains that this move “transforms living in the house into a walk in the landscape.”  

By superimposing the Mobius concept on the site, stretching it out to create a physical separation between wings, the design was able to visually expose more of the deep inner space of the public realm to the exterior. This reveals another level to the Mobius analogy, its blurring of inner and outer surface, which can be seen in the Mobius strip in its merging of inner and outer faces. The twisting gesture creates infinite continuity in a single-sided surface, implying a blurring of what can be defined as inside or outside space. This concept materializes in the design through significant visual connection with the site.

Finally, the nature of the Mobius suggests a construction type that can achieve a column-free surface. Thus, the diagram is transposed into form using concrete as the continuous structural surface, and glass to fill the void in the concrete shell and maintain transparency to the exterior.

---

22 Berkel, Ben van and Caroline Bos. MOVE. Amsterdam: UN Studio and Goose Press, 1999. Techniques, p. 43
It is important to note that the resulting form for the Mobius House in no way reflects the formal language of the diagram itself, but the underlying physical and conceptual ideas of circulation, divergence and convergence, and blurring of interior and exterior are all clearly evident in the solution. Furthermore, the concept of the Mobius was not inherent in the program of the house, but its relationships began to spatially address the functions of the house, serving as mediator between function and form. The concept was applied both physically and metaphorically. The resulting building fulfills the functional relationships and poetically expresses this relationship in one “inclusive” gesture. UN Studio’s explicit process of diagramming begins to display how the mediation of the rational and the poetic takes place in design process.

Figure 24: Mobius House, exterior view of south face.

Figure 25: Mobius House, ground floor (top), second floor (middle), and roof plan (bottom)
By starting with criteria based on the physical functioning of the building and its various systems, they are intimately linking their design ideas with physical functions derived from program and site, making it essentially a function-based approach. Unlike the rational functionalism of architects such as Adolf Loos or Hannes Meyer, aesthetics are not merely determined by pragmatics of economy and efficiency, but instead begin to come about as additional layers of influence, both technical and conceptual, are integrated into the comprehensive diagrams. Possible formal solutions are continually evaluated in terms of aesthetics, as well as their relation to the inclusive diagram. Diagrammatic concepts that are not inherent in the functions of the building but are nonetheless derived from that function, as in the case of the Mobius strip diagram, represent an integration of the rational qualities of function with the poetics of the architect’s imagination in actual process. Such a method provides solutions that go beyond satisfying utility to a point where program, circulation, structure, material, site, and experience are all integrated into “one comprehensive gesture incorporating difference.”
Herzog and De Meuron: Dominus Estate Winery

This final precedent provides a clear example of integration. It bears importance not only because of its response to site, function, and experience, but also because it deals specifically with key ideas associated with the chosen typology for this thesis, the winery.

Dominus is located on the West side of Napa Valley at the base of the Mayacamas Mountains. Unlike many other Napa Wineries, Dominus had an established customer base, and was built with the intent of being closed to the public, relieving the building of its duty as a winery tourist magnet. There was an obvious attempt at simplifying the building’s presence on the site, a clear opposition to the “curb appeal” strategy of the average Napa winery. The grayish-green color of the basaltic rock used in the façade subtly contrasts the color of the vines, blurring it with the surrounding landscape. The building seems to become a simple horizontal line, only slightly more structured and precise than the lines formed by the rows of grapevines, further enforcing its integration into the vineyard.

Figure 26: View towards north portal from entry drive.

The structure itself is very much a rationalist creation, echoing the influence of Aldo Rossi on Herzog and de Meuron in their education years. The bold, monolithic volume, punctured only by two portals, is a minimalist assemblage of the required programmatic spaces. Its linear form begins to speak of the linearity of the winemaking process. The building is divided into three functional units: the tank room with huge chrome tanks for the first stage of fermentation, the Barrique cellar where the wine matures in oak vats for two years, and the storeroom where the wine is bottled, packed in wooden cases, and stored until it is sold. The north end contains the cask room on ground level and administrative offices above. The remainder of the large spaces, including the tank room,
bottling facility, and electrical plant, occupy the full height of the two-story form. The two penetrations, or portals through the linear form, express the three basic programmatic units. The huge openings, scaled to the expansive size of the property, mark the points of access to the building from a distance. The north portal, which aligns with the East-West access road from the highway, provides entry access to each of the more public areas, including the tasting room, adjacent cask cellar, and offices.

Figure 27: Glass enclosed administrative offices (left) and interior view of steel fermentation tanks (right).

The masonry is in a sense treated much more like an applied surface than a traditional loadbearing masonry wall, in that prepackaged modular units of stone contained within wire baskets, called gabions, can be placed into a concrete structure. The density of the stone infill can be altered according to the functional and aesthetic conditions apparent at that specific moment in the building. The system itself is modular and repetitious, but its richness comes from the complex pattern of intricacy created by the voids between the roughly mined stones contained within the gabions. The wall is so dematerialized beyond its massive presence that it appears to be made of filigree.

Figure 28: Stone gabions from exterior (left) and close-up from interior (right).
Very few orthographic drawings can be found in reference to Herzog and De Meuron’s work. It is not that they avoid publishing information about their projects, as they hold many exhibitions. For these two, architecture is about the human experiencing the work as a physical, material manifestation. They intentionally withhold two-dimensional representations of their work as much as possible, claiming, “The force of our buildings lies in their immediate, visceral impact on the visitor”. Graphic representations compromise our understanding of the poetics of the work.

The intricate pattern of light and shadow created by the sun penetrating the stone filter in Dominus is something that can never be described through drawings, or even understood through photographs. While the wall system provides thermal mass, buffering the winemaking process from the hot California sun, it simultaneously achieves an experiential functioning through its interplay of light and view. Considering the additional effect the skin has on merging the building’s profile with its surrounding, Dominus can be said to represent an example of the integration of function, place, and experience through a single material solution.

