Cultural Colourscape

The Study of Colour as a Symbolic Element in Landscape Architecture

A thesis presented to the University of Manitoba in partial fulfillment of the requirements of the degree

Master of Landscape Architecture

BY
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Winnipeg, Manitoba

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Abstract

This thesis suggests colour plays a critical role in landscape architecture and should be used in more varieties of ways in the discipline. Colour decisions should be made on a rational basis based on the nature of colour and the given context. They should facilitate a clear dialogue with its context. The context should determine the choices of colour application, while colour should have a logical relationship with the environment.

The thesis starts with an exploration of the role of colour in landscape architecture. Some of the fundamental issues associated with colour and the different aspects in the context that can be a determinant in making colour decisions were then examined. Chinese garden design was used as a case study to demonstrate how some of these colour and contextual factors play a role with the colour scheme within a culture. Projects of strong colour content by artists, architects and landscape architects were then surveyed to illustrate the impact of colour in a designed environment and the inter-relationship between colour and context. The thesis concludes with guidelines for making colour decisions that are more sensitive to its context. It is the aim of this thesis to demonstrate that the application of colour in landscape architecture should be seen beyond the realm of intuition, or even a matter of personal taste. Colour design is an art and a science that requires a holistic approach, and careful analysis of the context and an understanding of the nature of colour are important in establishing a rational basis for colour application. Colour should be considered as a design detail that is sensitive to the project's context in order to facilitate a clear dialogue between the landscape and its users.

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Contents

List of Figures

Introduction

Introduction

Colour is often neglected in the constructed landscape. Its application is often an afterthought in the design process. The development of colour usage in landscape architecture is much later than in the other disciplines (e.g. graphic design, interior design, advertising), where it is more widely and more wisely used. Its possible role as a tool to enhance the constructed landscape has been under exploited. Hence, it is the subject of this thesis to explore the relationship between colour and its context in the discipline of landscape architecture.

The lack of information on the subject of colour application in the constructed landscape could result from the rise of modernism in architecture spilling over into landscape architecture, with form being a more critical concept dominating western design methodologies for decades. The result may be that landscape architects have become preoccupied with the mindset that form is the principal design element. Another possible reason may be that colour photography and television have only been widely available to the general public for less than half a century – the recording of real colour in the landscape reveals our awareness of the impact that colour can have. The strong influence of the romantic English garden and the emphasis on functional design in landscape architecture in western societies may also have led to the development of "colourphobia"– or fear of the use of "unnatural colour", other than the material's own colour, in the landscape. With the relatively short history of the profession of landscape architecture compared to other disciplines such as architecture, the subject of colour

application in landscape architecture is an important topic for the profession to explore and discover.

Colour plays a critical role in landscape architecture and should be used in a greater variety of ways in the discipline. Colour can enhance the functional aspect of a landscape design and enrich the artistic value of outdoor space. It can create a framework for interpretation, which has the opportunity to promote local distinctiveness in the age of globalization. Colour usages in a constructed landscape can also achieve instructional/ educational purposes. It can help landscape architects to communicate design intentions in an effective manner. In short, it can expand the possibility of a constructed landscape.

Colour decisions need to be made on a logical basis based on the nature of colour and the given context. They should facilitate a clear dialogue with its context. A basic understanding of the visual nature of colour, colour theory and the non-physiological factors affecting colour perception are essential for landscape architects to have greater control of the final product. Issues such as the physical, environmental, social, economical, political and cultural context are important for landscape architects in developing a colour palette that is sensitive to the given site. The context should determine the choices of colour application, while colour should have a logical relationship with the environment.

It is therefore the intention of this thesis to study the abiotic design elements in the constructed landscape, with particular attention being drawn to the relationship between

colour and context. The role of colour in landscape architecture will be explored in greater detail in the first chapter. Some of the fundamental issues associated with colour will be studied in Chapter Two. Certain aspects of colour will, however, not be discussed in this thesis; for example, colour therapy, the electromagnetic spectrum, colour combinations for gardening and colour in the natural landscape and in the biotic elements of landscape architecture. In Chapter Three, the thesis will examine the different aspects in the context that can be determinants in making colour decisions, followed by a case study to demonstrate how some of these colour and contextual factors play a role in the colour scheme within a culture. Projects of strong colour content by artists, architects and landscape architects are surveyed in Chapter Five. These demonstrate the impact of colour in a designed environment and the inter-relationship between colour and context. The information generated from the preceding chapters will then provide the basis for generating guidelines for making colour decisions that are more sensitive their context. It is the aim of this thesis to demonstrate that the application of colour in landscape architecture should be seen beyond the realm of intuition, or even a matter of personal taste. Colour design is an art and a science that requires an holistic approach. Careful analysis of the context and an understanding of the nature of colour are important in establishing a rational base for colour application.

Chapter One

Colour and Landscape Architecture

Chapter 1 - Colour and Landscape Architecture

Introduction

Colour plays a critical role in landscape architecture and should be used in a greater variety of ways in the discipline. Colour can enhance the functional aspects of a landscape design and enrich the artistic value of outdoor space. It can create a framework for interpretation, and it can provide opportunities to promote local distinctiveness in the age of globalization. Colour can also be used in a constructed landscape for instructional/ educational purposes. It can help landscape architects to communicate design intentions in an effective manner. In short, colour can help landscape architects to achieve their aims. In the following section, we will examine each of these opportunities in greater detail.

Enhancing the Functional Aspects of the Landscape Design

Functionality is an important benefit from the use of colour in landscape architecture. First, colour can convey warning as well as acting as a safety code. Colour-coded elements have long been employed in architectural design to identify the different functions between utilities components. Red is standard for identification of fire-protection equipment. Yellow is standard for indicating striking, stumbling, or falling hazards in Western cultures. Orange is used for acute hazards likely to cut, crush, burn, or shock factory workers. Green is used to identify first aid equipment, cabinets for stretchers, gas masks and medicines. Blue is used as a signal for machinery that requires caution in use, and as an identification of watchmen's recording systems. Purple is used

for designating radiation hazards. White, grey, or black are used for traffic control,' housekeeping', waste receptacles or aisle marking. (Birren, 1961: 253)

Colour codes are also used in landscape and engineering practice. The American Public Works Association has developed the following colour codes for temporary marking and facility identification purposes (American Public Works Association, 2003):

White	–	Proposed Excavation
Pink	–	Temporary Survey Markings
Red	–	Electric Power Lines, Cables, Conduit and Lighting Cables
Yellow	–	Gas, Oil, Steam, Petroleum or Gaseous Materials
Orange	–	Communication, Alarm or Signal Lines, Cables or Conduit
Blue	–	Potable Water
Purple	–	Reclaimed Water, Irrigation and Slurry Lines
Green	–	Sewers and Drain Lines

Landscape elements may develop a colour coding systems with respect to each project for identification and clarification. For example, in some eco-trail systems, routes are designated with different colours to indicate to the hikers the direction of the appropriate trail that fits their physical fitness level. In another example, constructors of play structures will tend to choose colours that are more eye-catching to children as a safety feature for exits and handles. If slides of different difficulty levels are needed in a play structure, slides will also tend to be differently coloured as an indication of skill level for children of different age groups.

Another practical function of colour in the built environment is its ability to reflect and absorb light and heat. For example, a dark opaque substance will absorb thermal rays of light and convert them into heat, which will be radiated from its surface, while a light-coloured opaque object will reflect heat and will remain relatively cool to the touch. This

property offers practical responses to extreme heat in the environment, such as designs for white houses, white tents, and igloos. Similarly, Heat-Absorbing Glass containing metallic oxide, which gives the glass a blue-green, bronze, or grey tint can absorb more heat from the sun. A significant amount of the heat is dissipated externally, thus reducing the amount of heat that is transmitted. This application reduces the cooling load in an air-conditioned building. Similar technology is used in Heat-Reflecting Glass, Insulating Glass and Laminated Glass. (Faulkner, 1972: 16-17) In a landscape setting, the visitors' thermal comfort level can be altered by using appropriately coloured site furniture and paving. For example, using light coloured benches and paving stones in a constructed landscape where the climate is hot, reduces the absorption of heat.

Since colour can affect proportion, bringing out scale and defining form through colour contrast, the application of colour can also aid illusion in the landscape. Interior designers have often used colour to create illusions - for example, using a certain colour to make a confined room appear larger. A similar concept can also be applied in landscape architecture. For instance, using a lighter colour paving (e.g. natural limestone) in a hard landscape will make the space appear wider and larger than dark colour paving (e.g. black granite). Application of a similar colour scheme within the various spaces of a large-scale project will tie different small spaces together - creating the illusion of the different spaces being one and suggesting a sense of unity within the constructed landscape. (Faulkner, 1972: 5)

Furthermore, the application of colour in the landscape can highlight a landscape element, as well as act as camouflage to blend design elements into the environment and reduce visual clutter (Brawley, 1997: 116). In general, painting the object a dull black colour will minimize the presence of undesirable elements; however, finding a colour that blends well into the background colour may sometimes be a more effective approach. Application of colour design in a landscape setting can create a sense of hierarchy, in terms of the degree of significance, without manipulation of architectural form or order of space.

More specifically, two kinds of landscape have made increasing use of colour as a blending medium: the urban complex (housing, high-rise apartments, etc.) and industrial zones (Porter & Mikellides, 1976: 75). Structures in these areas are, in general, insensitive to the scale of the immediate context and threaten to dominate the original qualities of the site. Their link with living nature is made even more difficult by the limitation on the installation of natural elements and the use of synthetic materials from artificial sources. The application of an integrated polychromy is useful with these types of development in creating a more habitable space that will help to unify the characteristics of the building with the environment. Colour in this type of development becomes the mediator between the landscape and the constructed elements.

Enriching the Artistic Value of the Space

Being part of our sensory experience of the environment, colour has contributed to the beauty of our visual world. Although associations and attitudes towards colours are

unique for each individual depending upon situation, time, cultural background, and up-bringing, it is, in general, believed that most people feel happier with colours, and that shades of grey or the lack of colour is often associated with the opposite, which can be translated in most languages as boredom and sadness. Polychromatic colour schemes are often preferable to monochromatic scheme in most design situations for they seem to create more interesting and inviting spaces. The application of colour in the landscape allows for the enrichment of the artistic value of the design space. It can function as a unifying device between design elements and the predominant features of the existing context, creating harmony with its context instead of an environment in isolation. (Porter & Mikellides, 1976: 38)

Colour application is also an effective way to modernize the appearance of a constructed landscape. Changing the colour palette of some constructed landscapes may bring new life into the space. A similar logic can be explained in terms of the automobile. If there are two cars of the same make and model, but one remains in its 1970s white and pink colour, while the other vehicle is painted a more popular and current colour - for instance silver - the vehicle that is painted with silver will appear very different than the white and pink one. In terms of landscape design, elements such as play structures, lamp posts, benches or picnic tables, can all have a fresh and up-to-date appearance simply by the alteration of colour. Changes in a colour scheme will provide visitors with a different impression of the space and give a more positive message. On the other hand, the alternation of colour scheme is also effective in creating more historical spaces. Since

certain colour combinations of a space can symbolize an era, it provides an opportunity for creating nostalgia when a particular atmosphere is desired for the setting.

Creating a Framework for Interpretation

Colour is descriptive; it is not only a representation of reflected light, but has the ability to carry messages. Colour has the ability to convey meaning without form. While there may be little variation in the symbolic meaning between form and style across different cultures, there is a much stronger cultural base in the interpretation of colour in different countries. One of the important aspects of landscape architecture is responding to context and communicating intended meaning or concept. It is critical that any possible means of drawing a relationship between design, meaning and context be understood and applied. Colour application opens the door for exploration of meaning in the landscape architecture. The discipline has a history of using form as its major tool in communicating ideas and design concepts. The wider availability of colour-based information could change this pattern. Greater use of colour, including exploration of its symbolic significance, allows landscape architects to convey design intentions in a more effective manner.

