

**Site Furniture Selection:**

*Context Based Criteria*

by

Jamison Whiting Brown

A thesis submitted

in partial fulfillment of the requirements

for the degree of

Master of Landscape Architecture

(Natural Resources and Environment)

in the University of Michigan

April 2013

Thesis Committee:

Professor Robert Grese

Professor MaryCarol Hunter

## **Abstract**

*Why is a bench still just a bench?*

While no one would argue that different rooms of a house require different types of furniture, somehow virtually the same type of seating is used within all exterior environments. The classic bench--either single seat or multiple--has been around for at least 200 years. In contrast, the “form follows function” mantra of the modernist was instrumental in the advancement of interior furniture design and selection.

Using modernist theory as a premise, criteria are developed that expands the definition of function to include factors such as refuge and visual preference. A review of environmental psychology literature informs the more complete definition of a seat’s function, and thus results in a more appropriate and purposeful selection and arrangement of furniture in an exterior space. The criteria for the selection of site furnishings that provide more complete function were developed and tested on two sites within the University of Michigan campus.

Defining the function of a seat to include factors of environmental psychology and the development of related criteria for evaluation did, in fact, result in a furniture selection that is more appealing and useful for a given setting and user.

## **Acknowledgements**

It is with mixed emotions that I acknowledge those that have helped me to see this long journey come to an end. I enjoyed every moment of my undergraduate and graduate studies at SNRE. Perhaps the never-ending thesis was an attempt to hold onto that incredible place, its passionate student body and unparalleled faculty.

First let me thank my family. Their constant needling to finish this thesis was unwavering even after over a decade of “life” getting in the way. Secondly, I would like to that thank my fellow MLA students from the Classes of 1999 and 2000, many of whom I work with professionally to this day, and all of whom I consider my dearest friends. Lastly, I’d like to thank my advisors past and present. Both Bob and MaryCarol, most recently, have been patient with my busy schedule and have seen to it that what was once a distant hope has now become a reality.

Thank you all for your support!

## **Table of Contents**

|                                       |           |
|---------------------------------------|-----------|
| Introduction                          |           |
|                                       | <i>1</i>  |
| Modernism                             |           |
|                                       | <i>3</i>  |
| Environmental Psychology              |           |
|                                       | <i>11</i> |
| Materials                             |           |
|                                       | <i>16</i> |
| Selection Criteria                    |           |
|                                       | <i>27</i> |
| Application of the Selection Criteria |           |
|                                       | <i>33</i> |
| Conclusion                            |           |
|                                       | <i>41</i> |
| Bibliography                          |           |
|                                       | <i>43</i> |

## **Introduction**

### ***Why is a bench still just a bench?***

While no one would argue that different rooms of a house require different types of furniture, somehow virtually the same type of seating is used within all if not most exterior environments. The classic bench--either single seat or multiple--has been around for at least 200 years. This type of seating is almost always rigidly affixed to a site, virtually eliminating the possibility that a user can move the furniture within the landscape. The direction and angle of view is chosen for the participant. The relationship of the participant to other users is fixed. All of this severely limits the ability of a user to engage his/her environment. Engagement is imperative for users to feel comfortable and increase their sense of ownership. Ownership is essential for the long-term use and protection of exterior spaces.

Why then, in a municipal context, is the prevailing seating option still the traditional bench despite so many years of design and theoretical advancement? This is in sharp contrast to the use of innovative designs and materials that is all but accepted practice in both the commercial and institutional (public) interior settings. Although the “form follows function” mantra of the modernist was instrumental in the advancement of interior furniture design, a review of environmental psychology will inform the more complete definition of a seat’s function, and thus result in a more appropriate and purposeful selection and arrangement of furniture in an exterior space.

Objects within an environment have the ability to communicate meaning directly to the user. How we feel and subsequently act in an environment is linked to the information that we can gather from that environment. The choice of materials can also have a significant impact on the function of site furniture both in the traditional modernist application and when applied to more broad function of a seat with respect to our aesthetic preference. In many cases, the assumptions that specifiers (landscape architects, park superintendents, owners, etc.) make are resulting in inappropriate furniture selections for a given space.

Therefore, there is a need for the development new criteria for the evaluation of site furniture selection for various sites. As such, one will be presented herein. Using modernist theory as a premise, criteria will be developed that expands the definition of function to include factors such as refuge and visual preference. To test these new criteria, two sites within the University of Michigan campus have been selected, each with differing programmatic uses and environmental conditions. The application of the criteria for the selection of site furnishings will be evaluated for each site.

## **Modernism**

Classically simple yet innovative in approach, Modernist furniture design remains a vital force in interiors today. As appropriate in a stark New York loft as in a warm and rustic farmhouse, Modern furniture transcends style. Although the formal introduction of this movement in furniture design closely follows the development of Modernist architecture in the early 1900's, the design of Modernist furniture has its own unique history. A history, which like architecture's, grew out of a society of increasing populations and increasing mechanization.

The term Modern will be capitalized to distinguish the movement as a theoretical one and distinctly separate from any stylistic connotations. For the purpose of this paper, modern (not capitalized) will refer to contemporary, or currently designed furniture, some of which is Modern in its approach.

What is Modern furniture? A question that is much harder to answer than “what is mission furniture?”, or “what is Queen Anne furniture?” The later, being distinct styles of furniture, are distinguished by common materials and details. While certain Modernist designs can be said to have stylistic similarities this is more likely a result of the period in which a piece was made, and by the close associations between furniture designers of various schools of thought. Modernism, however, is an approach and not a style. Modernist chairs are defined by a problem trying to be solved (Meadmode 1975). As alluded to earlier, the rapidly

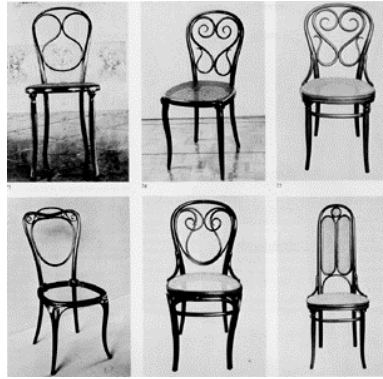
industrializing nations of Europe and the United States at the turn of the century saw increasing numbers of the middle class moving into cities, with their compact living spaces, a need for versatile, functional, and inexpensive furnishings arose (Levine 1998). To meet this need, designers turned to industrial quantity production as a stated ideal. Although many noted Modernists failed to meet this ideal, as a goal it drove the design process through the post war period.

As a problem driven approach, Modernism rejects ornamentation in favor of a minimalist expression of the function of a chair, namely sitting. The Modernist approach to design marked a refusal to recall appearance for the sake of nostalgia or ostentation (Pile 1990). The phrase “form follows function” most succinctly expresses the dogma of Modernist designers. Originally coined by architect Louis Sullivan, the phrase marks a shift in thought from the highly ornamental, historicist designs of the past.