**Integrations: Conclusion**

The precedents examined here serve as only a few examples of the condensing of multiple layers of influence into integrated architectural solutions. Such a solution can be arrived at only after a thorough analysis of the complexities of the project. The multitude of factors that impact the project from inside as well as from outside, from small scale to large, must be identified, isolated, and then assimilated into a singular solution. As stated by Alvar Aalto, this cannot be achieved by any means other than art.
Chapter 3: The ART and SCIENCE of WINEMAKING

3.1 Terroir: Distinctive Characteristics of Place

The character of a wine made from a single identifiable patch of ground reflects not only what we can see and feel right now, but also the deep history of the place, the dynamic mix of forces and events that form its geologic and geographic heritage. All of these forces, sun, topography, bedrock, sediments and soils, temperatures, and rainfall combine to create the French notion of terroir. Terroir has recently become an important focus for winemakers around the world, although the French have based their winemaking philosophy on this premise for centuries. The most important concept of terroir is distinctiveness, or the idea that any given plot of land will produce grapes of a truly unique character.

The physical side of terroir, the elements of sun, rain, soil, etc. can be evaluated fairly objectively (although the exact way in which they affect wine is only beginning to be discovered). There is a set of generally accepted principles concerning the ways in which site characteristics affect wine. Sun ripens grapes, assuring the development of enough sugar to produce sufficient alcohol. Too much sun can lead to intense, often exaggerated characteristics such as excessive fruit flavors and high alcohol. Soil brings forward earthy, mineral qualities, and can produce excessive tannins. Soil that is too nutrient rich can produce too many stalks and leaves, leading to less than ideal ripening of the fruit. Fertile soil also leads to grapes with prominent vegetative, or herbal characteristics. Water in high concentrations can literally “water log” the grapes, lowering sugar content to inadequate levels to produce enough alcohol, and can lead to vigorous plants that produce fruit with herbaceous and vegetative notes. Moist air cushions the vines from excessive heat in the day and insulates against cold night temperatures, buffering the temperature differential and balancing sugar levels. Hot winds dehydrate grapes, leading to highly concentrated sweetness and tannins, lacking the acidity to balance it out.
Without the winemaker there is of course no wine and therefore no notion of terroir. The complex physical characteristics are countered by the endeavors of the winemaker, which Howell and Swinchatt refer to as The Winemaker’s Dance. This human side of winemaking includes viticultural practices, selection of the variety, rootstock, growing and harvesting techniques, the design of the winery process and selection of equipment, and the execution of the winemaking process itself. The job of the winemaker is that of the artists and scientist. Although measuring sugar and acid levels in the grapes and taking temperature and precipitation measurements inform the winemaker scientifically, nothing can match the intuitive instinct of walking through the vines, touching the grapes, chewing the skins, tasting the juice, and crunching the seeds. Most good winemakers rely on their instinct as much as the concrete numbers. They must constantly adjust their process and vision in response to the given circumstances in order to create a balanced wine in the end.

The subjectivity in the art of winemaking makes it difficult to discern how well the local terroir has been expressed through the wine. Because of this, there is an ongoing debate in winemaking over to what degree the winemakers intervene on the natural process that is occurring. If terroir is going to be truly expressed, then the winemaker has to “more or less let the wine make itself.” Only then can the unique characters be traced back to the specific vineyard and vintage. It is becoming more common as a goal to produce a wine that displays as little intervention by the winemaker as possible, thereby accurately expressing terroir. Swinchatt and Howell explain, “The new fundamental goal of the winemaker is to preserve the inherent quality and character of the fruit while trying to extract its full potential. The intent is to produce a wine of great balance, in which no single element overpowers the others.”

The question becomes to what extent does the winemaker control the natural processes, while still letting them occur as naturally as possible? There is certainly no lack of human intervention. From the practice of choosing grape varieties and rootstock and maintaining fields of vines to the careful tasting of grapes to make sure they are peak ripeness, there is plenty of human participation before the grapes even enter the winery. Once inside, the entire winery is essentially a system created by the winemaker in an attempt at creating the perfect conditions for fermentation and maturation.

---

In essence, the goal of the Napa winemaker has generally shifted from attempting to mold Napa Valley grapes into traditional European style wines, to a slightly more passive approach, which strives to emphasize the subtleties contributed by the nuances of the locale. The resulting wines should still be balanced, but the idea is that capturing the subtleties of terroir should in theory lead to more unique wines that are expressive of their origins, rather than predictable wines that developed out of the winemaker's search for a predetermined “style” of wine.
Some winemakers say that a grape is simply a tool for extracting flavors from the Earth. Essentially, the wine created from that grape is a reflection of place, the resultant of a linear process connecting humans back to the parcel of earth on which the vine took root. Assume for a moment that qualities and characteristics in grapes do in fact reflect the place from which they came from, and that wines in tum reflect these properties as well. Although our senses may not be experienced or sensitive enough to taste them, qualities of soil and climate subtly affect the finished wine.

Howell explains, “Starting with a vision, the winemakers activate the links that connect the Earth with vine and fruit, guide the transformation from fruit into wine, oversee its maturation, and only then present the liquid that completes the circle, connecting us with the Earth from which it arose.”

There is something poetic about the notion that by drinking a glass of wine we are somehow connecting back with a specific place on earth. With this thought in mind, it is logical to conclude that a winery that focuses on the process of wine, should embrace this intimate connection with site.

---

Figure 29: Human connection to the earth and other natural elements that define the concept of terroir.
3.2 The Napa Valley

Figure 30: View from the center of the valley to the East, towards to the Vaca Mountain range.