Colour can create a framework for the interpretation of the constructed landscape. Notions of time, context, language, narrative, values, history and process that are *appropriate* to a particular locale are all needed to create a structure that will allow for the creation of "meaningful" landscapes. Although landscape designers may not be able to impose meaning and significance on the landscape, since meaning is "ultimately,

personally determined" (Treib, 1995: 54), and meanings may change according to the ever-changing dynamic of the space, landscape architects should set up a framework that allows public interpretation of the space over time, through qualitative design solutions. The use of colour is one of the most potent means of directing the interpretation of a place.

Through colour application in the constructed landscape, symbolism and meaning are expressed. Colour provides opportunities for the space starts to create a language of its own. For example, a bright colour scheme for a constructed landscape may create an atmosphere of gaiety and excitement, in which the landscape can become a narration that speaks of its identity, creating significant associations with its users. It helps to give organization and order to the space and gives its users a sense of orientation.

Helping to Establish Local Distinctiveness in the Age of Globalization

Colour is also an important topic with respect to communication. In an age of globalization, where style, material and form can travel from country to country in a short period of time, landscape architecture is in danger of following the road of modern architecture where homogeneous design has become the norm, and *Genius loci*, or the individual characteristics of a place, are neglected or lost. A new search for mediums to express local / cultural spirit in the designed landscape is emerging. The use of colour as a communication tool could open new doors for landscape architects.

By applying a colour scheme that is sensitive to the cultural background of the place, a sense of belonging and significance can be developed. Colour application gives the constructed landscape a "personality" with which people can associate. The space can become an informative device, reflecting its context. For example, in the *Zhongshan Shipyard Park* (Figure 6), Guangdong Province, China, the design team constructed the Red Box to commemorate the Cultural Revolution. (Figure 1) This 9m x 3m, red-painted steel plates structure allows visitors to contemplate one of the most depressing periods in recent Chinese history. As Mary G. Padua wrote, it

> "calls attention to the profound political implications of the colour red in China and reminds visitors of some of the famous sayings of Lenin and Mao. The symbolism may seem heavy-handed to an outsider, but it carries a great deal of weight in a country whose national anthem remains 'The East is Red'".
>
> (Padua, 2003: 82)

The local user group is able to identify with the colour red, while foreign visitors are able to recognize the local distinctiveness of the park without in-depth knowledge of the context. The design creates an identity for a place and promotes recognition of China's history.

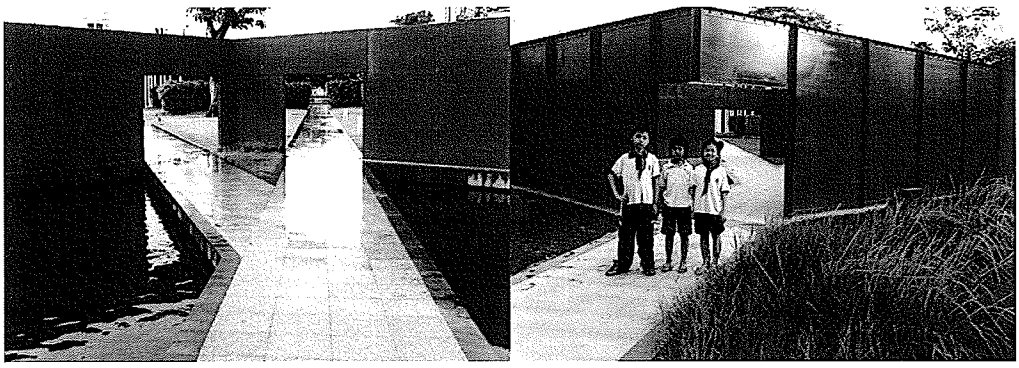


Figure 1 – *Red Box, Zhongshan Shipyard Park*, Guangdong Province, China. 2003. (www.turenscape.com, 2003)

Achieving Instructional / Educational Purposes

Since colour can impart information, it has the opportunitiey to be utilized for educational and interpretative purposes. For example, a garden with a great variety of colourful plants may create interest for people to learn more about plant materials, botany and ecology. Similarly, if colours that are sensitive to their context are incorporated into the elements of the constructed landscape - like the striking Red Box of Zhongshan Shipyard Park - the colour may create an instant opportunity for a lesson of the local culture, history and philosophical background.

Communicating Design Intention

Colour application in landscape architecture can also communicate design intentions. For example, by using a colour scheme that is different from any other constructed landscape, it can attract attention. Colour applications can also alter normal perceptions of familiar places or objects and help people to appreciate the everyday places or ordinary objects from a different angle. For instance, Claude Cormier demonstrated this technique in one of his projects – Blue Lawn, Montréal (Figure 2). He coloured the lawn of the Canadian Centre for Architecture blue for the an exhibition, "The American Lawn" by Diller and Scofidio. (www.claudecormier.com, 2003)

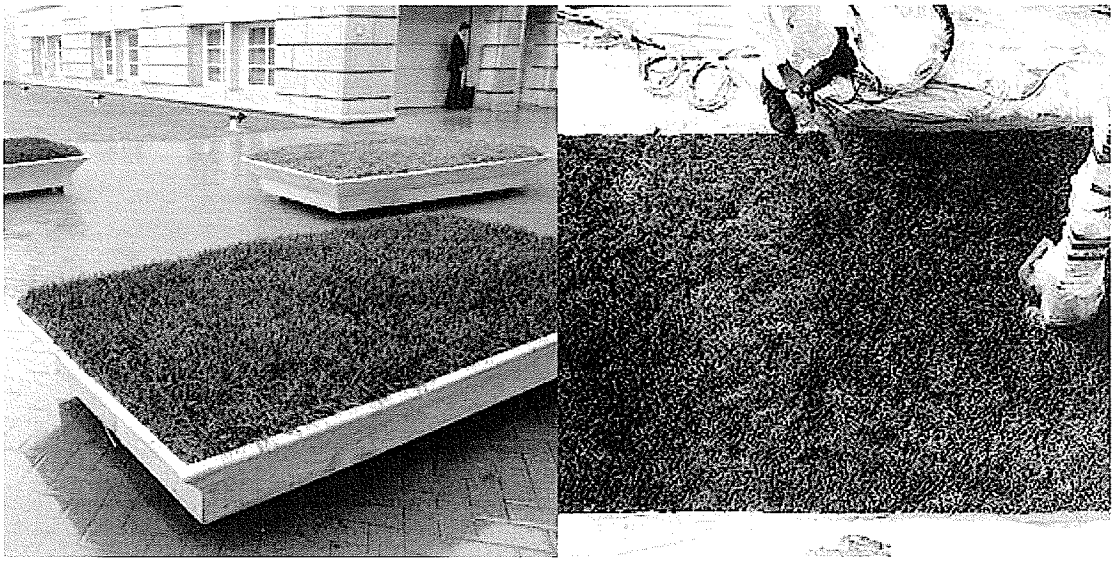


Figure 2 – *Blue Lawn, Canadian Centre for Architecture*, Montréal, Canada. 2001. (www.claudecormier.com, 2003)

By changing the lawn from green to an unexpected colour, he challenged the public's obsession with picture-perfect green grass. Viewers were able to examine their preconceived notion about the colour of a lawn. The everyday common feature becomes the centre of attention.

Colour can enhance the functional aspect of a landscape design, enrich the artistic value of the space, create a framework for interpretation, promote local distinctiveness, achieve educational purposes and help landscape architects to communicate design intentions in an effective manner. Colour should be used in a greater variety of ways in the discipline. However, in order to use colour as a tool in landscape architecture, a basic understanding of the tool itself is essential. In the following chapter, attention will be drawn to some of the fundamental issues of colour that landscape architects need to consider before applying colour to a constructed landscape.

Chapter Two

"Colour 101"

Chapter Two - "Colour 101"

Introduction

For the majority of people, colour is an inherent part of everyday life. Wherever there is light, colour can be perceived. In the field of design, where the visual aspect of the art form contributes a large part of the experience - whether it is a piece of painting, sculpture, architecture or landscape - colour is a critical design element. Although the main purpose of the thesis is to address the use of colour in landscape architecture in particular, an introduction to the principles of colour is a crucial basis for this study.

Discussion of colour can be approached from different perspectives and through different disciplines. This chapter will focus primarily on issues that are most relevant to the use of colour in the constructed landscape. This chapter will examine the fundamentals of colour, especially its characteristics, its visual nature, its history and its evolution. It should be noted that since the history and evolution of colour are closely related to its functions and symbolic meanings, there will be some overlap between the different sections of the review.

The Perception of Colour

Colours exist in the mind's eye. Humans work with colours and materials that reflect wavelengths, energy in the form of light radiation within the visible spectrum. (Porter, 1982:77) When light falls on an object, the surface of the object absorbs certain wavelengths within the electromagnetic spectrum; our eyes then perceive the reflected energy in a form of stimulus as colour. For example, grass appears green because it

absorbs all the light within the visible spectrum except green, which is reflected toward the eyes. Black is the resulting colour if the object absorbs all visible light, while white is the result if all visible light is reflected. (Van Gorp, 2000:27,28)

Hence, human perception is highly dependent on light. Radiant energy is the only adequate stimulus for the sensing cell in the retinas of the human eye. However, visible light comprises only a small portion of the total electromagnetic spectrum of radiant energy, which ranges from long radio waves at one end to short cosmic rays at the other (Faulkner, 1972:85). Wavelength that is visible to humans ranges from about 760 millionths of a millimetre in length - the longest, located at the red region - to about 390 millionths of a millimetre in length - the shortest, located at the violet end of the spectrum (Faulkner, 1972: vii). As the different wavelengths stimulate the eye through physiological processes, the human eye can perceive thousands of colours between the two extremes.

There is an average of 130,000,000 rods in each retina, which enable the human eye to see at low levels of illumination. (Faulkner, 1972: 81) However, these rods yield only the achromatic colour: the black-grey-white series. In addition to the rods, there is an average of 7,000,000 cones in each eye that are responsible for our perception of chromatic colours (red, blue, and so on), and only operates under a higher intensity of illumination (Faulkner, 1972: 81). These cells are connected by the optic fibers to a series of nerve centres associated with the visual cortex in the brain, where the interpretation of information takes place. Physiologically speaking, there are three

important factors that affect this interpretation of messages. These are the lighting conditions under which colour is perceived – which will be discussed in further detail in Chapter Three, the spectral characteristics of the object in view, and our perception of colour (Porter, 1982:77). Moreover, before a further discussion of the three factors that affect the interpretation of messages, a brief introduction of the colour system will be necessary in providing a basic guideline into the terms and theories behind some of the phenomena that are related to the perception of colour.

Colour Systems

> "If you, unknowing, are able to create masterpieces in colour, then un-knowledge is your way. But if you are unable to create masterpieces in colour out of your knowledge, then you ought to look for knowledge."
>
> (Itten, 1961:12)

Colour systems are the syntax of colour. In order to understand the organization of colour and to be able to communicate colour concepts that facilitate practical possibilities in landscape architecture, a basic knowledge of colour systems is essential.

Colour Wheel

The concept of the colour wheel (or colour circle) was first introduced by Sir Isaac Newton in the seventeenth century (Porter, 1982:79). It was initiated by his study of the property of light. A colour wheel is a colour system that positions the colours found from the refraction of a prism and places them in a circular arrangement. The wheel "started" with red, then yellow, green, blue, purple and then back to red. However, the division of

the colour wheel may be different among the different systems. For example, a twelve-hue colour wheel may divide the hues into red, red-orange, orange, yellow-orange, yellow, yellow-green, green, blue-green, blue blue-violet, violet and red violet. A ten-hue colour wheel division is red, yellow-red, yellow, green-yellow, green, blue-green, blue, purple-blue, purple, and red-purple (Mahnke, 1987: 25). The Munsell notation is a ten-hue colour wheel system for the classification and ordering of colours.