As early as the late eighteenth century furniture that begins to express Modernist ideology begins to emerge, namely furniture that utilizes new technology to produce relatively inexpensive furnishings for a wide cross section of the population. Probably most influential of these pre-Modern furniture designers was Michael Thonet. His innovative use of

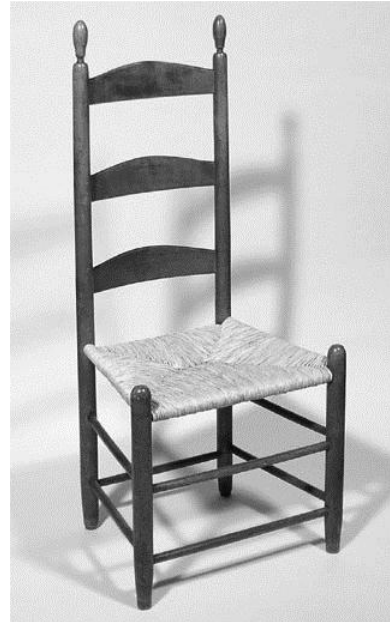


bent wood eliminated the need for complex joinery (Meadmode 1975). Of course, no discussion of pre-Modern design would be complete without



Thonet Bentwood Chairs (Betsky 1998)

mentioning the Shakers of New England. Their furniture was an expression of practical efficiency and entirely without ornamentation (Pile 1990). Interestingly, Shaker antiques remain highly sought after for their beauty and functionality.



Shaker Ladder-Back Chair (www.jkrantiques.com.)

This issue of beauty or aesthetics is a very tricky issue when it comes to discussing a design approach, which denounces ornamentation, and adheres to the ideal of forms driven by function. How then do designers who work in a visual realm deal with the desire to create objects, which are functional, yet pleasing to the eye. Additionally, how does one create for the masses with which beauty is a relative judgment? From a Modernist point of view, design excellence in aesthetic terms is a matter of clarity and precision, of expression of reality and intent so that a utilitarian thing stands for more than its everyday self (Pile 1990). The noted furniture designer Charles Eames has said, “Design is an expression of the purpose. It may (if it is good enough) later be judged as art” (Neuhart 1989).



Rietveld, Red/Blue Chair (Habegger 1989)

The De Stijl (the style) movement is an early Modernist school associated with the work of renowned artist Piet Mondrian, and architect Gerrit Rietveld. The name of the movement and their use of primary colors coupled with a desire for purity of elements (unimpeded horizontals and verticals) is arguably stylistically based. However, Rietveld's declared intention was to design a chair which anyone could afford, consisting of simple machine-cut elements put together with dowels and glue, and which depended in no way on expensive craftsmanship (Meadmode 1975). It should also be noted that the use of primary colors, and the simplification of forms into lines and planes, as exemplified by the work of Modrian, is less about stylist dictum and more about the simplification of formal expression into its component parts.

Mondrian is by no means the only artist to have had direct influence on the work of Modern furniture designers. The noted Bauhaus designer Marcel Breuer's Wassily Chair of 1925, considered by many to be the quintessential Modern chair, was named for the famed minimalist artist Wassily Kandinsky. The Bauhaus is the design school most closely associated with the formation and introduction of true Modernism. The work of Walter Gropius (who's later work at



Breuer, Wassily Chair (Habegger 1989)

Harvard shaped design education in the United States), Mies Van der Rohe, Le Corbusier, and Breuer is credited with solidifying Modernism as a legitimate movement, and introducing that movement to the world. It is interesting to note that the influence of the pre-Modernist Thonet can be seen not only in the form of many Modernist Chairs, but many Modernist architects used Thonet's chairs to furnish the interiors of their client's houses. This is a testimony to the clarity of Thonet's approach to design and production.

Although clearly influenced by their predecessors, many important developments originated at the Bauhaus. Breuer's clear expression of the function of a chair's parts was to have a significant impact on Modernist furniture design. The parts that hold the occupant are clearly separate from the sheer supports. The use of tubular steel for structure is a perfect expression of strength, while more organic stretched leather panels provide comfortable support for the occupant, who at no point comes in contact with any structural members. The use of new materials and technologies namely chrome plated tubular steel is still closely associated with Modernist design, and nearly 100 years after these designs were introduced they look as if they were created by the most contemporary designers. Another pioneering design to come out of the Bauhaus was Le Corbusier's Gran Comfort of 1928. The intention of this chair was to create a plush house for the body and plainly declare its structure rather than bury it inside upholstery (Meadmode 1975).

Despite its strong ideology, Modernism is not without its detractors. Schulze (1998) notes the lack of contextualism and limited rational method or functionality without consideration for psychic concerns.

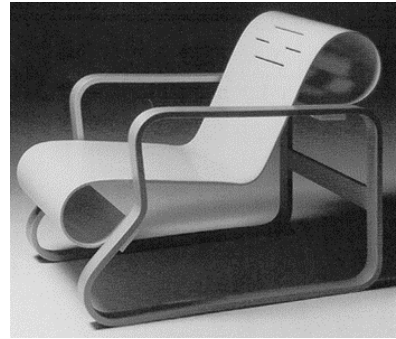
In my opinion, this is not a failure of Modernism, but a failure on the part of the designer to fully define the

problem. The Finnish designer Alvar Aalto's work is recognized for his unique approach to Modernism and his ability to get beyond these shortcomings. Aalto was a Modernist who combined reductivist abstraction with its apparent opposite – the organic, the sensual, and the additive – in a highly personal union of design effects

(Shultze 1998). Levine (1998) notes that, “the design aesthetic that Aalto originated combined influences from international Modernism, especially from the Bauhaus and Le Corbusier, with distinctly Finnish elements, notably a strong connection to the landscape and to natural materials.” The influence of Breuer and others is evident in Aalto's Palmo chair of 1929, most notably in the continuous movement of support from base to leg to back, and the clear separation of support structure and seat.



Alto, 406 Chair (Habegger 1989)



Alto, Paimio Chair (Habegger 1989)

Designer Charles Eames, whose name is synonymous with mid-century Modernism, was, like Aalto, also concerned with realizing the full potential of the Modernist approach.

Eames' aesthetic, both as an architect and as a designer of furniture, developed out of a highly personal approach to function (Meadmode 1975). Eames contended that the successful function of any design is limited by the designer's ability to define the problem.



Eames, Shell Chairs (Betsky 1998)

Clearly, Eames was thorough in his problem scope. His work with new materials both molded plywood and plastic came directly from his participation in several post war design competitions. These competitions, like the International Competition for Low-Cost Furniture Design, charged their participants with bringing the ideals of early Modernists to fruition. The work of these competitors was some of the first to achieve true industrial quantity production. Charles worked closely with manufacturers to develop techniques that were economical to develop without compromising quality. Eames began to use modularity and interchangeable parts to create a furniture system that was very flexible. This flexibility allowed Eames to tackle a variety of seating situations by mixing and matching inexpensively produced component parts. Eames' Shell chair of 1949 is a beautiful example his unique design philosophy. Meadmode (1975) notes that, "Before Eames no chairs were many-colored or really light in weight, or not fundamentally rectangular in plan, Eames' chairs belong to the occupant not the building." This is a further testimony to the success of Modern design; when the designer is complete in his/her problem development.