Napa Valley is a truly unique viticultural region, most of which is due to the geological circumstances that formed its very existence. Because of its proximity to two fault lines and a chain of volcanic hotspots, the valley has experienced a violent and complex geological history. The West side contains mostly marine sedimentary and metamorphic rocks, while larger quantities of lava flows and other eruptive products can be found on the east. The mountain soils are typically coarse, rocky, and well draining. On the edges of the valley, just inside the mountains, are alluvial deposits, caused by the breakdown and erosion of the mountains into the valley basin. As a result, these alluvial soils are a more homogenous mixture of a finer texture. In the very middle of the valley, along the Napa River, are mixed sediments- fluvial deposits - derived from both sides of the valley. These soils consist of even finer sedimentary particles, their dense structure and poor drainage often making them undesirable for grape growing. The numerous alluvial deposits in the Napa Valley are the most desirable soils for vines due to their balanced mixture of rocky aggregates and fine particulate matter.
This large-scale geological sequence is contained within a valley measuring only four miles across at its broadest point, creating a wide variety of soils in an area one-sixth the size of Burgundy. Furthermore, the valley is oriented north-south, with its south end open to cool San Francisco Bay air and its north end hot and dry, which makes for an equally wide variety of microclimates. This diversity in soil types as well as growing conditions helps to explain why many winemakers have shifted their focus toward emphasizing the qualities of a specific plot of land; each acre has its own unique characteristics that can contribute to the distinctiveness of the wine. In the 70’s, the standard practice was to ship grapes in from all over the valley, in order to try and get the “best” grapes available. The result was a homogenization of wine characteristics, and a total loss of the potential for truly unique wines that express their specific place or origin.

Advancements in viticultural techniques have allowed premium quality grapes to be produced in almost every spot in the valley, opening up the possibility for experimentation in expressing the terroir of Napa’s many unique viticultural regions.

Figure 32: Aerial view of Napa County showing the valley region outlined in yellow.
Stag’s Leap District

Although every spot in the valley can produce quality grapes, most areas are particularly suited for specific varieties. For example, the low-lying southern region with its exposure to cool breezes is excellent for growing Pinot Noir and Chardonnay, both of which need cool temperatures to develop high acidity and fruity characteristics. The sunny slopes further in the Northern section of the valley are baked by the hot California sun, creating the perfect conditions for building the intense structure and strong tannins. The Stag’s Leap district is world-renowned partially because it possesses both of these characteristics, sunny afternoons accompanied by moist, cooling breezes. It is here that some of the most distinct and refined Cabernet Sauvignon grapes in the world are grown, known for developing extraordinary balance and complexity.

Pine Ridge Acreage

The Pine Ridge site is located directly across the highway from Stag’s Leap Winery, that winemaker that beat out French Cabernet Sauvignon in a 1976 blind tasting, officially putting Napa Valley on the same level as France. It is truly one of the greatest regions in the world for producing distinct Cabernet. This specific site was chosen for its unique topography. The Pine Ridge property is located in a secluded micro-valley, part of a large geological “mega-slide” that originated in the larger Vaca Mountains to the East.

Figure 33: Aerial views of the Pine Ridge site.
Chapter 4: APPLIED INTERPRETATIONS of WINEMAKING

4.1 Issues of Winemaking and Place

The relationship with site will affect this thesis design technically and experientially.

The design methodology for this thesis finds its roots in the functions of the winemaking process itself, which extend outside the facility into the surrounding vineyards. Many of the technical large-scale technical requirements for growing, harvesting, collecting, and distributing the grapes to the winery facility will have a major impact on the overall organization of the site plan and the building. Harvesting hierarchies can be analyzed for their effectiveness in transporting the picked grapes to the crushing pad as quickly and efficiently as possible. Access routes and loading docks for semi-trucks will also be a major influence. These crucial technical needs must be addressed with

Response to environmental factors is a well-proven strategy for grounding architecture in its surroundings. Key winemaking areas should be sheltered from the hot California summer sun, while daylight can be carefully introduced into public spaces as necessary. The use of sunlight can easily become an important part of the poetics of the winery experience, relating to the ephemeral qualities of nature that Tadao Ando describes as being essential to his spaces.

Tadao Ando was able to achieve an intimate engagement with site in his Chichu Art Museum by physically submerging a majority of the building underground. This strategy could prove beneficial to this thesis on a technical and conceptual level. The large part of the winemaking process wants to take place underground where the temperature and humidity are nearly constant at around 55 degrees and 50 percent, respectively. This provides the ideal temperatures for fermentation, which would naturally occur on the ground, as well as provides ample moisture to keep oak barrels moist to avoid cracking or leakage. Where it may not be practical to submerge the vast square footages of the winery entirely underground, a similar effect can be achieved by excavating halfway and then backfilling around the
perimeter. Green roofs can provide the necessary temperature buffer needed on the tops of certain winery spaces. The winemaking process can still appear to make its descent into the earth for the barrel cellar, and then re-emerging at the other end. Because exposing visitors to the process is a primary objective, the path of the public should follow this sequence of descent and ascent. This physical connection with the earth can then literally begin to speak of the connection with site encompassed in the notion of terroir.

On a more poetic experiential side, the public space should be dealt with in such a way that emphasizes its subterranean journey, in many ways similar to the Chichu Art Museum’s spatial sequence.

Another major strategy for experientially connecting with site would be visual, by exposing the landscape through carefully considered views. Part of the process used by UN Studio in their Mobius House design consisted of first looking at the inner functions of the house, and then giving this abstract set of relationships a spatial orientation by superimposing it onto the site, taking into consideration key views of the surrounding woods. This thesis will mimic this methodology by first looking at the winemaking process in isolation, then eventually placing it onto the site thereby linking it with its external influences such as views, circulation accesses, and environmental factors.
4.1 Complexities of Process

In many ways wine is the result of process. Process in this case a series of actions or functions bringing about change through the passage of time. Processes can be segmented or continuous. For example, an automobile assembly line would be segmented, based on the incremental addition of individual pieces to the car. On the other hand, the process of tree growth could be considered continuous since it is virtually impossible to identify any distinct divisions or phases. The winemaking process is both segmented and continuous. While the human-created wine production process is broken into separate segments of crushing, fermentation, pressing, barrel cellaring, bottling, and aging, the wine traveling through this segmented process is undergoing a continual metamorphosis, although often on a scale too small to be perceived. The distinction between these two opposing types of processes will prove important later when articulating the functions of the winery.