American Munsell Notation

The Munsell Atlas (Figure 3), first published in 1915, is one of the most important colour-measuring instruments for defining colour. Briefly, the colour system devised by Munsell is organized in terms of "hue" (principal hues are red, yellow, green, blue, purple; and intermediate hues are red-yellow, yellow-green, green-blue, blue-purple and purple-red), "chroma" (saturation/ intensity/strength) and "value" (lightness, value of 0 for pure black to 10 for pure white). Over 1,500 detachable samples of colour in matte and gloss finishes are obtainable with the system. A numerical annotation (scaled series of decimal increments) is then given to each colour dimension that allows a colour sample to be specified precisely according to the three attributes (Porter, 1982:48). The system also allows for quick comparisons between varying degrees of colour relationship, the identification or selection of colours according to qualities of appearance both in the studio and in the field, and also the ability to be adopted as a colour measurement instrument for paints and other coloured building materials. Moreover, it should also be noted that although the Munsell Notation is widely used, there is no one system currently established that is shared by all industries internationally (Mahnke, 1996: 90). Most

industries, for example paint manufacturers, have developed their own colour systems, and these systems are often not interchangeable. In Sweden, the Natural Colour System (NCS) is more commonly used, PCCS (Practical Colour Co-ordinate System) is one of the colour systems used by Japanese industries, and ISCC-NBS (Inter-Society Colour Council, National Bureau of Standard), Pantone and the Colorcurve System are commonly used in the United States (Lai, 1997:49. 83, 86-87). Written identification is needed for colour selection, usually with no written or symbolic notation designated to saturation or value. Visual judgment is crucial for making the selection.

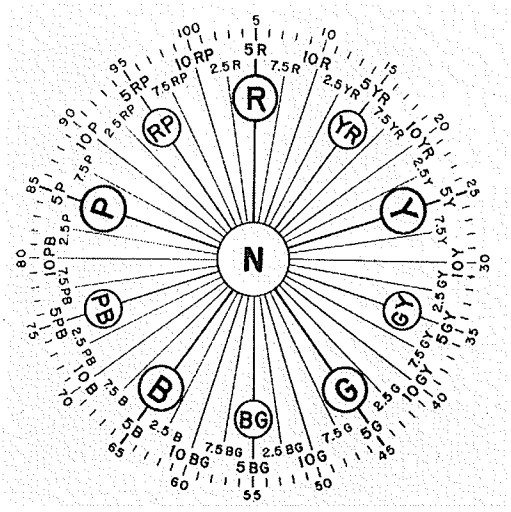


Figure 3 – Munsell Colour Atlas showing hue symbol and relationship. (Mahnke, 1987: 26)

Additive colour and Subtractive colour

Additive colour mixing and subtractive colour mixing is another important concept in understanding the notion of colour. Additive colour mixing is the process of mixing patches of coloured light. Derived from Newton's study, which suggests white light can be formed by mixing red, green and blue light, scientists Thomas Young (1801) and Herman von Helmholtz (1867) proposed that the colour receptors in the eye responded to red, green and blue wavelengths of light. This theory was then widely applied in colour photography and colour television. (Porter, 1982:80)

Conversely, subtractive colour mixtures occur when dyes, colour filters, pigments and paint for the colouration of buildings are mixed. Yellow, blue and red are the three subtractive primaries. When they are mixed the spectral energy of the pigments will neutralize each other to produce grey. It is called subtractive colour mixing because a part of the spectral energy of one pigment tends to neutralize parts of another pigment. In terms of application of colour in architecture and landscape architecture, subtractive colour mixing is in general of greater concern to the designer than additive colour mixing.

Colour Harmony

One of the more practical uses of the colour wheel is in understanding traditional colour harmonies. In general, colour harmonies fall into two categories, related and contrasting. Related harmonies are subdivided into monochromatic (based on one hue varied in value and chroma), and analogous (combination of three colours next to each other on the

colour wheel). Contrasting colour harmonies contain hues that are separated on the colour wheel; for example, complementary schemes (two hues directly opposite each other on the wheel), analogous-complementary (two hues next to each other on the wheel, combine with the complementary colour of one of the two), split-complementary (one hue with the two tones adjoining its complementary colour) and double-complementary (two hues next to each other on the wheel combined with their complementary colours). (Mahnke, 1996: 89)

We should, however, be aware that this judgment is based on a subjective colour experience and on the belief that harmony and discord are different between individuals (Verlag, 1961:19). Hence, colour harmony as understood by most artists and designers is under the rule of balance, symmetry of forces, visual effect and physiological phenomena in colour perception.

Physiological Factors in Colour Perception

Spectral Characteristic of Object and Colour Visibility

Another factor of human colour vision depends on the spectral characteristics of the object in view (Porter, 1982:78). This aspect is concerned with the ability of the surfaces and finishes of an object to absorb, reflect or transmit light. With respect to spectral colour in environmental design, it is necessary to be aware that self-coloured materials – exposed concrete, brick and wood, etc. should not be regarded as a neutral background. Designers should notice that colours on glossy or smooth surfaces tend to look darker and more saturated than colours reflected from a matte or heavily textured surface.

In terms of colour visibility, the eye sees best in white, yellowish or yellowish green light and worst in blue light (Birren, 1961: 243). In an environment where the intensities of the light stay uniform, a red light signal is the easiest to recognize, then green, yellow and white. In comparison, the eye does not focus on blue and purple well, and the colours tend to blur. Although white will attract less psychological notice in comparison to other colours, white walls, except for ceilings, may not be the most efficient colour in terms of human visibility. A study by R.J. Lythgoe has found that "visual acuity increases at a steady rate as the surrounding brightness is raised to equal the brightness of the task. However, where the surrounding brightness exceeds the brightness of the task, acuity immediately collapses" (Birren, 1961: 246). It is suggested that interior walls, in general, should not exceed a reflectance of 70 per cent, and soft tones of grey, blue and green are more desirable where critical visual tasks are performed (Birren, 1961: 247, 249). Furthermore, in strong light, a white on black background is more visible, whereas a black on white background is more visible in weak light (Birren, 1961: 245). This information may assist landscape architects in determining colour combinations for signage and landscape structures in dimly lit environments where the issue of visibility is critical for safety and security reasons.

Chromatic Sensitivity

The chromatic sensitivity of the eye and brain is the third factor that can alter our perception of colour (Porter, 1982:79). As already mentioned, colour - or more technically speaking, spectral energy - reaches the rods and cones in the retina and messages are then conveyed to the brain via the optic nerve. The rods are light-sensitive

nerve cells that are sensitive to light even at low illumination levels and only give a perception of black, grey and white. The cones are responsible for our ability to distinguish chromatic colours and operate at higher levels of light. Colour perception/ interpretation will be altered if any parts of the chromatic perception system malfunction. Aging can be one of the reasons for the malfunction. Anomalous colour vision, popularly misnamed "colour-blindness", is another example of this malfunction.

"Colour-Blindness"

Colour blindness can affects one's ability to interpret colour information. It is fairly common in humans: among men a frequency of about 8 per cent, and 0.5 per cent among women (Birren, 1961: 221). Red-green colour blindness is the most common affliction, while others may be deficient in yellow-blue discrimination or totally blind to the spectral hues. In R.W. G. Hunt's book, *Measuring Colour* (Horwood, 1992:35), the following is given as the proportion of the different kinds of colour blindness in the population:

	Male	Female
Protanopia [1]	1 %	0.02%
Deuteranopia [2]	1.1%	0.01%
Tritanopia [3]	0.002%	0.001%
Cone monochromatism	Rare	Rare
Rod monochromatism	0.003%	0.002%
Protanomaly	1.0%	0.02%
Duteranomaly	4.9%	0.38%

1. "Insensitivity to red light, causing confusion of greens, reds and yellows" (Pearsall ed., 1999: 1149)
2. "Insensitivity to green light, causing confusion of greens, reds and yellows" (Pearsall ed., 1999: 391)
3. "Insensitivity to blue light, causing confusion of greens and blues" (Pearsall ed., 1999: 1535)

Hunt further suggested that colour blindness maybe congenital or acquired, and that it is generally transmitted through the female side of the family (Hunt, 1992:35). However, cures for congenital colour blindness are yet to be found by the medical profession. Diseases of the eye, optic tract, or cortex may lead to colour blindness and often involve a general deficiency of vision. Acquired colour blindness may accompany pernicious anemia, vitamin B1 deficiency, or exposure to certain poisons such as carbon disulfide, lead or thallium (Birren, 1961: 222).

In normal colour vision the spectrum is made up of red, orange, yellow, green, blue and violet. All of these spectral colours may be created by the mixing of red, green and blue light. In anomalous trichromats, a kind of colour blindness, the perception of these coloured lights is abnormal. The proportions needed to create certain colours/ matches differ radically from the proportions made by a person with normal colour vision. People with this type of colour blindness would be confused when presented with pictures of fine distinctions or when the colours are in tone (Birren, 1961: 222). Yet in the case of dichromatic colour blindness, the afflicted individual only has two coloured lights with which to match all spectrum hues. The dichromat usually has visual discrimination for light-dark and for yellow-blue, but not for red-green. The dichromat may perceive hues of short wave length with a bluish (not greenish) tone, and hues of long wave length with a yellowish (not red or orange) tone (Birren, 1961: 223).

Afterimage

Afterimage is related to our perceptive mechanism in the experiencing of colour. Afterimage, or successive contrast, is understood as a fatigue effect (Mahnke, 1996: 73). An example of its occurrence is when one concentrates on a particular hue (e.g. red-purple) for some time and then shifts one's gaze to a white or grey surface; the complementary colour (e.g. in this case pale green) will appear upon that surface. Frank Mahnke explained the phenomenon as such: "As the cones in the retina adapt to a particular colour, let us say red, the red-sensitive photo-receptors will be temporarily fatigued and as the red stimulus is replaced by white, they respond less strongly to all the light rays reflected form the white surface. Only those sensitive to the complementary colour (in this case, blue-green) will function fully" (Mahnke, 1996: 73). It is a means for the body to find equilibrium and balance in the situation. The effect of afterimage is not permanent, but its occurrence can be disturbing. This may explain why most hospital gowns, cover sheets, and walls are green or blue-green nowadays - as opposed to white in the past – in order to eliminate the afterimage of blood and tissue, on which the image of the complementary colour of red will not show. Mahnke believes that the effect of afterimage is also a function of the body, seeking equilibrium between warm and cool colour (complementary colours) physiologically and psychologically (Mahnke, 1987: 28).

Colour Juxtaposition

Landscape architects should be aware that no colour is seen in isolation in the landscape. Any experience of colour is relative to its association with other colours, forms and

surface textures. Design elements can be perceived as larger or smaller than their actual sizes depending on the contrasting landscape that the elements are situated in. The size, shape, and even the angle and alignment of a particular colour application are all components that will make a difference in both a two-dimensional, pictorial sense and in a three-dimensional, proportional sense. Colour affects our senses, as demonstrated by Josef Albers' "Homage to the Square" series which will be explored here.