What it means to function as a piece of furniture has change dramatically, and has shaped the face of Modernism. Initially, function was simply related to an object's ability to perform its intended task. Later societal concerns began to broaden functional definitions. A chair had to hold an occupant and be available to "common" people. Still more concerns, such as comfort (ergonomics), and efficient use of materials began to define function. One of Eames' primary concerns to design was cost - economic, social, and environmental. His pioneering use of molded plywood, allowed him to make comfortable wooden furniture that at the same time used wood far more efficiently than solid wood construction. Recently, environmental concerns have again begun to influence Modernist designer's definition of function. It is no longer acceptable to create wasteful and even environmentally harmful objects. A chair may be a beautifully clean expression of comfortable seating, but if its production results in the expulsion of carcinogenic pollutants, or the depletion of old growth forests, then the piece is not fully functional. The credo remains the same; "form follows function", yet the problem of expressing those complex functional definitions simply, are a challenge to the most thoughtful designers.

## **Environmental Psychology**

Ecological function in terms of the physical function of the environment has been considered by Modernist, such as Eames, as far back as the Post War period. However, what is the psychological impacts of furniture on the way the environment functions or is perceived? The function of a chair, for instance, is obviously to provide something to sit on. At the same time, however, a chair may be designed to affect behavior (Heimstra 1974). How can designers affect people's perception of a landscape through the imposition of a design into a space? Do these clearly human influences in the landscape have a negative effect on the restorative nature of exterior environments? These questions represent the next layer in the evolving definition of function.

No doubt designers would gain by adopting a functionalism based on user behavior as a guiding principle (Sommer 1969). Professionals even today engaged in the design of our working, living, and recreational spaces operate artistically and intuitively, for the most part, rather than through reliance on well-established physiological considerations (Mehrabian 1976). As such, to be truly functional a piece must go beyond the application of accepted physical criteria and apply theories of environmental psychology. The behavioral function of a space is often expressed in terms of a single user. However, it is clear that the interaction of multiple users within a site and even upon a single piece of furniture can also have a significant impact upon the function, in behavioral terms, of a setting.

Personal space defines the imaginary zone around an individual and the zone into which another may not enter without causing psychological discomfort. Although there are major differences between cultures in the distances that people maintain, the general premise is universal (Sommer 1969). Architecture students on the Berkley campus noted the reactions of students on outdoor benches when they were joined by other students on the same bench. They found that the students shifted position more frequently in a specified time-frame and left the bench earlier than students who were left alone on the bench (Sommer 1969). Thus it can be seen that the size and placement of furniture in an environment can affect ones comfort within a space.

This comfort level can be manipulated to either foster or discourage interaction among visitors to a site. If, for example, the desire is to foster collaboration and/or social interaction then particular arrangements should be avoided. Too small a distance (less than four feet in a face-to-face position) has been show to results in decreased interaction (Mehrabian 1976). Similarly, the angle at which strangers are seated in relation to each other is a crucial factor in how much they interact. When the angle through which people are turned away from each other exceeds 90 degrees, conversation is curtailed sharply. Since people seated on a bench are separated by a 180 degree angle, benches are quite detrimental to social interaction (Mehrabian 1976). Although, two people can orient themselves on a bench as to face each other, it is virtually impossible for three or more to do so. As a result, a bench designed to hold four people will usually contain only two (Mehrabian 1976).



Just as social function is related to the arrangement of furniture, aesthetic function is related to perception. For example, if red tends to make people feel uneasy, then the choice to paint a bench red can have far-reaching effects. Possibly hampering the function of the space the bench was placed in, therefore limiting the function of the piece. For this reason creating truly functional furniture is dependent on people's preferences. To that end, we must understand the psychological root of visual preferences, namely survival.

If the information an organism acquires through the power of perception is to aid in its survival, it is essential that it not only perceive what is safe but also prefer it (Kaplan, Kaplan and Ryan 1998). The root of this sense of safety is the ability of the organism to see without being seen. When these conditions are met, anxiety is set aside and relaxation is possible (Appleton 1996).

As far back as the early 1800's it has been known that legibility (one's ability to understand and navigate a space) was important in the creation of successful landscapes, and that the objects within those landscapes had an important impact on that legibility. Roney claims, "It is well known, that at least nineteen in twenty of the intelligent part of mankind, are much better pleased with the appearance of neatness" (1822). Perhaps more scientifically, and over 150 years later, Kaplan et.al. found that landscapes that are coherent or orderly tend to be preferred by visitors. They go on to say that including repeating elements and textures can increase coherence (1998). In this sense, site furniture can have a two-fold effect on

perception. It can be used as an element that is both used repeatedly throughout a space, and placed in an orderly manner. It may also, as an object, use repeated forms and textures in its construction. In essence, a coherent object will increase the coherence of the space that contains it. Kaplan et.al., further states that how the contents or elements in an environment are organized can make a significant difference in the people's ability to pursue their basic needs of understanding and exploration (1998).

That understanding depends on the ability of a space to communicate meaning to its occupants. Much of the information in the environment comes to us from the things in it. Designed objects are channels of communication between people quite as much as language (Pile 1990). The language of design can be used to inform visitors about the values imbedded in a particular space, or its intended use. To increase legibility, a scene has to have some memorable components that help with orientation (Kaplan, Kaplan and Ryan 1998).

Specifically we can make environmental elements and settings easier to recognize, identify and remember by simplifying and clarifying visual form (Lynch 1978). This link to form is important as we make connections to behavioral functionality and Modernist ideology. In other words, landscape perception research can affect specific design decisions.

It has been shown, in landscape preference studies, for instance, that scenes that receive the most favorable ratings are the ones that include both a natural setting and clear human influence (Kaplan, Kaplan and Ryan 1998). This study, and others like it, indicates the

importance of objects in the landscape. When Kaplan et.al. found that people preferred landscapes with a human influence she also noted that in each case the human factors tended to “show a compatibility” with the landscape. This notion of compatibility, however, would seem to limit the designer to objects that are “wood, stone, and old” (1998). I would argue that applying her techniques for creating functional landscapes should also be applied to designing furniture that is compatible with those landscapes. In other words create furniture that is complex, coherent, legible and mysterious. Surely, materials other than old logs and stones can be “compatible” with a variety of landscapes, especially if those landscapes tend to be more urban. Again the Modernist notion that aesthetics arise from a clearly articulated functional problem, assures that the piece will be perceived as beautiful if it meets its functional requirements. In this case function dictates that the site furniture is, among other things, informative and compatible with its surroundings.

## **Materials**

In the language of design, the choice of materials set the tone for the conversation. The materials and methods of construction can be as expressive as the form of a piece of furniture. Certain metals are cold and sterile, quite appropriate for certain institutional settings, but too institutional for a family living room. On the other extreme, wood is often perceived as warm and inviting. Visual perception can affect not only ones interaction with an individual piece of furniture but also ones interaction with the entire environment in which the piece exists.

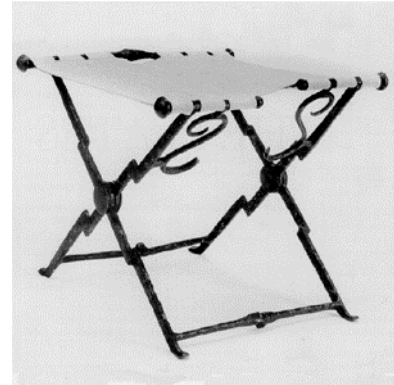
In addition, the materials chosen have real impacts on the function of a piece, both structurally, and economically. For example, pine can be quite affordable and easy to work with, but is wholly inappropriate under certain climatic conditions. Similarly, some advance materials may be structurally very strong and resilient, yet are cost prohibitive either due to their rarity or the skill needed in manufacturing.