Satisfying the winery’s complex technical needs is a given. Allowing the public to walk away with a greater understanding of the nature of the process, exposing them to the subtle nuances of the facility’s inner workings, and generally creating an experience that is as close to the true essence of winemaking as one could get is a much more daunting task. The only way is to delve into the complex system of processes that when all is said and done will converge on a single glass of wine in the hand. Naturally, the clearest way to attempt to reveal this complexity is to start with that single glass of wine and begin to trace it back through its history as far as is physically and conceptually possible.
The metamorphosis of fermentation and the following period of bottle aging, are distinct parts of the human-created process of winemaking that attempts to manipulate the naturally occurring process of grape decomposition by extending its timeframe. The breakdown of the grape contents into alcohol and eventually vinegar would naturally occur over the course of several hours. Through careful control of the fermentation conditions, this process can be expanded into several months, or even years of gradual, relatively controlled change. Tasting a sample of wine at any given point of this process of transformation is the equivalent of experiencing an event through a photograph: the photograph represents only an infinitely small sliver of time with respect to the duration of the entire event. This exposes a common difficulty in the representation of real-time events through static media: how can something that is continually changing over time begin to be perceived by means of a form of representation which itself cannot change? Such is the problem when attempting to capture the dynamics of the winemaking process through a static medium such as architecture. There are strategies for beginning to address this issue, however, first and foremost a thorough understanding of the process is required to begin identifying methods for conveying that process.

To begin analyzing the complex world of wine as a both a process in itself, as well as the result of many additional processes, it is easiest to begin with the end of the wine’s life, the moment when it is consumed.
Figure 35: Programmatic layout of key spaces in winemaking process, showing their linear organization.

*Based on the 50,000 case production program for the Cloe Fogasa Winery
Moving back in time beyond the winery itself to the vineyard, we find the development of the fruit on the vine, which for the sake of distinction are broken into separate segments of dormancy, budding, blooming, and veraison, or the period when the clusters of immature green nubs transform into bunches of deep-colored fruit. These stages form the cyclical process of the annual growing season of the vine. Extending further, the aging and maturation of the vines themselves can be identified as a cycle in itself, where full capacities of top quality grapes only occur after five to seven years of training and pruning, and after approximately thirty years the vine is in its last stages, producing smaller quantities of highly concentrated fruit. Within the vine we can identify several continuous processes occurring, one of which is the transformation of water, nutrients from the soil, carbon dioxide from the air, and sunlight into usable energy for the plant. Sun, water, air, and soil represent the major constituents being channeled into the grape through the grapevine. They also become the primary determining factors of grape characteristics. Sunlight and weather include several time-based processes that affect the vine primarily through their immediate temporal impact on the scale of the day, month, or year, exhibiting both linear and cyclical qualities. Changes in sun and weather can be easily perceived, so their influence on the grape can be easily measured. The effects of sun exposure, water, and air on the vine and fruit are relatively well understood by winemakers. When you begin to talk about soil, however, you open up an area that viticulturists and geologists have only begun to explore. The influence of soil is much more subtle, yet vastly complex. An exploration of soil reveals a set of processes occurring on a much larger temporal scale, sometime thousands or even millions of years ago. These changes are nearly impossible to perceive, but are equally important in contributing to the characteristics of the wine. Geological changes occurring thousands of years ago are directly affecting the vines and grapes planted today by determining soil structure, stratification, and topography. Minerals and organic matter are constantly decomposing, transforming, recomposing, morphing, and restructuring. These often imperceptibly slow processes are responsible for creating the characteristics of any given site, on every scale imaginable. The subtle nuances of soils and topography directly affect grape, and consequently wine attributes. One geologist put it into perspective by claiming, “What you are tasting in a bottle of wine is a hundred million years of geological history.” (Swinchatt, 5)

Wine itself is in a continuous state of flux, and is alternately influenced by the vast array of continually
changing processes that contributed to the grape. Time and process, therefore, hold an important place in the deeper of wine. Understanding the complex set of processes would lead to a deeper understanding of the intricate complexities of wine itself. One method of achieving this deeper meaning behind wine could be to address the importance of time and process through the winery architecture. To attempt to transfer these ideas of temporality and process into architectural form would suggest first looking at the various methods by which time and process are dealt with in other static media.

The photograph is representative of the static. Unlike painting or sculpture, which although usually inanimate, require a certain frame of time to compose or construct, the photograph on the other hand is representative of a true split second of time. To capture a large scale temporal sequence through a medium as anti-temporal as the photograph would be an extreme example of the compression of time.

Serialization stands as the most critical in its relationship to temporality. Through the repetition of a motif, operation, or system – by working to expose durational shifts in an object or process over time – serialization may be the motor of Conceptual Art.

“In documenting gestures and processes, the photograph allows the artist to eliminate the problem of duration, either by isolating a specific moment, or by presenting a linear sequence without having to endure the possible monotony of film or video.” 25 The absence of a sense of scale associated with time is often addressed through notations as to how long the process took, the distance covered, the size of intervals, number of occurrences.

Collections or sequences of images can offer a sort of conceptual complexity that can rarely be achieved through a single image. The viewer, through gathering a number of images and understanding their relationships, can begin to piece together the actual temporal process. This mentality can be transferred to a strategy for expressing the dynamics of wine itself through fragmented images of the winemaking process.

Starting at the end of the sequence with the finished wine, the visitor travels back through the spatial and temporal path that the wine has traveled. Snapshot images of the process are exposed along the way. This continues

underground through the barrel cellar, past the fermentation room and crushing pad, until the person reaches an intermediate goal, the end of the physical process of winemaking, in the vineyard itself, in intimate contact with the grapevine.