Josef Albers was a pioneer in viewing colour as a subject with its own identity, whereas traditional artists viewed colour as a dependent variable in describing an object. His paintings drew attention to the psychological effect, aesthetic experience, animation and mutability caused by the interaction and perception of colours (Weber, 1988: 12). To many, he was known as "the square man", for he spent the last twenty-five years of his life making over a thousand of his *Homages to the Square* paintings. Albers called the paintings "platters to serve colour", in which the different climates and effects of colour were presented, while viewers were able to explore the way solid colours changed qualities according to the colour's positions and surroundings in the painting. The square may appear to move in and out, up and down, increasing and diminishing according to the environment – a metamorphosis that is relevant to colour usage in the landscape. The juxtaposition of forms and of colours was of greater importance in a painting than the individual components it presented. As Weber stated:

> "... Colour behaviour can be compared to human behaviour. People, like colours, have one appearance when they are alone, another when they are with a group of family members whom they resemble physically and psychologically, and yet another when they are surrounded by strangers. Their relatives often mitigate their distinctiveness, while foreign visitors can intensify the dominance of certain characteristics by contrast. Even if

> people do not change, our view of them, just like our perception of colours, varies according to their surroundings."
>
> (Weber, Nicholas, 1988: 41)

In the many *Homages to the Square* paintings, Albers attempted to achieve a similar goal in demonstrating how the change of colours may transform both the emotional character and the apparent physical action of the forms. Radically different effects may also occur with two paintings of identical format but of different colour schemes. As more of an exploration of the visual aspect of colour than merely a piece of art, Albers used techniques that were unique to his drawing - for example, the application of unmixed colours straight from the manufacturer's tube, painted directly on white machine-made panels. Quantities of each colour were either equal to or proportional to the other colours on the painting, but no colour overlapped another. The manufacturers' names of the colours used were also listed on the reverse of the panel as a means of demonstrating the powerful illusionary and dynamic property of colour seen in the painting. (Weber, 1988: 36) The drawings almost appear to have been created in laboratory-like conditions, where maximum control measures were employed in the creation of geometric abstractions and where the property of colour attracts greater attention than the forms.

Despite Mist (1967) (Figure 4) is another example of the effect that a single colour can have on the perception of its neighboring colours. The elements, sizes and formats on the pair of paintings are identical, except for the colour of the outermost squares - one with Chapin Neutral #1 by Shiva and the other with Reilly's Grey #8 by Grumbacher. Both the middle and the second squares were painted with "Optic Grey #1 Warm" and "Optic Grey #1 Cool", made by the same manufacturer. However, the tones in the interior of the

two paintings appear to be different under most light conditions (Weber, 1988: 41). The movement, shapes and the proportions of the squares also appear to alter.

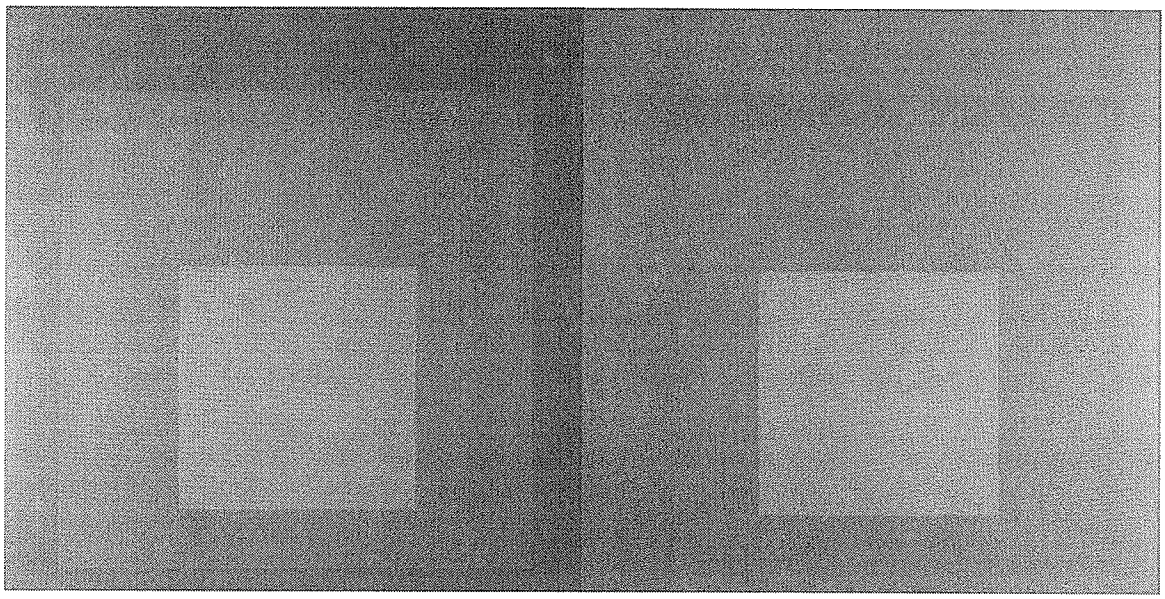


Figure 4 - *Homage to the Square: Despite Mist* by Josef Albers. 1967. Oil on Masonite, diptych, each panel 40 x 40" (101.6 x 101.6cm.) Collection Maximilian Schell. (Weber, 1988: 284-85)

The *Homage to the Square* series illustrates the subject of colour juxtaposition to the fullest degree. Colour changes an object's appearance, proportion and shape according to its association with other colours. Since no one colour is seen in isolation in the landscape, landscape architects should avoid the separation of each colour element. A holistic colour scheme should be designed to harmonize the existing and proposed elements within the context.

Additionally, besides the selection of hues to be used in an outdoor setting, the careful orchestration of the intervals between the saturation and lightness levels of the various colours is also important in environmental colouring. (Porter, 1982:90) An

understanding of colour intervals along all three dimensions of colour - hue, chroma and value is crucial for a successful scheme. In most situations, there should be a balance between the unity and complexity of colour application, since it is often most acceptable and preferred by the majority of the public. Landscape architects should avoid over stimulation and under stimulation. Colour variety should be rational and respectful, creating a linkage between landscape elements of different scales in the design.

One of the possible methods to address the issue of colour juxtaposition in a constructed landscape is to adopt the use of "material boards" that is often used in interior design. In almost all interior design projects, interior designers will put together samples of all the material that they intend to use on a piece of cardboard to determine if a chosen colour and texture is appropriate for the space. Landscape architects can develop a simplified version of the material board. By compiling the different colours and materials that are found in the relevant context - either the actual material, a collage of colour photographs or combination of both - along with the proposed colour scheme, the effects of colour juxtaposition can be perceived in the early stage of the design process. Although the size of the colour sample does play a role in affecting the appearance of colour, landscape architects can still be better informed when deciding the general direction for colour palette choices through this practice.

Non-physiological Factors in Colour Perception

In addition to the physiological aspects of colour perception, there are also non-physiological factors that can affect the understanding and interpretation of colour. One of these factors is culture. Colour is defined, practiced and perceived differently

according to the culture in question. For example, in most of sub-Saharan African societies, there are some situations where little importance is placed on the differences between red with brown or yellow, or even with green and blue, but knowing whether a colour is dry or damp, soft or hard, smooth or rough, mute or sonorous, joyful or sad are the fundamental aspects of understanding a colour. In West African culture, in Benin for example, the perception of colours and the vocabulary that expresses it varies according to gender, age and social status. In Japanese culture, for example, Japanese people are able to distinguish from the most somber to the most luminous of white, since the dullness or the shininess of a colour is a key characteristic. Japanese vocabulary devoted to white shades is much richer than that of European languages (Pastoureau, 2001: 175). These examples illustrate the necessity for researchers to keep in mind the profound cultural nature of colour perception, the important role of sense impression, and the mixing of sensory experience in the perception and understanding of colour.

The study of words describing colour in ninety-eight different languages has shown that no one language has only one word to describe colour. There are always two or more, and the basic two are always black and white. When there are three, the third is always red. Green or yellow will be added to the language if there are four; but both are included when there are five. If there are six, blue is one of them; brown if there are seven. Purple, pink, orange or grey will be included in the language if there are eight or more colour words. It is also interesting to note that out of the 2,048 possible combinations of the 11 words describing colour, only 22 are found in most languages (Lancaster, 1996:17,18).

Personal needs/background of an individual may also alter the perception and interpretation of colour. For groups who have a more or less professional need to exercise colour-discrimination, both the precise vocabulary and their perception of colour expands in order to communicate these discriminations to other people. For example, historians have studied groups of horse-breeders and traders and found that they have rare and highly specialized terms in describing the colours of horses: thirteen horse-colours in Latin during the fifth to the seventh century; eleven in Byzantine Greek; eight in Arab-Latin around the eleventh century; fourteen for the Spanish in the thirteenth century; thirty among the Kirghiz of the Steppes, and around sixty in western Russia in more recent times (Gage, 1993:79). It should be noted, therefore, that unless one's profession is required to engage in colour-technology, reduced colour-vocabulary has a powerful effect on the understanding and interpretation of colour for most people.

In short, colour-language and colour-perception are closely related to each other. It is also crucial for the purposes of this paper to keep in mind that since symbolism is essentially a linguistic function, the availability of colour vocabulary, inferring colour perception, has a decisive role in the creation of colour symbolism in the landscape of any culture. For example, if a landscape is designed with a colour that is nonexistent in that particular cultural landscape or local language, the purpose of creating an identity associated with the characteristic of the space, through the application of colour symbolism will be lost. The colour and the possibly even landscape that is created may become a foreign element to the culture.

Further Study on Colour Perception

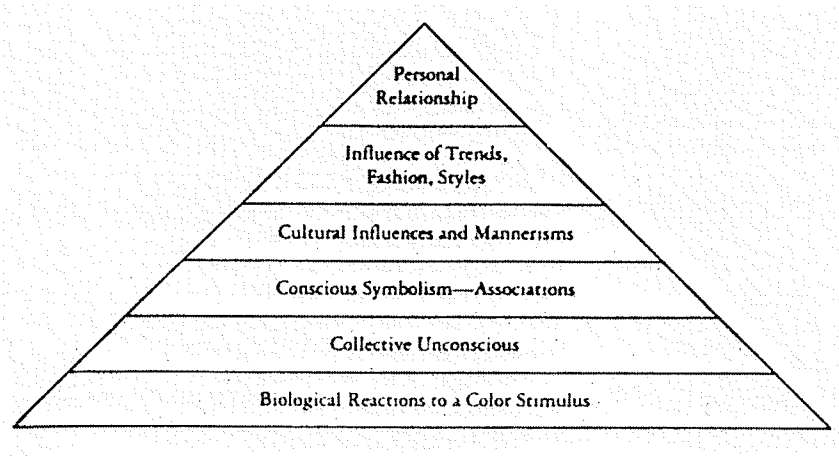


Figure 5 – The Colour Experience Pyramid (Mahnke, 1996:11)

Frank Mahnke's book, *Colour, Environment, and Human Response.* (Van Nostrand Reinhold, 1996: p10-18), is a detailed study of the factors that influence experience and reaction to colour. Using a pyramid to illustrate this (Figure 5), the first level is our inescapable biological reactions to colour stimuli. The process of photosynthesis is an example of this level where the survival of a plant is reliant on the pigment chlorophyll, by which the red, yellow, blue and violet wavelengths of the light spectrum are absorbed to manufacture carbohydrates from water and carbon dioxide. Plants and animals that display signal colouration as a means of maximizing the opportunity for germination, reproduction, protection, and preservation, provide another example of biological reaction to colour. In the evolution of the human species, the messages conveyed by signal colouration are critical to our survival. Significant guidance is given by the colour of the seasons, the natural environment, and edible or inedible food, for example. A further aspect of biological reaction to colour, unconnected to colour as a message carrier, is direct physiological reaction to colour stimulation. For example, it has been

found that the activity of mice reduces under green and blue light; chickens will lay more eggs under red light, and artificial "white" light will cause the production of the stress hormone cortisol in human beings (Mahnke, 1996: 12).

The second level of the Mahnke's "Colour Experience Pyramid" is our association from the collective unconscious (Mahnke, 1996: 13). This level is not controlled or caused by the intellect or by conscious rational deliberation; instead it is based on personal experience amassed during one's lifetime. The contents of the collective unconscious are "fundamental images formed in our development as a species" (Mahnke, 1996: 14). These unconscious images refer to the earliest development of the psyche and are the predispositions or potentialities for reacting to or experiencing the world in similar approaches to human ancestors. In short, it is the "inborn" knowledge that we inherited that helps us to sort out, recognize, or interpret the numerous pieces of sensory information, data, and signals that have occurred to us since birth. Examples are an infant's immediate recognition of a human face or a human's appreciation of the aesthetic qualities identified or connected with colour (Mahnke, 1996: 14, 15).