In this section, materials and methods, both traditional and those at the forefront of furniture design and manufacturing, will be explored. Materials such as iron, wood, cement and plastics will be assessed with their associated methods of production in order to inform the development of criteria for furniture selection. The preliminary criteria for evaluation are; availability of the material, the material's cost, its ease of use and the material's suitability for mass production? The final criterion is the material's perceived meaning. The

criteria for material assessment are derived primarily from the research outlined earlier, both modernist theory and environmental physiology.

## Iron

The oldest iron furniture to have been preserved is of Roman origin. The Roman *sella corulus*, from the 1<sup>st</sup> century A.D. was a folding chair reserved for the people of high ranks (Himmercheber 1996). These wrought iron pieces were very strong and consequently quite heavy.



*sella corulus* (Himmercheber 1996)

However, the skill needed to manufacture them and the labor-intensive nature of black smiting, meant that for the next 1700 years traditional wooden furniture would remain the norm. By the end of the 1700's improvements in blast furnaces led to the perfecting of iron casting (Himmercheber 1996). The casting process, which involves pouring molten iron into a preformed mold, resulted in the furniture that was much stronger than wood, which didn't rot, and could be mass produced. For the iron industry, the 1830's were a decade of rapid expansion. Railways needed iron products such as wheels, track, and engines. They also provided the need for transportation of ore and coal (Himmercheber 1996). Now manufacturing operations could be located far away from the source of the iron ore (the raw material for cast iron). This meant reductions in the cost of cast iron furniture. But it was the mass production – one of the most crucial phenomena of the 19<sup>th</sup> century in all fields (bentwood or paper-mâché furniture too for instance) – that caused harsh criticisms to be leveled at cast-iron manufacture, especially in the final third of the 19<sup>th</sup> century (Himmercheber 1996).

The development of cast iron furniture had ended even before the Art Nouveau period, a period marked by a return to craftsmanship.

Physically making a cast is a relatively simple endeavor. Extraction (of iron ore) is, however, dependent on extensive technological resources and large amounts of energy as well as demanding a high degree of awareness of the chemical processes taking place in the smelting (Himmercheber 1996). This coupled with questionable mining practices means that from an environmental point of view the use of cast iron may be too costly. However, the relative efficiency of mass production does offset some of those costs. Another consideration of the economics of cast iron furniture is the ease at which pieces can be copied. Once a piece of furniture has been cast, it can itself be used as a model to make a replica sand form.

Iron is extremely hard and has a high melting point. It can be forged, welded, cast, rolled and drawn (Himmercheber 1996). This versatility made iron an excellent choice for furniture designers in the past. It is the nostalgic quality of the material that makes not only the material but also the designs of that period very popular for use in restoration projects. Today, that nostalgic cast iron bench, gate or lamppost is not cast iron at all, but rather aluminum, which is much lighter and more resistant to weathering.

This brings up a very interesting point. This sort of material dishonesty not only violates Modernist theory, but also is a clear crutch used by designers today. The proliferation of

historicist design in site furniture speaks of an industry clearly bogged down in the past and afraid to take a chance.

### **Wood**

This discussion will focus on two relatively new, and closely related, advances in wood technology. Those advances are wood bending and wood veneering. Humans have used bentwood for tens, if not thousands of years, in shelters and various tools. However, its use in furniture is a more recent application. And more specifically the scientific understanding of the properties of bent wood is a recent innovation. Also, advancements in wood veneering, specifically rotary cutting, has led to several improvements in wood construction.

Michael Thonet's use of bentwood revolutionized furniture production in the early 19<sup>th</sup> century. His ability to efficiently mass-produce a variety of objects from a kit of parts had a strong influence on Modern furniture design and production well into the 20<sup>th</sup> century. In his factories he found that wood under certain bending conditions was quite strong. His furniture could be assembled using no glue or complex joinery. This made the cost of manufacture far less than traditional furniture making. This cost was passed on to the consumer, which was eager for affordable furniture.

There are two main methods of bending wood: one by softening and bending the complete piece of wood (Thonet's method), and the other by bending and gluing together thin laminations or plywood strips to produce a built up piece of required dimension and curvature. The later technique required significant advances in both wood milling and gluing

technology. The rotary cutting blade made possible the production of thin veneers that didn't require hours of highly skilled labor. This meant that wood could be used much more efficiently than with traditional saw cutting, where a considerable amount of waste is expected. When plywood is built up of many layers with the grain running in opposite directions the resulting member is far more stable than solid wood. In the 1830's the piano industry began using plywood, perhaps first to do so (Sellers 1985). Laminate bends utilize the strength characteristics of both plywood and bending. This material has been used by furniture designers throughout the history of Modern furniture design, most notably the chairs of Alvar Aalto, and Charles Eames.

There is no question that engineered wood products like those outlined above are economical. The proliferation of new forms of engineered lumber in recent years is a testament to these early practitioners. Spurred on by increasing costs of raw wood, and leaps in adhesive technology, engineered lumber is replacing traditional lumber in all aspects of wood production, from furniture design to housing construction. Stevens points out that power bending machines are cost prohibitive, and are limited to certain bends (1978). However, as wood prices continue to increase and glues become less so, we will see those costs offset, especially in industrial quantity production. Also many of the environmental costs of wood construction are decreased with manufactured lumber. As mentioned earlier engineered lumber utilizes the entire harvested timber, virtually eliminating waste. Also, younger plantation grown timbers can be used to create larger dimensional units, which reduce the need to cut old growth forests. Finally, engineered lumber as a far greater life



expectancy than tradition wood members, which reduces long- term cost for maintenance and replacement.

Wood veneers have three important categories of application. Veneer is bent into shapes, as in commercial basket making; veneer is used to decorate surfaces and typically is applied over a substrate with a plain appearance; and veneer is applied to plywood in a cross-ply construction to equalize in all directions the inherent strength properties of the plywood panels (Stevens 1920).

People's familiarity with the material may lead to higher preferences for wood in natural settings (Kaplan, Kaplan and Ryan 1998). It has been noted by many that the use of wood in the work of Eames and Aalto has added an element of humanism to Modernist designs that are seen by some as hash. Improvements in wood technology are constantly made. From the use of plywood in pianos to the pioneering work of Thonet, Aalto, and Eames, the furniture industry has always been poised to take advantage of and even influence those technologies. However, with the exception of plantation grown Teak, most commercially available woods are poor performers when exposed to years of wind, rain, and sun. They require perpetual maintenance, and in the long run simply are not as resilient as other materials. However the relative ease with which wood can be worked, and its variety and availability means it will continue to be used in exterior situations.

## Plastic

Mention plastics and the first thing that comes to mind is that memorable scene from *The Graduate* (Nichols 1967) when Mr. McGuire tells Benjamin “I just want to say one word to you. Just one word. Are you listening? Plastics!”