Beyond the winemaking process itself are all of the natural processes that affect the grapevine. Many of them occur on a geological scale of time. This notion of geological time echoes the stratification of time described by French historian Fernand Braudel as coexisting in the present. Braudel identified three distinct temporal modes: the time of the individual, or “biological” time, the “social” time of human cultures, their mental structures, beliefs, and customs, and finally a much slower time of environmental, climactic, and demographic change. Smithson’s conception of “geologic” time can be identified with this final temporal mode, although he transcends it by including larger scale cataclysmic events that predate human existence. The scale of time that encompasses the geological influence on wine is much different than the scale of time within the winery, making it even more difficult to capture and portray through static means.

This geological scale of time is portrayed through a revealing of the landscape on the visitor’s return journey. Images of the vineyards are revealed along the sequence, which culminated with a view of the Vaca Mountains off in the distance, they very mountain range where the soil deposits of the Pine Ridge site originated (see Figure 36).

Figure 36: A closeup of the surrounding vineyard juxtaposed with a view of the Vaca Mountains of Stag’s Leap off in the distance.
Figure 37: Analytical Diagrams of winery activity (top) juxtaposed with a graph of change in wine properties. Note the correlation between layers of information.

Figure 37: Technical requirements of winemaking process are synthesized with analytical diagrams (above) and site features to generate a composite building section.
Figure 38: Drainage and site circulation analysis (left) followed by a circulation and view study based on visitor experience (right).
Figure 39: Roof surface studies (left) and initial bearing wall / structure layout
Figure 40: Detail rendering of stacked precast concrete wall system.
SUMMARY

This thesis began not as an architectural problem, but as a response to a typological problem with the winery as a building type. The exploration into wine and winemaking revealed a vast, complex set of ideas that all seemed individually to be rich with possibilities. From the historical origins associated with ancient civilizations and geological transformations, to the current technological advancements and proliferation of tourism, almost any area of study could somehow be connected back to wine somehow. Rather than singling out a specific topic and ignoring the multitude of other factors, I chose to accept this complexity as an inherent level of complexity present in almost every architectural scenario. Hence, the thesis study became not about portraying a single idea as simply and clearly as possible, but instead attempting to tame this complexity and find a single solution that dealt with it effectively. The task proved to be as difficult as it sounds.

For the sake of organizing information, the various functions of the winery were broken down into three main categories, process, place, and experience. The winemaking process was dealt with by first identifying the technical requirements for the facility itself, and then analyzing and diagramming other types of information inherent in the process, such as activity levels in spaces and temporal aspects. The site was dealt with in a similar manner, starting with the technical requirements for drainage and site circulation, and then looking at key views, implied nodes and axes, and important topographical features to be highlighted. The visitor’s experience became the thread that tied all of this together. Every move can be traced back to allowing the visitors to observe the process and its connection with the chosen site.

Attempting to integrate these complex layers of information into the architecture was a daunting, but nonetheless worthwhile exercise in dealing with large amounts of information. The overall mentality associated with this approach seemed to be aligned with Dutch “organic” theories on architecture, where like an organism, the design that survives is the solution that deals most efficiently with the multitude of influential factors affecting it, both from the outside and from within. The theory seems to be logical except for one crucial exception: organisms don’t take into account aesthetics because they aren’t a product of the human mind. Architecture, however, is.
APPENDIX

A. HISTORY OF WINEMAKING & NAPA VALLEY

1. Ancient Origins of Wine

Grape seeds have been found in the ancient cave dwellings of the early humans. This is evidence that the grape was probably a source of nutrition long before it was known to ferment. Winemaking began soon after grape growing became established with origins of Western agriculture. It started in the Fertile Crescent, between the Nile River and the Persian Gulf (3000-4000 B.C.) [26]. These primitive cultures probably discovered wine by accident when grapes that were cracked open slowly began to taste more pungent and acidic. It was presumably a relatively easy discovery, as this is a natural occurrence in grapes anyways.

The Egyptians grew grapes in the Nile Delta, maintaining prized vineyards there. They quickly learned that breaking open the skins and releasing the sweet juice inside initiated the process of turning fruit into the liquid they considered to be a gift from the god Osiris. Since the entire process was entirely natural, it was easy for them to achieve relatively consistent results. The wine they made was a sweet white wine from grapes native to the Nile Delta. They eventually fermented in wooden vats, similar to the ones still used traditional European processes today. Wine was of great value to the people of the Nile, eventually becoming part of their sacred funeral rites.

The Persians, located at the other end of the Fertile Crescent near the Tigris and Euphrates Rivers, began established grape growing around this same time, 3000 B.C. They produced wine from grapes originating in the Caucus foothills to the North. Like the Egyptians, they considered wine to be a gift from the gods, and rightfully so. The grape variety found in the region at that time is a precursor to the vitis vinifera species grown all over the world today.

The Phoenicians, who set sail into the Mediterranean from present-day Syria, traveled to Greece, Sicily, and N. Central Italy, where they spread their knowledge of grape growing. The Etruscans in North Italy began what will become a long tradition of producing fine wines in the region now known as Tuscany. Eventually, under the rule of the Roman Empire, wine will find its way into most of Western Europe.

When the Greek civilization expanded to the many islands of the Aegean and Mediterranean, they found grapes there already, planted by the Phoenicians hundreds of years

---

earlier. Wine came to be an important part of Greek culture and spirituality. Their high regard for wine was represented by Dionysus, Greek God of fruitfulness, fertility, and ecstasy. Each year they would hold the Feast of Dionysia, a celebration of the harvesting of the gift from Dionysus. These wines were very different from most wines we know today. Herbs and seawater were often added as flavorings. Retsina, the wine of Greek Gods, is an example of a traditionally styled Greek wine that still exists today. Much of its unique character comes from the need to condition the wine to prevent spoilage. As a means of storage and preservation, the wine was stored in clay vessels lined with pine pitch, which imparted a pungent pine resin aroma to the wine. It was also not uncommon for the liquid to be smoked or boiled down to preserve it. As preservation techniques surpassed this method, pine pitch and smoke became solely flavor additives, in honor of the long tradition of Greek winemaking.