Above the level of collective unconsciousness lies the level of conscious symbolisms or the associative quality of colour (Mahnke, 1996: 16). This application of colour associations and their symbolic content is of great significance in human history. Throughout civilization, the symbolism of colour has been used in religion, medicine, mythology, alchemy, astrology, art, sports and ceremonies such as birth, marriage and

death. Today, it is also important in the fields of advertising, fashion, product design, graphic design and, of course, environmental design.

Closely related to the level of conscious symbolism through association is colour experience through cultural influences and mannerisms. Among the many human cultures and social groups there exists some commonality in the interpretation of colours. For example, in most cultures, blue is usually associated with sky and water; green with nature and red with revolution. Meanwhile, cultural differences are also evident. One example is the Japanese preference for the gentle colouring of water, sky, and wood, compared with an Indian inclination towards vivid colours in arts and crafts.

The next level that influences the overall way we experience colour is colour trends. Mahnke argued that colour changes are a response to the Zeitgeist, the spirit of a particular time, and that this is a guard against consumer boredom (Mahnke, 1996: 17). Colour trends change more rapidly in fashion and consumer products and are relatively slower to change in architecture and environmental design. This may result from concern about stifling an individual's creative freedom and the wide-spreading, long-term impact architectural colours may have on user groups and the surroundings.

On the highest level of the pyramid is the personal relationship that an individual may have to colour. It expresses our likes and indifference or dislikes of certain colours. It is made up of the interrelationships among all the levels of the pyramid, consciously and unconsciously (Mahnke, 1996: 18).

Mahnke has summarized the human experience of colour as:

> "Colour, which is created by light, is therefore a form of energy, and this energy affects body function just as it influences mind and emotion. We know that colour affects cortical activation (brain waves); functions of the autonomic nervous system (which regulates the body's internal environment), and hormonal activity; and that colour arouses definite emotional and aesthetic associations. In short, our response to colour is total; it influences us both psychologically and physiologically."
>
> (Mahnke, 1996: 18)

Colour Attributes

Colour Temperature

In 1976 an experiment was conducted to study the relationship between colour and the sensing of temperature (Porter & Mikellides, 1976: 100). Subjects were put in a space where the change in the temperature remained consistent but five colours of diffuse illumination: green, blue, yellow, amber and white were being used at different times within the time frame of the experiment. The findings from the experiment suggest that although there were no significant differences between apparent levels of discomfort between the colours of illumination, the amount of heat that each colour transmitted was ranked differently by the subjects: Green and blue were ordered as the coolest, yellow and amber the warmest, and white as more temperature neutral. Another study showing similar results suggests that people would have a tendency to set their thermostat four degrees Fahrenheit higher in a blue room than in a red room (Mahnke, 1996: 73). In other laboratory experiments, researchers found that the colour red would stimulate the nervous system, which included a rise in blood pressure and speeding up of respiration rate and heart beat (Porter and Mikellides, 1976: 13). It should be noted, however, that

due to the many contradicting results regarding the therapeutic use of colour with emotionally and mentally ill patients, its use as a medical instrument still requires further investigation, and is outside the scope of this thesis.

Research by Benjamin Wright in 1962 suggests that the effect of hue is more definitive than that of brightness and saturation, and that an increase in saturation, to an extent, correlates with an increase in warmth rating (Porter & Mikellides, 1976: 100). These findings may become a helpful tool in environments with extreme weather; colour can be used to create an allusion of a landscape with an apparent temperature that is more comfortable to the human body.

Colour Depth

Two theories have been proposed with respect to the illusion of depth generated by certain colours (Porter & Mikellides, 1976: 100). S.H. Bartley suggested in 1958 that apparent depth is caused by chromatic aberration, and that radiation of longer wavelengths (e.g. a red object) would be focused closer to the lens within the eye (i.e. appear closer) than an identical object with radiation of longer wavelengths (e.g. a blue object). The second theory, suggested by W.H. Ittleson in his paper "Visual Space Perception" (1960), explores the figure-ground interaction – the more a colour differs from its background the closer it seems; and closer the object's colour to the background, the more the object recedes into the background. Furthermore, objects of lighter colour would also appear to be nearer and larger than a darker object of the same size at the same physical distance. Perceived colour distance related to architectural space is,

however, slightly different from the results with objects. An experiment conducted by Randall M. Hanes in 1960 suggests that with different coloured walls located at the same distance from the observer, the yellow and green walls were judged to be the most advancing, black was seen as the least advancing, and white occupied the fourth position out of the eight coloured walls (Porter & Mikellides, 1976: 100). The theory can be used in creating "outdoor rooms". An understanding of colour depth provides landscape architects with a tool in selecting appropriate colour(s) when designing an enclosed landscape setting, for example, a courtyard.

It is also interesting to note that some researchers have found that because of the receding nature of blue, an empty space in a parking lot between two blue cars would appear wider (spatial expansion), and hence blue cars would be more likely to suffer more "dings" than those of other colours (Porter and Mikellides, 1976: 15). It is, however, important to note that when a number of colours are involved, hue alone does not determine the spatial characteristics of colour. Contrasts of value and chromatic intensity are important in some circumstances and can become controlling factors (Porter, 1982:86).

Colour Weight

Various experiments have been conducted regarding the apparent "weight" of colour (Porter & Mikellides, 1976: 99). Findings from these experiments suggested that the apparent heaviness of colour is independent of brightness. Hue is the determining matter in this subject area. Results of the experiment indicate statistically an apparent ordering of weight, which, reading from heaviest to lightest, are red, blue, purple, orange, green,

yellow. In other words, yellow objects were judged as significantly the lightest and red the heaviest. In general, the darker (or more saturated) and warmer the hue of the object, the higher the tendency for it to be perceived as being heavier (Mahnke, 1996: 59). Hence a piece of landscape sculpture painted with dark colour may appear unstable on a light-coloured base.

In terms of apparent size of colours, yellow and white will appear to be largest, then red, green and blue (Birren, 1961: 243). It is, however, essential to consider the context in which the object is situated when determining the actual result.

Colour and Perception of Noise and Sound

Another aspect of colour that is of interest to landscape architects is the relationship between colour and sound. Loud noises make the eye more sensitive to green and less sensitive to red. People generally would associate loudness with warm colours (e.g. a loud red). Hence a noisy and bothersome landscape setting situated with colours like red or yellow would tend to be experienced negatively (Mahnke, 1996: 74). Paley Park in Midtown Manhattan, New York is one example of the landscape architect using a simple colour palette to create a relaxing environment.

The Functional Aspect of Colour

There are aspects of the functionality of colour in landscape architecture in addition to the functions which were discussed in the previous chapter. For instance, colour often acts as a signal in nature. It indicates attraction or warning, safety or danger. The red spot on a

gull's beak is a sign of attraction, while the red and yellow colours of poisonous tree frogs are signs of warning for other animals. Humans tend to have a remarkable ability to discriminate by colour between the edible and the inedible, the healthy or 'off-colour'. Blue in food is one of the prime examples. Experiments show that people who have consumed blue dyed vegetables would become decidedly ill but would be tested as happy with blue sweets that were artificially coloured (Porter and Mikellides, 1976: 15).

Colour Function in Human Civilization

Colour has long been believed to have the power to affect the well-being and health of people. Primitive cave dwellers in Lascaux, France used colour to enhance narratives drawn on the wall, as well as to project magical meaning that could, in their belief, be vital to the continued existence of the human race (Porter & Mikellides, 1976: 22). As Porter and Mikellides suggested, it was common in primitive and ancient cultures to use colour symbolism in areas "such as religion, mythology and astrology, ceremonial occasions, for healing purposes; and to denote social status, race, and the elements of science and points of the compass" (Porter & Mikellides, 1976: 23).

Colour and caste have been closely related through the centuries. Throughout the history of human civilization, colour has served as a sign of social classification, especially through social dress code in creating segregation between people. People had to wear garments with colour appropriate to their gender, estate, dignity and rank. For example, during the late Middle Ages, under the influences of sumptuary laws and dress regulations throughout Christendom, black and/or white were assigned to the poor and

the sick; yellow to counterfeiters, heretics and Jews; green to musicians, minstrels, buffoons and fools; red to executioners and prostitutes (Pastoureau, 2001: 86,93-94). It should also be noted that the system of colour codes changed from period to period, and from city to city. Prostitutes, for example, were labeled by red in the Medieval age; but the sign of a prostitute was a yellow scarf in Venice in 1407; a white cloak in Milan in 1412; a double red-and-white cloak in Cologne in 1423; a green scarf in Bologna in 1456; a black cloak in Milan in 1498 and green-and-yellow sleeves in Seville in 1502 (Pastoureau, 2001: 94).

Superstition in the Use of Colour

Colour has a long history of playing a mystical role in the creation of harmony with nature and protection from evil. Thus, superstitious use of colour is another important topic in the study of purpose and symbolism in the human use of colour. Across different cultures, colour or objects related to colour have been accorded mystical significance. For example, a Hindu mother in India will put daubs of black on the nose and forehead or on the eyelids of her baby as a means of protection from evil forces. She would also tie a piece of blue or white cloth to her dress. In Scotland, a piece of red ribbon would be tied around a newborn's neck, making it safe from evil. A ring or amulet of red chalcedony would be worn in parts of England; and in Italy, "a piece of coral held the needed power" (Birren, 1961: 30). In ancient Egypt and Babylon, amulets of gems of different hues were believed to bring blessing to the wearers. Amulets were to be worn near the forehead or scalp, or against the ears, heart, wrist, spine or genital organs. Red, blue, yellow, green, and white were the preferred colours, each with different meaning.

> "Red stones were efficacious in the treatment of disease and in protecting their wearers from fire and lightning. Blue and violet stones were associated with virtue and faith.... Yellow stones brought happiness and prosperity. Green stones caused fertility in man and beast and had mysterious connection with vegetation, rain and strength generally. White stones averted the evil eye and, because they were thought to come from heaven, carried with them the protection of heaven."
>
> (Birren, 1961: 31)

Animals were also protected by having red strings and bits of cloth tied around them in Scotland, Hungary, Portugal, Norway, Denmark and Germany; a similar practice with blue strings is also performed in Afghanistan, Syria and Macedonia (Birren, 1961: 39). Although the superstitious use of color has no scientific background to support it, the existence of colour symbolism in different cultures is evident in these examples. An acknowledgement of cultural attitudes to colour is essential in designing any constructed landscape with colour.

History and Evolution

Further along the functional aspect of colour are the history and evolution of colour itself. New opportunities for human expression have arisen since the development of colour photography, colour television and mass media. Colour surrounds us in such profusion today that it is easy for us to take it for granted (Faulkner, 1972: 4). We often do not realize that much of the terminology that designers use today - the spectrum, the colour wheel, and the notion of primary colour - results from continuously developing knowledge. During the seventeenth century, the spectrum, with its natural order of colours, was made known to humankind. The notion of primary and secondary colours started to emerge but did not become common until the nineteenth century. Colours were

imbued with significance by the earliest human societies. The significance of different colours at different times - such as blue being recognized as a warm colour in Medieval and Renaissance Europe – was influenced by cultural convention of fashion and by particularities of location (Pastoureau, 2001: 9, 181). Pastoureau suggested that colour is a natural phenomenon that is closely related to the complexity of social and cultural constructs. The interpretation of colour is ultimately a social phenomenon: society gives it meanings, defines it, constructs its codes and value, and determines if the colour is "acceptable" or not (Pastoureau, 2001: 7,10). It is therefore important to take a brief look at the history and evolution of colour in western cultures as a means of understanding the subject.

The Ancient World

"Nearly all of early colour expression concerned mysticism and the enigmas of life and death" (Birren, 1961: 3). Colour was believed to be important to the welfare of humanity. In ancient cultures colour was mainly used as a symbolic, and sometimes mystical, vehicle for protecting humans from spiritual forces. It was also used to represent an abstract idea not necessarily impelled by aesthetic urges or sensuous delights (Birren, 1961: 3). Colour was used as a sacred formula rooted in mysticism until the Renaissance when it was developed to be a function of an artist's individual expression of beauty (Mahnke, 1996: 29).