Almost synonymous with all that is bad about American culture, plastics are a much maligned and much misunderstood material. What are plastics? All plastics are



Panton, Staking Z-Chair (Enck 2007)

polymeric and all polymers can be regarded as potential plastics. Certain polymers occur naturally, i.e. caseins (milk solids), cellulose derivatives (wood, cotton) etc. and all others are produced synthetically and are divided into two types thermoplastics and resin plastics (Joyce 1978). Thermoplastics make up most of what we would consider to be plastic.

Thermoplastics can be injection molded, extruded, and vacuum formed (Joyce 1978). They are used in every aspect of modern life, from containers for everything from food to chemicals, to automobile interiors and exteriors, to building materials and clothing.

Injection molding is the most common method of producing plastic furniture. The first injection-molded plastics were cellulose derivatives. In fact the process was developed for making alternatives to billiard balls, as the cost of ivory became prohibitive. Today, thermoplastics are the most commonly molded plastics. Spectacular advances in the development of plastics and progressive reduction in costs of production have enabled the furniture industry to make increasing use of these wonder materials (Joyce 1978).

The economics of plastics are even more enhanced when you factor in recyclability. Plastics can be recycled over and over again without appreciable breakdown in molecular characteristics. This means that old bottles, car parts, and other plastics can be in essence melted down and remolded into new products. These new products can themselves be recycled creating a closed loop system that eliminates the environmental risks associated with extraction of raw materials. Another advantage of this process (injection molding) is that many functions and features can be incorporated into the product design, this process will minimize, or eliminate, the amount of secondary work required to produce the same product in other ways or using other materials (Bryce 1998).



Eames, RAR (Betsky 1998)

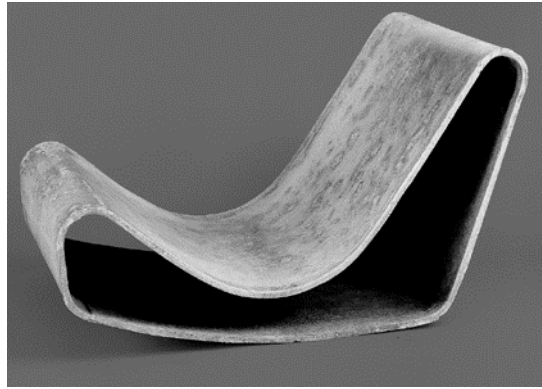
In addition to the economic advantages of plastics are the physical advantages to furniture designers. Thermoplastics are tough, resilient and can be given controlled flexibility (Joyce 1978). Charles Eames chose plastics for precisely this reason in the development of his ever-popular shell chairs. The unsurpassed ability of plastics to withstand weathering has made it a natural choice for site furnishings. It has been used as a coating on metals as well as for construction. Plastics have been used as a replacement for less resilient materials like wood and iron, but have been molded to replicate the physical characteristics of those materials. Unfortunately, this new material has been underutilized as a catalyst for new forms in the landscape.

**Ferrocement**

While both the Romans and the Egyptians had used cement, it is considered likely that the addition of steel reinforcement was a considerably more recent advent. Probably discovered accidentally by a mason who forgot to clean his trowel, steel and cement when cured create an unusually strong bond at the molecular level. Ferrocement is mortar (cement and sand) and wire mesh. Originally patented in 1856 and used in gardens and boat building it was not widely used until Pier Nervi's work in the 1940's (Abercrombie 1977). His magnificent ferrocement boats and later buildings, with Breuer and others, revolutionized architectural engineering. With this new lighter concrete he was able to achieve forms and spans that until then were never possible with traditional steel or wood framing.

A great virtue of ferrocement is that it is made of inexpensive materials readily available in many countries (Abercrombie 1977). Additionally, cement is inert and possesses little threat to the environment. However, there are, as with many materials, concerns with the extraction of both the ore needed for steel and of the Portland cement. The need for elaborate formwork and the time it takes to erect and dismantle it does add to the initial costs of such projects. Fortunately the material is very durable and its material life span will often offset this initial cost. Also, the labor needed is relatively unskilled in comparison to other construction techniques.

Ferrocement, when properly shaped, can be a thin, durable and resilient shell (Abercrombie 1977). Its resilience, especially its resistance to weathering, makes this material a natural for outdoor furnishings. Its “surprising thinness” makes it much lighter than traditional



Guhl, Garden Chair (Betsky 1998)

concrete construction. Additionally, it can be formed into organic flowing shapes that may blend well into a natural setting or can be formed into more architectural shapes for an urban setting.

### **New Materials**

New materials such as carbon fiber, ceramic/metal composites, and synthetic fabrics are currently available, although their use in consumer products is limited. However, there is progress in certain fields such as bicycle manufacturing, where competition drives a market for ever stronger and lighter material. Interestingly, it was Marcel Breuer’s ride upon a bicycle that led to his use of tubular steel in his revolutionary furniture designs.

It will take a partnership, like the one developed by Eames and the plywood industry, for furniture designers to have access to these advanced materials. A cooperative environment like that can push manufacturers and designers to create lighter, stronger, more comfortable, and more environmentally sound building materials. Recently the Aeron chair developed at Herman Miller used newly created fabrics held in tension to completely eliminate the need for padding in the seat and back. This completely adjustable, highly ergonomic chair

represents the forefront of Modern furniture design. It redefines what the function of a chair is in the modern workplace. The Aeron uses new materials, to solve problems and at the same time reinvents what it means to sit.

## **Selection Criteria**

In the past, Modernist design has been criticized for its shortcomings. Among those criticisms has been a lack of context, high cost, lack of comfort, and a disregard for the environment. These shortcomings are not the result of inadequacies in Modernist theory, but rather inadequacies on the part of Modernist practitioners. Modernist design is only limited by the ability of a designer to understand a problem. It is important that functional definitions include among other things, cost, environmental concerns, and the psychological needs of the public. The work of Charles and Ray Eames has shown that a thorough definition of the function of a piece of furniture can yield a surprisingly useful and beautiful result.

The goal of this project is to develop criteria for selecting a seating system that will further expand the definition of the function of site furnishings. How one feels and subsequently acts in an environment is linked to the information that we can gather from that environment. Objects within those environments have the ability to communicate meaning directly to the user. As a designer it is important to understand that when an object is placed, such as a piece of furniture, in the landscape there is an opportunity to affect both how people perceive that space and how they act within it. That is important because being in a setting that is not preferred can have unfortunate consequences; people may get bored or angry or even destructive (Kaplan, Kaplan and Ryan 1998).

Unfortunately, it frequently happens that the chief enforcers of spatial norms are the maintenance staff (Sommer 1969). In the majority of settings, the selection of exterior furniture has been limited to three factors: cost, style and maintenance. Many elements within our environment have been placed for ease of maintenance and efficient cleaning with little attention given to their social function (Sommer 1969). We are now learning through advances in environmental psychology and other related fields that other factors are equally, if not more, important. The many failures in environmental design can be attributed to simplistic and all-encompassing notions which fail to draw upon psychological facts. Practitioners fail to fit the user, their personalities, and their many diverse daily activities, to places (Mehrabian 1976).