2. European Domination and Influence

The true explosion of wine in the Mediterranean region, and ultimately into most of Europe came as a result of the far-reaching Roman Empire. The Romans found grapes already under cultivation by the earlier Phoenicians and Greeks. They quickly abandoned the rustic Greek style in favor of a more balanced and refined form of pure grape wine. The Romans developed sophisticated cultivating and processing techniques that would be unsurpassed until the eighteenth century. In A.D. 92 Emperor Domitian ordered that the established vineyards of France be uprooted. The order was not fully realized, and by the time the Roman Empire fell in A.D. 476, most of France, Germany, and Italy was sprinkled with fine grape vines.

At the same time as the art of winemaking was becoming refined in Western Europe, the wine culture in the Middle East was diminishing due to the rise of Islam. In 634 the prophet Mohammed conquered the Meccans in the first jihad. The Islamic code of law forbade the consumption of alcohol in any form, and all wine production eventually ceased in this region.

The Romans taught their advanced cultivation techniques to the native Gauls of France. Monastic monks owned considerable quantities of grapevines throughout France and Germany by around A.D. 1000. Around this same time period Christian soldiers were bringing new grape varieties back from the Holy Land, adding to their list of Vitis Vinifera strains to choose from. The monks' meticulous recording of rainfall, crop yields, and grape species led to better understanding of how specific varieties respond to climatic conditions.
conditions. This body of knowledge eventually contributed to the high quality of wines produced by these bordering countries. Bordeaux and Burgundy started to gain widespread demand across Europe, with England’s taste for the exotics of France leading the way. By 1350 the city of Bordeaux was shipping out over a million cases of wine per year.\textsuperscript{27} Wine production in France thrived until the French Revolution, when vineyards were seized from the churches and distributed to the people, losing much of their tradition and therefore reputation in the meantime. To make matters worse, American grape varieties being tested in France introduced a plague of disease called phylloxera during the mid 1800’s. The organism attacks and destroys the roots of the grapevines. Before anyone knew what was causing the blight, this tiny louse had devastated over ninety percent of the vineyards in France, forcing French winemakers to migrate into other regions, including Spain and Italy. France eventually recovered by grafting French vines onto the rootstocks of native American grape varieties, which were resistant to the disease.

3. Transporting the Art of Wine to the New Land


European exploration spread the art and knowledge of winemaking, as well as the tested European varieties of grapes, to most acceptable temperate climates among the Spanish, French, and British settlements. In the early seventeenth century, settlers brought European vines to the eastern United States, only to see them fail due to the harsh winters and unfamiliar pests (May, 9). The settlers had previously attempted to make wines from the grapes they found growing natively in the United States, achieving poor results due to the very different properties of these new grapes. Unbeknownst to the Easterners, Spanish settlers had great success cultivating European grape varieties in the coastal lands north of Mexico.

Hybrid grapes varieties, such as Catawba and Concord, were created using the native American varieties. They proved to grow considerably well near the Great Lakes in Ohio and New York, where winter temperatures were mediated by the water. By 1859, Ohio was the leading producer of wine in the nation, accounting for over 40 percent of the national output, until diseases and prohibition virtually annihilated Ohio’s wine industry.

The constant flow of people to California during the gold rush only fed the state’s wine market. Hit hard by prohibition in 1920 however, they needed a boost to get things
going again. The same grafting technology that saved the French wine industry after the phylloxera epidemic allowed French hybrid varieties to be grown abundantly in California, reviving West Coast wine production past previous levels. While native hybrids exhibiting a “foxy”, or grapey taste were still being used to make wines in select regions of the East, the mild winters and abundance of sunlight in California were perfect for the Mediterranean species of grapes, and the French varieties quickly replaced most of the less-desirable native vineyards. The Golden State had the climate, topography, and now the right vines to become a worldwide competitor in the arena of fine wines. In order to truly contend they needed to begin by aligning themselves with current trends in fine wine. Naturally, they looked to the European countries already producing the greatest wines in the world for stylistic cues, the same countries that supplied them with their technology and even their vines, France, Spain and Italy.

Fueled by the affluence of the late 1950’s and America’s growing interest in wine, California’s reputation for producing world-class French-style wines continued to improve. Napa Valley was the epicenter of the explosion of winemaking knowledge, with much of the research and experimentation occurring in collaboration with geologists and scientists from the viticultural program at UC Davis. The development of refinement culminated in 1976 when Napa Valley Cabernet Sauvignon defeated French Bordeaux and four other notable French wines in a side-by-side blind tasting, shocking the wine world. The Paris event provided confidence to Napa Valley winemakers. They began to exploit the qualities that made their wines stand out against their French counterparts, producing big, bold highly tannic wines. California now has established identity, knowledge, and opportunity to correct problems. They could begin to focus on the nuances of the locality, which is the traditional French approach to terroir.

(Continued in Section 3.2 The Napa Valley)
B. THE WINEMAKING PROCESS

1. Fundamentals

In spite of all of the science and technology that go into winemaking today, it remains a fairly simple process, not far from the process of fermentation that occurs naturally in grapes. *Vitis vinifera*, the grape species used in wine, can grow considerably well in most sunny temperate climates. On the skins of these grapes are naturally occurring yeasts, which are single-celled plants that convert sugars into alcohol and carbon dioxide. The inner flesh of the ripe grape is a concentrated acidic solution of natural fermentable sugars dissolved in water, an ideal environment for the feeding and multiplying of yeast. All that is necessary to initiate this process is the breaking of the skin of the fruit, mixing the dormant yeast on the outside with the sweet liquid inside. As this occurs naturally, the exposure of the grape flesh to oxygen promotes the growth of acetobacters, bacteria that convert alcohol to acetic acid (vinegar). Because of this, oxygen is considered the enemy of wine, and much of the winemaker’s effort will go into preventing oxidation, thereby preventing bacterial contamination and breakdown of the wine into vinegar.