Before much was known about the nature or the universe, humankind believed that survival was a function of one's harmony with divine forces and colour was an important

means of achieving this aim (Birren, 1961: 13). As mentioned earlier, a vast range of colours can be found in the cave paintings of Lascaux, France. Primitive cave dwellers projected their perceptions of their struggle to survive in the form of painted images. It is believed that they used colours both as a means of enhancing the aesthetic value of form and shape, in conveying a potent, magical meaning that could be critical to their survival, and in using colour for its own sake, as demonstrated in abstract designs painted high on the walls of the cave. In almost all primitive and ancient cultures, coloured images were created to protect people from spiritual powers that were to them as real as the forces of nature. Strong, saturated hues were often used: namely red, blue, yellow, green, black, and white, together with precious metals like silver and gold.

In ancient cultures, different colours signified different meanings. The people of Tibet in Central Asia used colours to represent the different directions: yellow to represent north, blue for south, white for east, and red for west. Similarly, colour was used in some cultures to represent each of the twelve constellations in some cultures: "red for Aries, dark green for Taurus, brown for Gemini, silver for Cancer, gold for Leo, variegated hues for Virgo, clear green for Libra, vermilion for Scorpio, sky-blue for Sagittarius, black for Capricorn, grey for Aquarius, sea-blue for Pisces" (Birren, 1961: 12). Although, the origin of these colour associations is unclear, they have become part of the cultural heritage. Furthermore, there is a long history of using different symbolic colours in representing the different religious groups. In the orient yellow is considered a sacred colour for Brahmans; Buddhism is represented by yellow and gold; and Confucius is identified with black and white. Green is the colour of the followers of Mohammed - the

Koran states, "As to those who believe and do good works ... for them are prepared gardens of eternal abode... They shall be adorned therein with bracelets of gold, and shall be clothed in green garments of fine silks and brocades, reposing themselves therein on thrones" (Birren, 1961: 4). In Judaism, the veils were said to be composed of four elements signified by different colours: white signified the earth, purple signified the sea, blue signified the air and red signified fire. This information on colour associated with religions may be a helpful tool in establishing identity in a landscape that is related to a religious setting, for example, churches, temples or cemeteries. The use of colour design reinforces the values of the religious and the cultural groups.

The ancient Egyptians had a colour symbolism system that pervaded their art and culture. "The hues of the rainbow were as significant as language and were generally a part of hieroglyphics" (Birren, 1961: 4). Their architecture, for example temples, talismans and charms, was rich in colour tokens as prescribed by the magicians, who wore blue breast-plates to represent the sacredness of their judgment (Birren, 1961: 8). It is also said that the Pharaoh would wear a white crown to symbolize his dominion over Upper Egypt, and red for authority over Lower Egypt. The ceilings of temples were coloured blue, representing the sky, and green, which symbolized the meadows of the Nile.

In the Mesopotamian civilization, colours were assigned according to the solar system. In C. L. Woolley's *Ur of the Chaldees*, a ziggurat described as the "Mountain of God" was built in four stages, where each stage conveyed a different message. The lowest wall was black, representing the dark underworld, while the red upper wall represented the

habitable earth. A blue tiled shrine with a gilded metal roof on the top of the structure conveyed the heavens and the sun (Porter & Mikellides, 1976: 22).

Use of colour was passed on from Mesopotamia via Asia Minor to the ancient Greeks, a culture that continues to influence present-day Western civilization. It is a widespread misunderstanding that early Greek architecture used little applied colour. During the mid-eighteenth century archaeologists announced the discovery of colour in the Greek temples and statues and disproved the common misconception that ancient architecture emphasized only form and space (Porter, 1982:9). The ancient Greeks had indeed used colours in most of their houses and temples. Most Greek architecture was colour-washed, predominantly painted with red, black, yellow, white and the less-prized blue, with the exception of a surface of gold and silver (Pastoureau, 2001: 24). The internal and external friezes of the Parthenon, for example, are believed to have been gilded and painted in contrasting hues in 432 B.C. Colours were also found as a symbolic element in narrating the mythology of the Greek Golden age (e.g. blue for "truth and integrity", white for "virginity", and red for "love" and sacrifice") (Porter, 1982:10,13) (Figure 6 - below). There is one theory which asserts that the Greek's polychromatic creation is related to their belief that the natural colouration of wood, marble, ivory and bronze was no substitute for the artistic creation of the city as a total art form. Another theory suggested that colour is used as a device to intensify form, and to create an optical illusion. For example, red, an optically "heavy" colour, was used for the columns in Knossos (a Minoan settlement on the Greek island of Crete), to emphasize the weight borne by supports, while creating contrast with the blue of Aegean Sea and

Mediterranean sky (Figure 7) (Porter, 1982:13). While architectural elaborations, sculpture and paintings were polychromatic, some statues even went to the extent of having red lips, green irises, black outlined eyebrows and eyelids, false eyelashes, bright blue hair, and possibly precious stones simulating flashing eyes in their flesh-coloured stone heads (Porter, 1982:10).

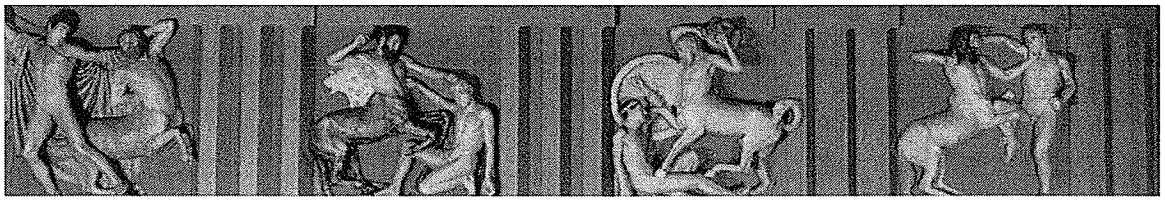


Figure 6 – Reconstruction of the original colours of the Parthenon frieze by the Royal Ontario Museum. Courtesy: Royal Ontario Museum (Porter, 1982: 10).

Figure 7 – Restoration of Palace of Minos columns, Knossos, Crete by Sir Arthur Evans. Use of red pigment emphasized the weight of the structure. Ontario Museum. Photo: William Taylor (Porter, 1982: 14).

In the twelfth century prominent ecclesiastical writers generated more discussion on colour and tended to agree on the meaning of the three principal hues: white, black and red. White symbolized purity and innocence. Black denoted abstinence, penance, and suffering. Red represented the blood spilled by, and for Christ, and hence the passion, martyrdom, sacrifice and divine love. Blue was not mentioned in the discussion and consensus was not found for the meanings of green, violet, grey or yellow (Pastoureau, 2001: 37).

During the late twelfth century, Pope Innocent III pronounced that the dioceses should follow the customs of Rome, which included enforcing a more homogeneous use of liturgical colours throughout Western Christendom (Pastoureau, 2001: 39). From a symbolic and practical perspective, the Pope addressed the role of colour as follows:

> White – symbolizes purity, to be used for the feast days of angels, virgins, confessors, and for Christmas, epiphany, Holy Thursday, Easter Sunday, the Ascension, and All Saints Day.
>
> Red – represents the blood spilled by and for Christ, used for the feast of martyrs, apostles, and the holy cross and for Pentecost.
>
> Black – symbolizes grief and penance, used for masses for the deceased, feast of the holy innocents, and during Lent and the Advent season. The colour can sometimes be replaced by violet.

It should also be noted that it was during the thirteenth century, while a new social order was being established, that a new order of colours had also started to emerge (Pastoureau, 2001: 81,83). The simplicity of the old system, with red, white and black as the three "primary" colours, which had been the focal point of Western colour systems

since antiquity, started to be replaced by the six basic colour system (white, red, black, blue, green and yellow), with a much richer and more subtle combination for its emblems, representational codes and symbolic systems. This shift in the colour system and its perception indicated that a much more complex society was forming.

The increased knowledge of pigment, pottery glazing, and especially glass-making skills contributed to the rich architectural colour in the medieval period (550-1400 A.D.) (Porter, 1982:16). Polychromatic mosaics had an important role on the colour stage during the Roman and Byzantine period (Verlag, 1961:9). The stained glass window is the signature of the medieval period. While the sun poured into medieval cathedrals, the brightly painted surfaces of the interiors became multi-coloured. As for the exteriors of medieval architecture, researchers have found traces of colour in French cathedrals; for example, spots of red, blue and green at Angers, and red on Notre Dame. Colour usage took on a more dominant role again in the Romanesque and Early Gothic period (around 1000-1150 A.D.). Instead of multitudinous shading and chromatic variations as seen in art and architecture of the previous period, a simple and clear symbolic effect was sought during this time.

As new brands of Christianity emerged, particularly the Protestant Reformation and Puritanism, society managed to rid religious buildings of their sensuous and pagan overtone; people instead valued simplicity, chromatic austerity and uniformity. Vibrant use of colour in architecture started to disappear after the Gothic period (1150-1400 A.D.) (Porter, 1982: 38). The colour red was no longer seen as a symbol of the blood of

Christ, but of the worst forms of luxury and sin - the folly of humanity (Pastoureau, 2001: 101). A continuity of the moralistic discourse on colour use in Europe could be recognized. It had its origins in Cistercian art in the twelfth century and moved onto the early Reformation's anticolour movement in the fourteenth and fifteenth centuries, to Calvinist and Jansentist painting in the seventeenth century. These were the "chromatic puritans"; the idea that colour implicated luxury, artifice, and illusion had repeated itself. It was not until the Baroque period (late seventeenth and eighteenth century), that the Catholic Church had fully become, once again, the sanctuary of colour that it had been during the Romanesque and Early Gothic period (around 1000-1150 A.D.) (Pastoureau, 2001: 107,108).

Colour was employed as a tool for chiaroscuro during the Renaissance period, where the effect of depth and contrast rather than the actual content, became the focus. As the Renaissance progressed into the Baroque period, colour tended to be further detached from objective denotation, but, instead, an abstract means of rhythmic articulation assisted in the creation of illusions of depth. Confined colour choice dominated in the art world during the Classical period as a means of achieving realism in paintings. However, the situation changed dramatically with the Romantic Movement that followed where more vivid colours were chosen as a psychological-expressive medium. A similar theme was also resorted by the Expressionists in the later period of art history (Verlag, 1961:10).

A breakthrough in colour theory occurred in the seventeenth century when Sir Isaac Newton suggested that white light radiates the entire spectrum. He argued that all perceived colours, whether of lights or objects, are essentially radiating portions of the spectrum. The new order of colour confirmed the long-held belief that black and white were excluded from the colour universe. It altered the view that red occupied the central position on the ancient and medieval colour system; indeed it was suggested that blue and green were at the centre of the spectrum (Pastoureau, 2001: 101). Newton also produced the first colour circle by simply joining the two ends of the visible spectrum, which became the foundation stone in systematic organization of surface colour dimensions. Colour theorists such as Goethe and Chevreul in the nineteenth century and Ostwald and Munsell in the early twentieth century were some of the outstanding personae in the classification of surface colour. Their theories were built on Newton's discovery (Porter, 1982:79). While colourimetry (or the "measurement of colour", which consists of the study and description of colour) began to integrate the realm of the arts with quantifiable colour science, there was an explosion in chromatic scales, charts and samplers declaring numbers, laws and norms to define the nature of colour during the late seventeenth and early eighteenth century. Colour was no longer a mystery; the "men of science" mastered it (Pastoureau, 2001: 109).

The impact of Newton's research also extended to human definition of the primary colours. There were no longer the six basic colours (red, white, black, yellow, green, and blue) as identified in the Middle Ages and the Renaissance, but three – red, blue and yellow, which were discovered by the industry of colour engraving. They found that

these colours could produce all the colours in the spectrum (Pastoureau, 2001: 122). White and black were excluded from the realm of colour, and green lost its status in the colour hierarchy, as it was viewed as a product of yellow and blue for the first time in western culture.