Of the factors most typically used to select site furnishings, only style is truly important to the user's experience. However, in most cases, both cost and maintenance are driving factors in site furniture selection. It has been shown that neither of these factors are true indicators of the success of a selected piece. Arguments that littering, vandalism, and theft necessitate intense security measures prove expensive and self-defeating in the long run. In fact, this often leads to the purchase and installation of cheap and unattractive furnishings. This approach becomes a self-fulfilling prophecy that leads to disinvestment in a space and may increase the likelihood of vandalism and neglect. However, when people are given nice things and learn how to use them, they will take care of them. This sense of ownership has been shown to deter theft and vandalism. The occasional psychopath or thief can be



apprehended, and the citizens will help police when the property elicits respect (Sommer 1969).

When it is determined that theft is a real rather than perceived threat placing furnishing in heavily used, well-lit areas with multiple “eyes on” the space will help to protect them. Materials that tend to be heavier such as concrete and steel/iron may also be used to deter theft but will limit a piece's ability to be moved in order to take advantage of an individual's desired orientation.

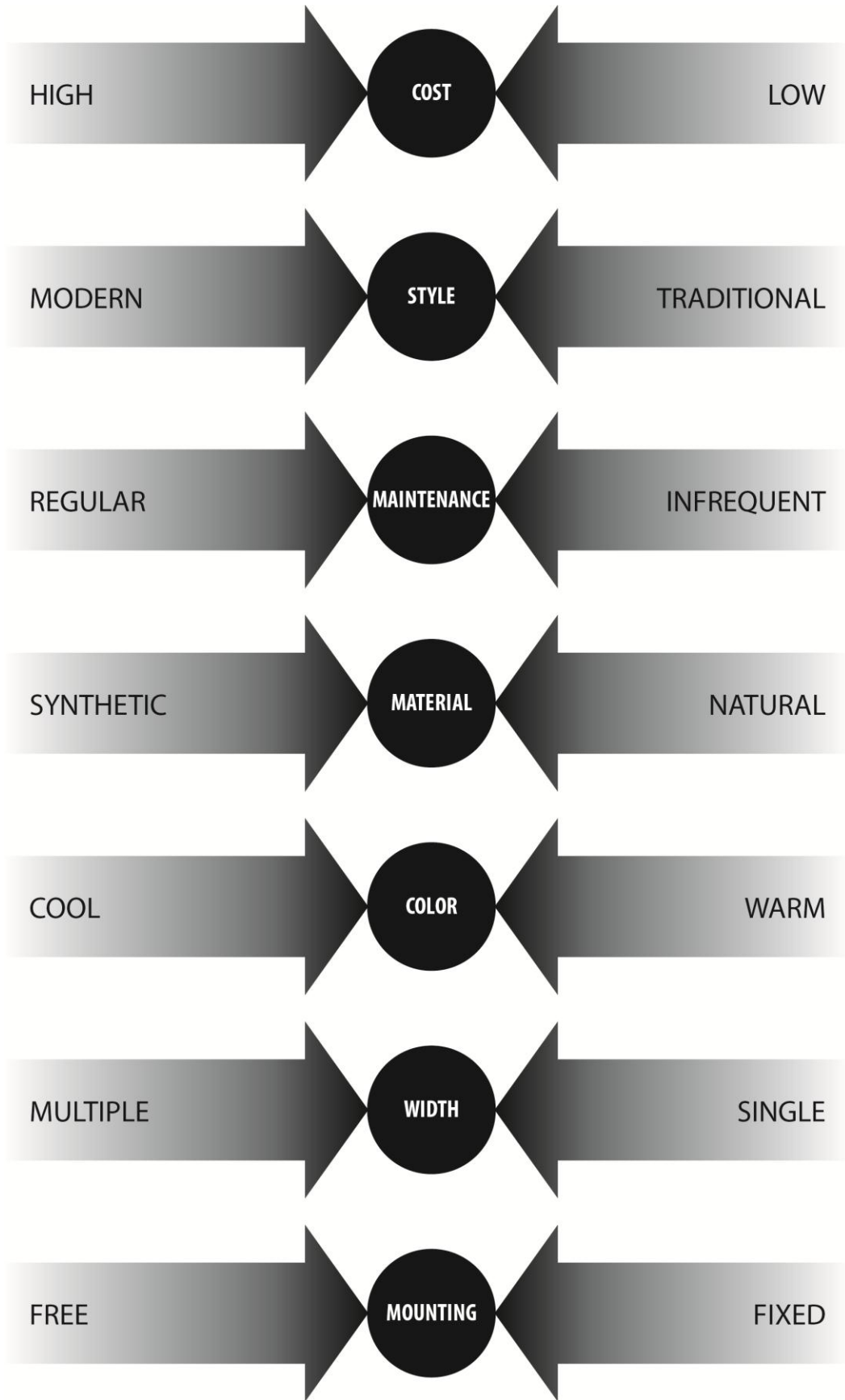
To be beneficial to the user the piece must be comfortable, and adaptable. To be comfortable the piece should adhere to general ergonomic principles. It should be made of a material that is forgiving to sit on, is breathable, and relates to the general contours of the human form. However, we now know the comfort extends to the psychological sphere as well. Does it add to a site's mystery, or complexity? (Kaplan, Kaplan and Ryan 1998). How safe will the user feel, or how likely will the user be able to interact with others? Appleton and Sommer have shown that to be most beneficial, the furnishing should afford its user a variety of perspectives into and out of its setting, and between users (1996). To be adaptable the piece must be able to be used in different ways by different users. Human beings have a gift for deliberately altering their environments, and to deny or minimize this gift is a mistake (Mehrabian 1976). This concept is quite eloquently illustrated in Willam H. Whyte's seminal movie *The Social Life of Small Urban Spaces* (1980).

A truly useful the selection criteria must take into account these important functional requirements. Our revised criteria build on the earlier criteria and add the following factors: material, width, color and mounting. Within each factor there exists a spectrum of choice. Material choices ranging from natural to synthetic will have various degrees of compatibility within a space. This perceived compatibility will impact ones perception of a piece and/or the environment it is placed within.

For our purposes, natural materials such as wood and stone will be selected for natural settings while metals and plastics will be selected for more urban locales. The width of a piece should correspond to the type of space and the programmed use. A two person bench is typically used by only one person. To provide more functional seating, settings that are intended for quiet contemplation by single users, such as overlooks and gardens, may find single seats more useful. On the other hand, large groups of familiar visitors may be better served by multiples. The mounting of a piece has been shown to be very important to one sense of safety in a space; the ability to change vantage comfortably will have a great impact on the success of a space. For this selection criterion, a piece should fall on the spectrum from free to fixed. A piece that is free from mounting offers the highest degree of manipulation. It can be arranged to provide vantage or to discourage or encourage interaction with other users of a space. In contrast a fixed bench provides the greatest control of the user experience and may be useful in setting such as a bus terminal or area where an orderly arrangement of users is an important function of the piece. The final criterion to be added is color. Although very subjective, color, ranging from cool to warm, can also have a

significant impact on perception. It is important, as a specifier, to consider the color's impact on a user's experience. Is the space a high energy space dictating more vibrant cool colors or does the space dictate more subdued warm colors?