2. Viticulture

The process of making wine begins in the vineyards, long before grapes have developed on the vines. The beneficial and detrimental aspects of soil, topography, microclimate, and macroclimate form the basis for choosing favorable grape-growing sites, as well as the appropriate varieties for the site. This allows growers not only to produce better fruit in favorable regions, but also to expand growing into new viticultural regions (Jackson, 204). Favorable vineyard practices form the foundation for quality wines. A majority of the wine’s properties will be determined by the specific grape variety and its response to the nature of site, such as wind, moisture, sun exposure, and soil characteristics.

Vineyard maintenance including pruning and training vines on wires or trellises is necessary in order to get the most out of the vineyard. The chosen system for training vines must attempt to balance high fruit output, optimal fruit quality, and efficient pruning and harvesting practices (Jackson, 109). The method of vine training will determine the method of harvesting, ultimately affecting the quality of the wine.

3. Harvesting
Although there is no true replacement for the careful human hand in harvesting grapes, there have been machines created that harvest with minimal damage to fruit, but they tend to gather twigs and leaves that must be sorted out later. The minute the grape leaves the vine it begins to undergo a sequence of depreciation, so it is crucial that the grapes make their way to the fermentation tanks as soon as possible. Getting the grapes into a controlled environment quickly and without breakage protects the grapes from contamination and minimizes loss of the precious juice. Efficient harvesting can be made possible through the proper treatment of field and site, which will most certainly have architectural implications.

4. Stemming / Crushing

Immediately after harvest, the grapes are taken by gondolas or trucks to an area where the stems and leaves will be removed. They will then be crushed to release the juice and initiate the process of fermentation. Stemming and crushing often are done in the same machine, but there is a trend towards physically separating them to prevent stem and leaf parts from contacting the juice. Stems are usually separated by a machine that uses paddles to push the grapes through a metal cylinder perforated with round holes, leaving the stems behind. Crushing is done by either forcing the grapes through a set of rollers, or in centrifugal crushers, which fling the grapes against the inside of a drum, breaking them open. Care must be taken to not break the seeds, however, as they could oxidize the juice creating rancid odors (Jackson, 284). The mixture of seeds, skins, and juice, called “must”, is ready to be taken to the fermenting tanks.

5. Maceration

Leading up to fermentation time, maceration is the segment responsible for preparing the mixture of seeds and skins for fermentation. Enzymes begin to break down some grape constituents into more easily fermentable compounds. More importantly, grape skins are broken down in order to facilitate the transfer of pigments and tannins during fermentation. This can last anywhere from a few hours to several days, and often overlaps with fermentation itself. Because of this, it often takes place in the fermentation vessels. Maceration can differ significantly, depending on the winemaker, grape variety, and desired character of the final wine. Sometimes it is done under refrigeration or at very high temperatures in order to stimulate different chemical reactions within the must.
6. Fermentation

Due to indigenous yeast strains on the skins of the grapes, fermentation may begin spontaneously during maceration. This is often inhibited by the addition of powdered sulfur dioxide before maceration. A culture of a carefully chosen yeast strain will then be added to the must to start the fermenting when maceration is deemed complete. Fermenting sometimes takes place in concrete or wooden vats, but the preferred vessel used today is the stainless steel tank, for its ability to effectively control internal temperatures. Heat buildup created during fermentation can eventually cause yeast to slow down or die, creating what is called a “stuck” fermentation.

7. Pressing

Whether it occurs before or after fermentation, at some point the skins and seeds need to be separated from the liquid. But before the mixture of seeds, skins, and juice is squeezed to salvage every last drop of liquid, the juice that drains out under the weight of the berries, called “free-run” juice, is collected and kept separate. Then the remaining juice is pressed out of the must. Up until about 150 years ago, this was done with the manual vertical screw-type presses. Inventions in pneumatic inflation presses and hydraulic vertical and horizontal presses revolutionized pressing by their ability to extract more juice with less pressure, resulting in a better quality juice. Pressing extracts excessive tannins from the seeds and skins, making the pressed liquid very pungent and bitter. This liquid can be later mixed back in controlled amounts to adjust the tannin level of the wine. The remaining cake of seeds and skins, known as pomace, is usually discarded off site.

In white wine production pressing is done before fermentation, as the skins of white grapes offer nothing positive to the wine. In the production of reds, the skins are left with the juice during part of the fermentation, allowing the color compounds, flavors, and tannins (bittering components found in the seeds, skins, and stems that are desirable in moderate amounts) from the skins to be absorbed into the liquid. The pressing in done once the desired levels of color and tannin have been recognized, usually no longer than about 14 days. The must will continue to ferment for several days after pressing in red wines. Pink or rose wines are made by allowing only minimal contact between the red skins and the juice, which usually requires only 2 or 3 days to impart a pink hue.

8. Clarification
The look of a wine is as much of the sensory experience as the taste. The crystal-clear transparencies of both red and white wines do not occur naturally. The wine is usually clouded with a dead yeast cells and fine particulate matter from the pressing. Winemakers must use filtering techniques judiciously to prevent subjecting the wine to harsh treatments that can compromise the flavor, in exchange for a more desirable appearance. A process called fining involves adding various substances, such as bentonite clay or egg whites, which attract particles and pull them to the bottom. It is intended to accelerate the precipitation of particles in the wine. This is often accompanied by racking, where clearer liquid left after settling is transferred into another storage unit. Centrifuging involves high-speed rotation of the wine, increasing the rate of sedimentation. Advanced centrifuging, filtering, and fining are all effective techniques used to remove particles suspended in the wine, but can also remove desirable flavors and characteristics if overused.