The Modern Age

In the early nineteenth century attention was paid to the influence and rationale of colour. The colour system was further explored and developed, and chemical research produced a large number of new pigments that were critical for colour application in the architectural environment. The notion of cold and warm colour was experienced in paintings and study of the relationship between the light quality and the landscape gave inspiration to Impressionism (Verlag, 1961:11). By the late nineteenth century, colour had become a central element for European painters and the public. Colour, for probably the first time in history, had become "independent". It became a tool for non-representational art, and the autonomy of colour inspired various art movements among artists and designers in the field of visual art. Colour in a piece of painting was not necessarily a representation of either an object, or even an intellectual symbol, but an entity of its own, in which the harmony between geometric forms and the pure spectral colours was sought (as illustrated in Josef Albers's *Homage to the Square* series) (Verlag, 1961:12). The notion that colour has its own grammatical structures and is seen as a universal language, similar to music, was also popular at the end of the nineteenth century (Gage, 1993: 247). Ostwald in Germany and Munsell in the United States, who

had introduced new colour-order systems during the same period, further reinforced this notion.

Delicate pastel tones were popular at the turn of the nineteenth century. An explosion of colour occurred before World War I and there was a more subdued and quieter colour choice in the European exterior and interior of architecture during the 1920s and 1930s (Mahnke, 1996: 17). Colour in architecture did, however, have a brief period of rediscovery during the 1920s with the De Stijl movement. With the signature piece of the movement, the Schroder House (Figure 8), architect Gerrit Rietveld used primary colours on the building, not for symbolic purposes, but as a tool to control the spatial effects of sthe internal and external planes of the construction (Porter, 1982:18).

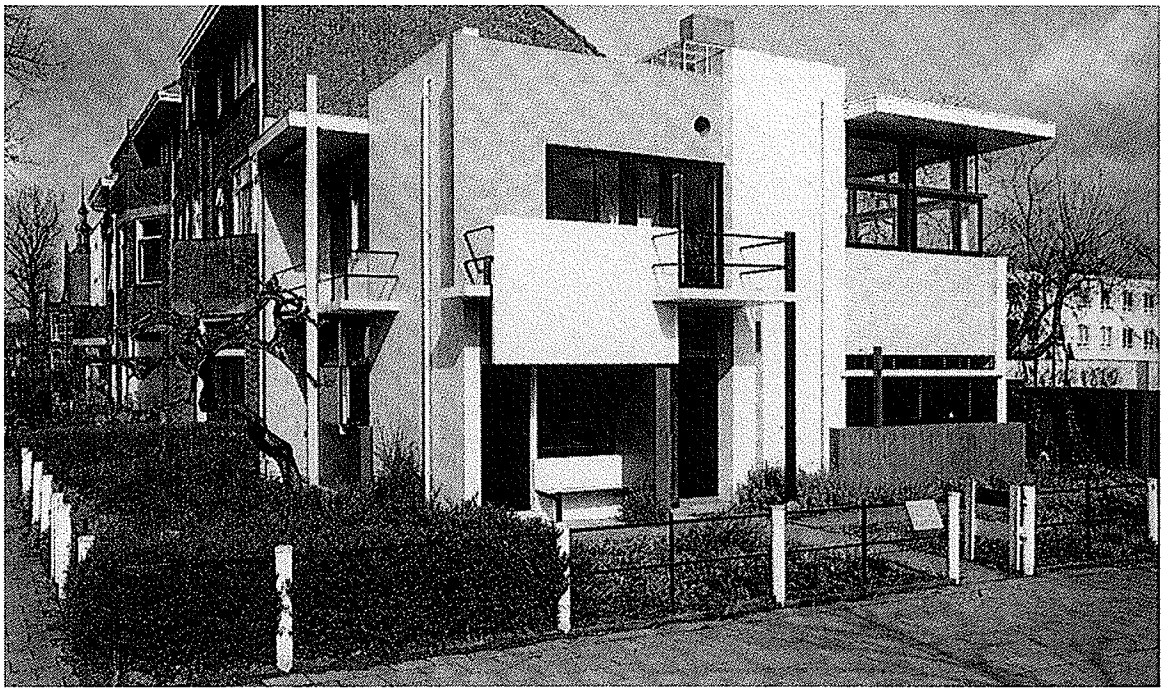


Figure 8 – Expression of geometric forms and primary colours in the Schroder House by Gerrit Rietveld (Stevenson, 1997: 2).

During the 1950s, shortly after the end of World War II, the profession of colour designer started to develop in Europe, especially as an aid to industrial architecture. With strong influence from the Bauhaus, mainly in terms of form, the "International Style" which began to boom in the 1950s tended to use black, white and grey for most of the architectural elements in buildings (Marberry, 1994:16). It is interesting to note that interior designers used bold colours (eg. intense yellows, red-orange, greens and cobalt blues) during the same period, as a method of contrasting/ balancing the purist's palette of white, grey and black. More complex colours were favoured for interior space in this era.

Around 1960, with the appearance of large apartment complexes, more personalized colour schemes were needed for these often sombre and repetitive buildings (Lenclos, 1999: vii). It was a period when concern with form was more dominant in architecture and sculpture circles. The importance of colour was conversely reduced. This concern with form and preference for greyness in environmental design was especially evident during the post-war period. Hence, in the sixties, the young generation started to rebel against the colourless urban environment and the monotony of city life. Fashion, as a reflection of a similar trend, was also filled with colourful, bright garments for men and women (Porter & Mikellides, 1976: 28). Murals and supergraphics were placed next to billboards and traffic signs with the intention of bringing art outside of the studio / gallery realm, while encouraging greater interaction between the community, the environment and designers. Large scale murals using fresh colour, by artists like Alan D'Archangelo or Paul Levy, transformed the landscape of New York City, while helping to lower the

crime rate and increase participation in community affairs (Porter & Mikellides, 1976: 30). By employing colour as a means of humanizing the built environment, artists were able to be more involved in the planning stage of projects. This movement in the 1960s not only promoted the status and the involvement of artists in enriching the environment, "it heralds a rejection of drab and derelict environment" (Porter & Mikellides, 1976: 30).

In the 1970s an increasing use of factory-coloured and self-coloured building materials promoted a more individualistic and colourful expression in architecture. Materials such as vitreous enamel, tinted glass, colour-mixed brickwork, plasticized stucco, anodized and plastic-coated metals, stains and colouring agents were being experimented with by architects of the period. With the more advanced knowledge of glass and other building materials, walls were allowed to be behind structural frames, and the exposed structural elements became prime objects for experiments in the use of colour (Porter, 1982: 61). Furthermore, by the end of the 1970s, greater ranges of colour were used on more building exteriors as a way to "highlight details, coordinate with the landscape, or reduce mass and volumes (Marberry, 1994: 65). Colour was being embraced as an ornament. The use of colour also appealed to architects as a compositional element that could suggest a more complicated mood by the activation or delineation of the space through the different characteristics of colour (Porter & Mikellides, 1976: 47).

In terms of colour trends, from the 1980s forward, colours that represented Modernism, High-tech and Post Modernism (from bright shades to matted pastel) dominated Western architectural design (Mahnke, 1996: 17). This tradition of Modernism and the domination

of colourless architecture and landscape design for most of the twentieth century could owe its root to the tradition of the Bauhaus - many successful practising architects were trained at the Ivy League Schools, which were heavily influenced by the Bauhaus. Grey, three-dimensional cardboard models were one of the most heavily used modeling communication techniques by architecture students. These models, which refrained from any display of colour, texture and material, became manifest in buildings with raw concrete exteriors and interiors. These raw concrete buildings often satisfied the purist aesthetic and minimalist preference of the modernist designer. However, they had a great possibility of creating a negative effect with the building users, who often prefer a variation in colour and texture of natural materials, as a form of expression of affluence.

As the economy improved and standards of living increased, "Pop Architecture" came into fashion. Public taste tended to be richer in symbolism, decoration and colour, as opposed to the hardness and uniform greyness of the forms created by the modern architectural movement (Porter and Mikellides, 1976: 17). By the 1990s the inherent texture and colour of construction materials (e.g. wood, brick, stone) were emphasized (Marberry, 1994: 107). The palette was polychromatic, but economical and minimal.

As seen throughout different periods of history, humans have had a fascination with colour and with the symbolic and practical use of colour in the environment. There is a notion of the colour continuum, where periods of high architectural colouration have been preceded (and followed) by periods of more neutral architectural colouration. In the twentieth century landscape architecture was dominated by designs that tended to be

minimalist, influenced by the Modern Movement and the International Style. Designs were mainly based on variations of white, which, it was argued, would allow "the colours and light in the surrounding environment to reflect into the space: thus the design lives in its site" (Linton, 1999: xv). However, some would argue that these designs were merely a demonstration of the limitation in design disciplines, in which colour was considered merely as an afterthought, or a kind of decoration that is unnecessary in a "civilized society". As we arrived into the twenty-first century, designs consisting of more vibrant colour have started to take the stage once again, as illustrated in Chapter 5.

This chapter has discussed very briefly the primary aspects of colour – colour theory, physiological and non-physiological factors in colour perception, colour attributes and its history and evolution. It is intended to open up discussion between landscape architects and to help designers to treat colour usage as a fundamental design strategy. In the following chapter, greater attention will be drawn to the contextual factors in the environment that may be determinants in colour decisions in the practice of landscape architecture.

Chapter Three

Colour and Context

Chapter 3 - Colour and Context

Introduction

Context should inform the choices of colour application in landscape architecture. Designing with colour in the landscape is often more complicated than using colour in fine art. It cannot be treated in isolation, for it has a direct influence on its surroundings and should be informed by them. Site analysis is crucial in and around the location of a landscape architectural project in order to avoid the application of colours on the basis of generalities. The physical, environmental, social, political, economical and cultural factors of the site can assist landscape architects in making colour decisions that are sensitive to the context.

Physical Factors

Scale of the Site

The scale of the site determines the distance from which colour will be viewed, in turn affecting the perception of colour in landscape architecture. For example, bright reflective yellow and orange are often used for sea rescue services for their "advancing" characteristics and visibility at a distance. A colour such as red, however, tends to darken quickly when seen from a distance. Some colour combinations will merge with one another and the colour distinction between some painted surfaces and their natural materials start to disappear at a relatively short distance, where textures are no longer discernible. The uniform colour of bricks and mortar in a wall when seen from a distance is such an example (Lancaster, 1996: 28). Hence, landscape architects should be concerned about the process of colour assimilation. Designers should take into account

the intended distance from which the user group is going to view the constructed landscape or feature and determine what degree of visibility is desired for the final product. Perceived textures may also vary with scale and distance under different contexts. For example, the perceived texture of a rough surface seen from close proximity may have an effect equivalent to that of a ribbed material seen from further away.

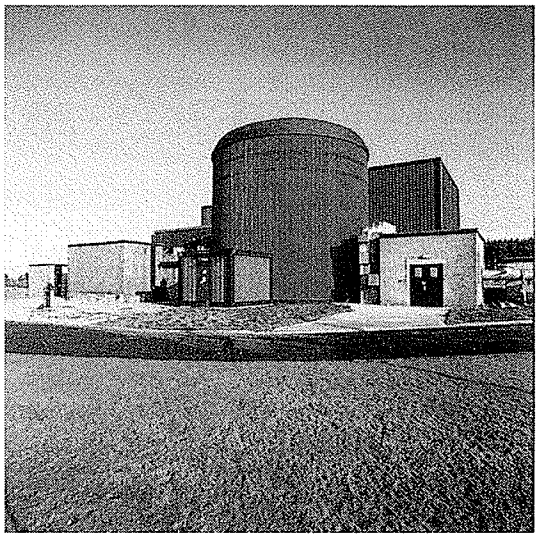
Size of the Audience

Landscape architects should consider the size of the audience to which colour is going to be most appealing - on a "macro" level or a "micro" level, especially if the symbolic aspect of colour is part of the design intent. Although there is a general understanding of meanings associated with certain colours in each culture, there usually exists another level of meaning that is only understood by the local population or a certain group of people native to the vernacular landscape. It is a form of "insider knowledge" on a "micro level". If colours were applied with sensitivity, this translation of information could be a powerful tool for incorporating the spirit of the place into the design and establish local distinctiveness as a result.