In sharp contrast to the "one size fits all" method of furniture selection typically employed, this new approach is intended to focus the specifier on factors that will provide the most benefit to the user, the site and ultimately the owner. The setting in which the furniture is proposed should affect the specifier's choices. Natural settings dictate more natural materials and warm colors. Urban settings should lean toward cooler colors and synthetic materials. A site's location, the expected user and the programmed activity will affect where on the spectrum the width and mounting type will fall. Quiet contemplation calls for single user seating, while group waiting areas may benefit from multiple seat options. A free mounting can help facilitate user comfort and vantage while a fixed mounting may be more functional in institutional settings. The figure below shows the selection criteria and the spectrum of choice within each.



## **Application of the Selection Criteria**

To test these new criteria, two sites within the University of Michigan campus were selected, each with differing programmatic uses and environmental conditions. Each site was virtually furnished with two seating options selected from the same manufacturer's collection. One selected using the revised criteria and the other a typical traditional park bench. The resulting images were then evaluated to see if the additional criteria indeed resulted in a more preferential vignette and thus more functional seat.

### **Site One**

Located within the University of Michigan's Matthaei Botanical Gardens in Ann Arbor, the site provides an excellent vantage point for the observation of nature. It is secluded, yet visible from the surrounding gardens. The site is a bucolic setting intended to provide a peaceful retreat.

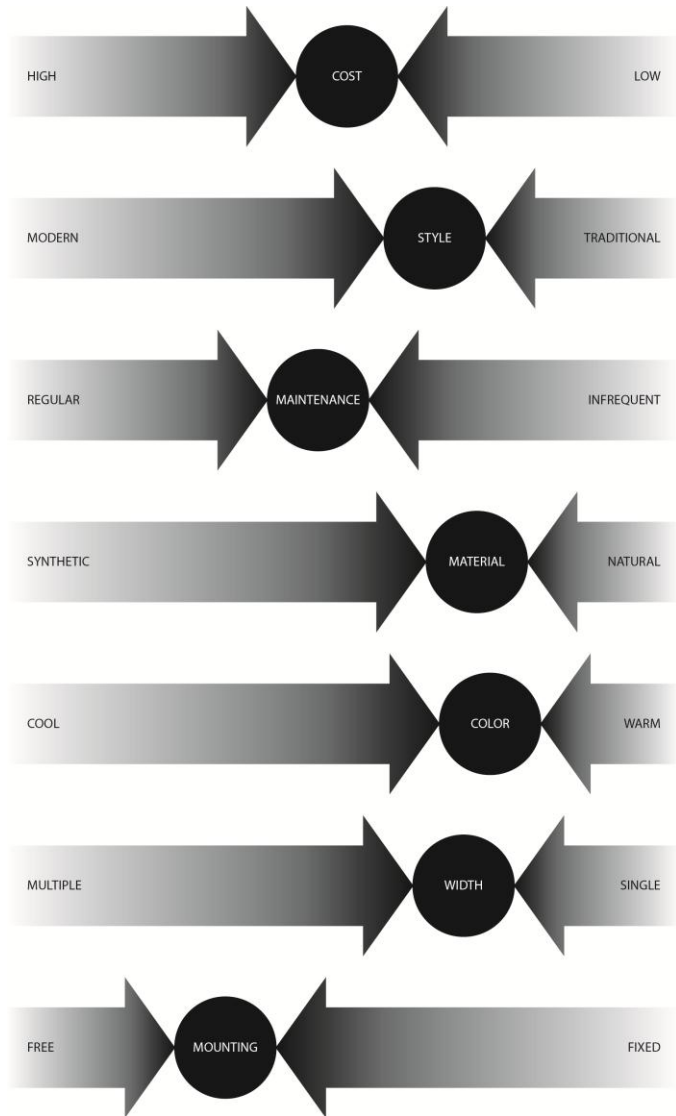


Vignette 1 shows the typical bench. The traditional form and use of natural materials is certainly compatible with the setting. It can also be inferred that this compatibility will have a positive impact on the user's preference to enter the site. However, there are several failures in function. First, the width of the bench is inefficient. The likely single user of the space will be quickly off-put if the bench is already occupied. Although the bench could comfortably seat three adults, it is unlikely that two unrelated individuals will share the seat. Secondly, the fixed nature of the bench limits the user's vantage to a prescribed view shed. As the ever changing natural scene is what draws visitors to the site, it can be assumed that a more flexible seating arrangement could provide a more satisfying user experience.



The setting dictates several choices that will affect seating selection.

For the purpose of this exercise, cost and maintenance will be ignored as it has been shown that they have little positive impact on preference and, in fact, may have an inverse relationship to the long term success of the piece. Given the setting, seating options that tend toward natural materials, warm colors and traditional styles should be considered. Given the program and likely users, choices should skew toward single or double width and a free mounting



to

provide opportunity for users to select their preferred view. Vignette 2 shows application of our new selection criteria.



Looking at the scene above there are several functional advantages that can be inferred from the study of environmental psychology. The use of movable furniture allows the user to arrange his/her vantage point to both view the scenery but also to see other visitors entering the site. This is particularly important as this site is accessed from behind the viewer, thus increasing the user's sense of safety. Also, two or more users can visit the site and arrange themselves as to avoid interfering with the personal space of others. This was not possible with the use of a bench. Although the style and material of the traditional bench were appropriate for the space and likely to enhance people's preference, the size and lack of flexibility would likely hinder use by multiple visitors and decrease the visitor's sense of safety in this space.



**Site Two**

Located within the University of Michigan's East University Mall, site is adjacent to a bustling pedestrian corridor. The space is intended to facilitate collaborative discourse. However, it should be flexible enough to allow for quiet study or break from the often hectic schedule of campus life.

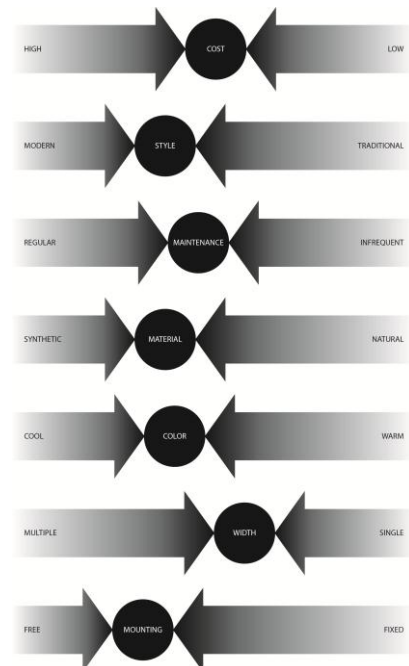


Vignette 1 below shows the typical bench. Immediately, there are problems that can be seen with this installation. First of all, the style and material choice is in conflict with the more contemporary architecture of the urban campus setting. In addition, the traditional form allows little flexibility of use such as laying out books and papers for study. Secondly, the usefulness of the bench for the facilitation of group interaction has been called into question

by Sommer and others. Although two users can orient so as to engage in conversation, the size of the bench limits this discussion to two.



This setting dictates several choices within the new criteria that should affect seating selection. Beginning with style, material and color, our selections should tend toward the modern, synthetic and cool. These choices should add to the compatibility of furnishing and attractiveness to users. More modern forms may allow for more flexibility of use. Interestingly, it has been shown that adaptability is almost a universal trait that can be employed in both rural and urban contexts to



increase preference and facilitate socialization. To that end, furnishings that skew toward free mounting and narrower widths, much as was done for site two, although for different reasons.