9. Stabilization

After fermentation the wine needs time to stabilize. This usually takes place either in large stainless steel tanks or oak barrels. During this period sediment will most likely precipitate in the bottom of the tank. Any residual sugar will slowly continue to be fermented until it is all gone.

10. Mixing

Mixing provides an opportunity to adjust the color and flavor characteristics of the wine to the desired level. This is a chance to attempt to correct any imbalances in the sweetness or acidity as well. Small amounts of the highly tannic press juice may be added to the free-run to increase the tannin levels. Wines made from different grape varieties or sources can be blended to balance their characteristics. Blending of wines can occur at several various points in the process. As a general rule, mixing before fermentation results in a better integration of characteristics of the constituent components, while mixing after fermentation gives the winemaker a clearer sense of the outcome resulting from the combination, but the flavors and aromatics may not meld together as effectively.

11. Storage

Wine requires time for the flavors to fully combine. This is done either in steel tanks to retain a fresh, crisp taste, or traditionally in oak cooperage (barrels), which will impart a
mellow, earthy tone. The flavor of oak is often an important characteristic to the complexity of many red and white wines, and is often described as tasting like vanilla or caramel in the finished product.

12. Bottling

Bottling is often the most mechanized part of the entire process. The primary concerns are to avoid bacterial contamination and excessive aeration of the wine. This is most commonly done using special machines designed specifically for sterile operation. The bottles are often washed and sterilized just prior to filling, and the air in the bottle is sometimes purged using carbon dioxide or inert gas, leaving a buffer against oxidation in the unfilled portion of the bottle. The design of the bottling area should focus on the sanitation and efficiency of the bottling process itself.

13. Maturation/Aging

Some wines, specifically dark reds such as Cabernet Sauvignon, Nebbiolo, and Pinot Noir, and whites such as Chardonnay, benefit from some aging in the bottle before being distributed to the consumers. It is often advantageous for the wines to rest for one or two years, up to five. During this period, the tannins smooth out and become mellower, and the flavors tend to meld together. While this is an investment in winery space and time, as the wine may greatly increase in shelf value during its aging. It is the winemaker’s choice whether or not to age the product before sales, as it is often not in their best interest financially. Because of this, many wines are sold before they should be, and consequently most wine is consumed before it reaches its full potential.
C. A BRIEF HISTORY OF FUNCTIONALIST THOUGHT

Classicism to Modernism

Functionalist thought is by no means a recently founded body of theory. In fact, discussions on function in art and architecture have existed since the days of classicism, when Xenophon, in his Memorabilia and Oecinomicus, made statements on the connections between the good, the beautiful, and the useful based on ideas set forth by Socrates. These theories, which provide the foundation for early functionalist ideas, establish a moral as well as mechanical analogy between function and beauty, stating that objects that are “good” and “appropriately fit for their purpose” are intrinsically beautiful. Plato took what Xenophon had stated and introduced an organic analogy by stating that beauty in nature was a reflection of divine beauty, or the ideal concept of beauty, and that man’s art can only provide a reflection of nature, twice removed from the pure notion of beauty. Aristotle elaborated on this organic notion, comparing beauty in utility with the astounding ways in which nature is able to satisfy its functions through beautiful formal solutions. He also spoke of the organism in terms of “wholeness”, or a unity of parts in relation to the whole. This idea of the organic underlies much of Aristotle’s theory on art. Vitruvius, who was by no means a functionalist, came to adopt the organic analogy laid out by Aristotle, but did so in a narrow, humanistic manner, speaking of proportion, balance, and harmony in relation to the human body. The writings of Vitruvius became the basis for a significant portion of architectural theory for centuries to follow, although many of the fundamental ideas were lost or abandoned in what would often become only a superficial replication of classical form and ornament.

Essential functionalist ideas have found their way into various bodies of theory since classicism, adopted, translated, altered, rejected, and reincarnated many times along the way. The constituent functionalist ideas from classicism became part of the perennial Western philosophy of life and architecture. Traces of these ideas can be found in the structural and material rationalism of the Gothic or Gothic Revival, and the classical revivals of the Renaissance and Neoclassical eras, among others.

The foundation for the approach to functionalism in modernist architecture is said to have originated in the ideas of the Italian Jesuit Monk Carlo Lodoli in Venice, Italy around 1750. Lodoli was extremely critical of any form of extraneous ornament or decoration in architecture, both contemporary and earlier styles, and strongly believed that nothing should be put on show that was not a functioning part of the structure. Lodoli also introduced the modern notion of organic architecture, which for him was an architecture based on functional, or rational, considerations. His conception of function is never clearly defined, however, and so the application of these ideas to architecture becomes vague. Nevertheless, he became a great influence on functionalist thought building up to Modernism.

Horatio Greenough came to learn of Lodoli’s theories while living in Florence in the 1830’s. Although he was a neoclassical sculptor, Greenough eventually wrote many essays on architecture and design during the middle of the 19th century, criticizing contemporary historicism and arguing for a reform in which function would play a key role. These all had an explicit religious undertone, as many earlier functionalist ideas have. In his words, “God’s world has a distinct formula for every function, and we seek in vain to borrow shapes; we must make shapes, and can only affect this by mastering the principles.”

(Continued in Section 2.3 XXXXX)

---

30 Michl, Jan. “Form Follows What: The Modemist Notion of Function as a carte blanche.” in Magazine of the Faculty of Architecture & Town Planning (Technion, Israel Institute of Technology, Haifa, Israel) nr. 10, Winter, 1995: p.4

SOURCES CITED

Wine and Winemaking Resources


Architectural Resources


Michl, Jan. “Form Follows What: The Modernist Notion of Function as a Carte Blanche.” in Magazine of the Faculty of Architecture &
Town Planning (Technion, Israel Institute of Technology, Haifa, Israel) nr. 10, Winter, 1995: 31-20