In evaluation of the scene above, multiple functional improvements were observed that will likely increase the user's preference. First, the use of color and material are playful and inviting. The unique form is also interesting and likely to invite exploration. However, the benefit of this form goes beyond style. The lounge accommodates various arrangements to suit the variety of users and tasks likely to take place in this dynamic space. The solid structure and high back also create a sense of enclosure for the user. This is important for the comfort of users as the space is very exposed. As in the Matthaei example, the use of

multiple movable single seats can better accommodate a wide variety of users and allow users to orient the bench to preferred views or to take advantage of warm sunshine. Multiple lounges can be arranged to accommodate a group of students looking to study or converse together, or be placed at a distance suitable to provide personal space and seclusion. It is clear again that the more robust selection criteria can improve the function of the furniture within a space and help to improve user's likely preference for that space.

## Conclusion

The history of modernist furniture design sheds light on the advancement of style, ergonomics and material selection while environmental psychology begins to explain why the selection and arrangement of furniture in an exterior space is important. Using modernist theory as a jumping off point, criteria were developed that expanded the definition of function to include factors influenced by environmental psychology. It was determined that the concepts of refuge, visual preference and personal space should be key factors in the selection of the appropriate furnishings for a giving setting.

Users must be attracted to a space to use it. The underling psychology of the choice is rooted in ones sense of safety. Although this choice is often symbolic in nature, it nonetheless affects our behavior. As such, preference must be accounted for in the development of our exterior spaces. The placement of elements, namely furniture, within a landscape has a twofold impact on people. It affects not only ones preference for a space, but also, one's ability to meet one's needs within that space. Those needs may be of a deep biological nature such a safety or an immediate need such as to converse with a fellow user. Either way, the function of a seat is much more than a simple place to sit.

Unfortunately, the assumptions that specifiers (landscape architects, park superintendents, owners, etc.) make are in fact resulting in inappropriate furniture selections for a given space. Through comparative imagery it has been shown that the careful definition of the criteria

for furniture selection and the appropriate application of those criteria can lead to more successful spaces. Only a short test of the criteria developed to better define the function of a seat within a given context was able to be presented herein. Further study and experimentation is needed to refine the criteria and develop useful guidelines for manufacturers and specifiers. Real world installations with associated visual preference testing would be able to more scientifically test various users' reaction to different applications of the criteria and perhaps suggest refinements to them.

Additionally, the development of a simple selection tool, perhaps in the form of a website or mobile application, would help to narrow down the selection of site furnishing options to those that will be most suitable to a space's setting and program, thus simplifying the task of flipping through reams of catalogues. Exterior furniture catalogues could also be organized, much like a furniture store is organized by room type, using criteria similar to those discussed above such as; seating for large group discussion in an urban plaza or seating for quiet contemplation in a nature park, etc.

Perhaps, in the future, even more purpose built furniture options would emerge if manufacturers and designers (using environmental psychology in addition to traditional functional definitions) were to work together to create furnishings that are specifically suited to different outdoor rooms. Maybe then, a bench will no longer be just a bench!

## Bibliography

- Aav, M., and Stritzler-Levine, N. (1998) *Finnish Modern Design: Utopian Ideals & Everyday Realities, 1930 – 1997*. New Haven: Yale University Press.
- Abercrombie, S. (1977) *Ferrocement: Building with Cement, Sand, and Wire Mesh*.  
New York: Schocken Books.
- Altieri, C. (1942) *Postmodernisms Now: Essays on Contemporaneity in the Arts*.  
University Park, Pennsylvania: The Pennsylvania State University Press.
- Appleton, J. (1996) *The Experience of Landscape, Revised Edition*. West Sussex,  
England: John Wiley and Sons
- Betsky, A. (1998) *Sitting on the Edge: Modernist Design from the Collection of Michael and Gabrielle Boyd*. San Francisco: San Francisco Museum of Modern Art.
- Fried, M. (1998) *Art and Objecthood: Essays and Reviews*. Chicago: the University of Chicago Press.
- Greenberg, C. (1984) *Mid-century Modern: Furniture of the 1950's*. New York: Harmony Books.
- Habegger, J., and Osman, J.H. (1997) *Sourcebook of Modern Furniture: Second Edition*. New York: W.W. Norton & Company.

- Heimstra, N. and McFarling, L. (1974) *Environmental Psychology*. Monterey, California: Brooks/Cole Publishing Company
- Himmelheber, G. (1996) *Cast-iron Furniture: And All Other Forms of Iron. Furniture*. London: Philip Wilson Publishers Ltd.
- Joyce, E. (1978) *Encyclopedia of Furniture Making*. New York: Drake Publishers Inc.
- Kaplan, R., and Kaplan, S., and Ryan, R.L. (1998) *With People in Mind: Design and Management of Everyday Nature*. Washington D.C.: Island Press.
- Kaplan, R., and Kaplan, S. (1978) *Humanscape: Environments for People*. North Scituate, Massachusetts: Duxbury Press.
- Kaufman, E. (1950) *Prize Designs for Modern Furniture: from the International Competition for Low-Cost Furniture Design*. New York: The Museum of Modern Art.
- Logie, G. (1947) *Furniture from Machines*. London: George Allen and Unwin Ltd.
- Mang, K. (1979) *History of Modern Furniture*. New York: Harry N. Abrams, Inc.
- Meadmore, C. (1975) *The Modern Chair: Classics in Production*. New York: Van Nostrand Reinhold Company.
- Mehrabian, A. (1976) *Public Places and Private Spaces: The Psychology of Work, Play and Living Environments*. New York, New York: Basic Books Inc.



- Neuhart, J., and Neuhart, M., and Eames, R. (1989) *Eames Design: The Work of the Office of Charles and Ray Eames*. New York: Harry N. Abrams, Inc.
- Pile, J. (1990) *Furniture Modern and Postmodern Design and Technology: Second Edition*. New York: John Wiley & Sons, Inc.
- Schulze, F. (1998) "Architecture as Humanism" *Art in America*.
- Sellers, T. (1985) *Plywood and Adhesive Technology*. New York: Marcel Dekker, Inc.
- Shepley, M.M. (1981) *Age Changes in Spatial and Object Orientation as Measured by Architectural Preference and EFT Visual Performance*. Ann Arbor, Michigan: Mardelle McCuskey Shepley.
- Sommer, R. (1969) *Personal Space: The Behavioral Basis of Design*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.
- Stevens, W.C., and Turner, N. (1970) *Wood Bending Handbook*. Woburn, Massachusetts: Woodcraft Supply Corp. Sweeney, F.M. (1987) *Reaction Injection Molding Machinery and Processes*. New York: Marcel Dekker, Inc.
- Villard, P. (1975) *A Manual of Veneering*. New York: Dover Publications, Inc.
- Woodcock, D.M. (1982) *A Functionalist Approach to Environmental Preference*. Ann Arbor, Michigan: David Marcus Woodcock.
- Whyte, William H. (1980) *The Social Life of Small Urban Spaces*. New York, New York: Project for Public Spaces.