Character of the location

Colour application should be responsive to the atmosphere and mood and be appropriate to the place and support the function of the landscape. This can be achieved either through related or contrasting colour harmonies. For example, at the Winfrith Technology Centre in Dorset, England (Figure 9), the application of dark red, orange-yellow, dark brown and bright pink has blended effectively with the characteristic colours

of the landscape when seen from a distance and creates a fresh and lively spirit seen from a close distance (Lancaster, 1996:15).



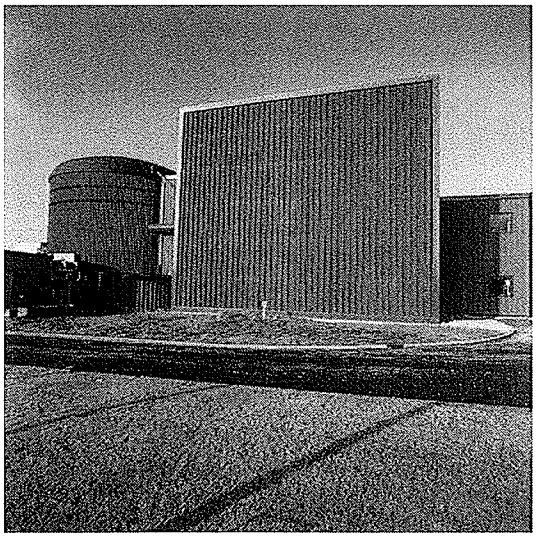


Figure 9 – Winfrith Technology Centre, Dorset (colour design: Nicholas Pearson Associates). Colour application that appears fresh and lively in the near view and blends effectively with the landscape in the middle and far distance (Lancaster, 1996: 14,15).

Existing Colour Combination

The Winfrith Technology Centre also demonstrates the importance of observation of existing colour combinations around the location in establishing an appropriate colour palette for the site. This particular colour scheme harmonizes with the existing colour combination. On the other hand, colour can also denote the surrounding elements, such as the sky, grass, rock, sunlight, water body or even the people, which may be site

specific, and weave these elements with the rhythm of line, form and colour to create a balancing effect with the surrounding landscape. It is critical that detailed analysis be conducted in each individual situation to assess whether generalities pertain. Consideration of existing colour combinations will also help landscape architects to assess the impact colours will have on the surrounding neighbourhood after colouration (Porter 1982: 55).

Environmental Factors

Amount and Quality of Natural Light

Since colour and light are essentially inseparable, colour application should be designed in conjunction with existing and proposed lighting conditions to establish desirable viewing conditions. Environmental colour is a dynamic element that is subject to constant change. Since our perception of objects alters under different light conditions, landscape architects should be aware that colour selection of paints and other landscape elements should always be made or tested under light sources similar to those specified for the final scheme. The effect of latitude in changing the effects of light leads to the different use of colour in architectural structures in the northern and southern hemispheres. In Louis Swirnoff's book, *The Colour of Cities: An International Perspective* (McGraw-Hill, February 2000), examples drawn from cities in the United States, Europe, the Middle East, Latin America and Asia demonstrate how the use of colour contributes to the appearance of different urban areas. Swirnoff suggests that the root of vernacular colour selection is geophysical; colour decisions are determined in large part by how colours are altered by the angle of the sun's rays. For landscape designers, lighting

quality created by the sun should be one of the many factors in determining the selection of color for the landscape elements. For example, a brighter colour scheme may be deem to be more appropriate for a city like Vancouver or in England where the quality of sunlight is often diffused by rainy and foggy weather.

Furthermore, landscape architects should be aware of the fact that the quality of natural light fluctuates with time. As an object, a building or a landscape element is seen under natural light, the apparent colour varies not only with the time of the day, but also from day to day and with the time of year. The same landscape may appear to have a different colour scheme on a sunny day and on a cloudy one; it may have another appearance when seen against a blue summer sky as compared with a dark sky of winter. With the different angle of incidence of the sunlight and the quality of the air (eg. the amount of dust in the atmosphere), the description of the "rosy light of dawn", "bright glare of noon", "warm glow of sunset", and the "pale rays of moonlight" can all be applied to the same location at different times or seasons (Faulkner, 1972: 7).

Amount and Quality of Artificial Light

Artificial light and landscape colour are also an inseparable issue. Lighting conditions have a psychological and a physiological effect on the eyes and the brain: natural or artificial lighting can change the appearance of colour in the landscape. In terms of a practical application that can be employed by designers, for example, it should be noted that it is often more desirable to have a consistent light source (eg. consistent fixture or lamp type) within most landscape design, in which the hue of the landscape elements can

be perceived with a sense of continuity and legibility throughout the spaces within the design. However, there is an exception to this principle when designing the more "unusual" spaces, such as a theme park or skateboard park. Unusual lighting schemes and materials are often expected and desired in these atypical landscapes.

Designers should also be aware of the colour rendering effects that artificial light sources can have on objects. For instance, metal halide lamps tend to enhance the colour of vegetation, while high-pressure sodium lights will result in plants appearing lifeless and dull (Van Gorp, 2000:29). The Manitoba Legislature grounds are a classic example of inappropriate lighting in the landscape. Possibly for security reasons, the formal garden and fountain area on the south side of the grounds is over-lit with an excessive number of light standards and an inappropriate lamp type (high pressure sodium) contributing to the poor lighting quality of the space. As a result, the colour rendering quality is poor and landscape objects are not viewed in their optimum colour quality. The over-abundance of lights raises the operational costs for the park. Probably worst of all, since the strong lights fatigue human eyes, an unintentional temporary purple hue appears on objects as the viewer exits the garden - earning it the title of "purple city" (Van Gorp, 2000:31).

Colour shadow

Very often human beings are not aware of the colour under their feet. Colour shadow is, however, a subtle but fascinating phenomenon that is of interest to landscape architects. The phenomenon is related to the concept of complementary colour and the colour wheel, in which a complementary colour shadow will be cast by exposing an object to white

light. Through observing nature, artists have found that coloured light will produce shadows of complementary colours in daylight. For example a green shadow will result if a white object is illuminated with red light in daylight (Itten, 1961:126). Hence, on a summer evening in the orange light of sunset, the blue shadow of the trees can be seen plainly. The phenomenon is more obvious during the winter months when the orange light of street lamps casts a deep, luminous blue shadow on the snow. Acknowledgment of the existence of shadow colour may possibly help landscape architects in creating a more interesting landscape, where a special light setting with an appropriate landscape element can create a sense of curiosity and interest for visitors who are unaware of the inter-relationship between colour, light and shadow. The landscape itself could possibly become an educational tool.

Climatic Condition

The climatic condition of the site, either at a macro scale (eg. the dry and sunny Arizona desert) or at a micro scale (eg. the humid Japanese moss garden), and the capacity of the design material or paint to endure weather changes should also be considered during the design process. While different materials and textures take on colour differently, certain kinds of materials and paint will stay in their original, perceived colours better than others under periods of weather exposure. Weatherproof material will be a better choice if the designer desires a consistent colour appearance over a period of time. Nonetheless, weatherproof material and paint may not necessarily be valued more highly than other material, especially when a design is intended to take on different character over time. The action of time can be a powerful tool in creating a more interesting landscape. For

example, a lamp post on the Pembina Highway in Winnipeg that has rusted over a period of time with different degrees of exposure to sun, snow and traffic, shows a gradient effect of colour changes that has its own attraction over time. (Figure 10)

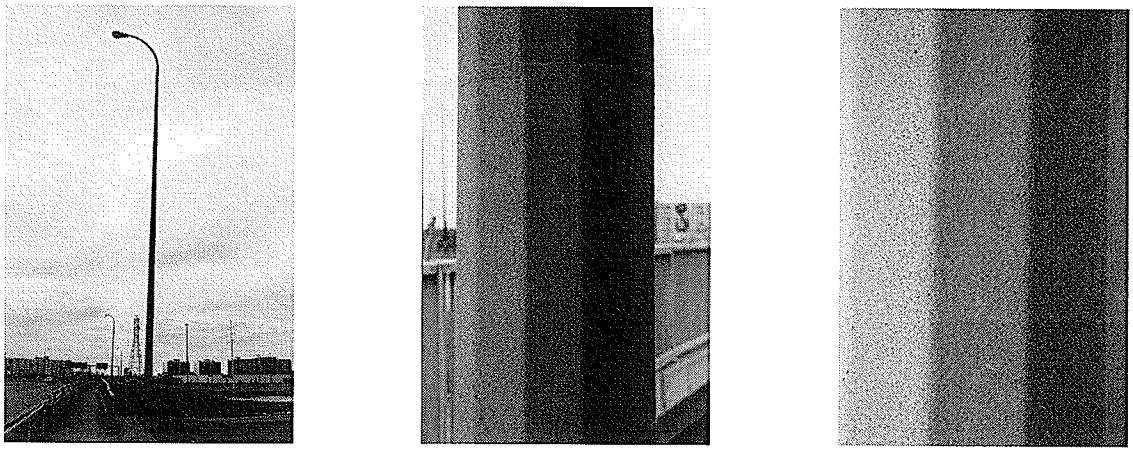


Figure 10 – Flux of Time. A lamppost on Pembina Highway, Winnipeg, Manitoba, illustrating the impact of weather on colour and material (Author, 2002).

Consideration of the physical character of the location, the amount and quality of light the site receives, exposure to weather, and the impact colours will have on the neighbourhood and on people after colouration (Porter 1982: 55) are all critical issues to address in terms of the site's physical context.

Social Factors

Impact on the People

The educational background, social status and average age of the user group are some of the social factors that may affect the perception and interpretation of colour. Different social groups may have different colour preferences and may have colour association systems that have been affected by their up-bring and social background. Some colours

may be perceived to be more "acceptable" than the others for use in the landscape. Some social groups may have a greater or lesser tendency to "colourphobia"– fear of the use of "unnatural colour" (colour other than the material's own colour) in the landscape – than other groups. For example, people in the creative industries – like interior designers, visual artists or commercial directors – will probably be more comfortable with a wider range of colour combinations than people of other professions.

The average age of the user group is also another social factor. For example, most children prefer colours such as red, yellow or blue; and they do not express colour preferences for cold colours until aged ten and over (Pastoureau, 2001: 170). As a result, selection of subtle shades of colours may not be the most appropriate choice for playground design. On the other side of the age scale, aging can dramatically reduce one's ability in colour differentiation. As the lens of the eye hardens and thickens, and the size of the pupils reduces, visual impairments are common in the elderly (Brawley, 1997: 109-110). As Brawley suggested, spaces designed for the elderly or cognitively impaired should have colour schemes that "accommodate ease of visibility", "provide good contrast" and "use objects that are visibly bright and distinct" (Brawley, 1997: 123).

Vernacular Values

A further consideration with respect to specific user groups is the impact of vernacular values on colour selection. For instance, the colour scheme for the landscape of Celebration, Florida is different from the colour scheme for a vernacular Mexican community. Celebration, a residential real estate development by Disney, has the colour

quality that feeds the nostalgic and homogeneous theme that "emphasizes regulation and conformity" (Beardsley, 1997: 93). The colour selection for a vernacular Mexican community may tend to use bright and bold colours that are characteristic to the culture.

Colour Trends/ Style

As discussed in Frank Mahnke's Colour Experience Pyramid, colour trends can influence human experience of colour (Mahnke, 1996: 17). As certain colour palettes associated with the particular period in history, the colour combination can signify an era. A space, however, can also be identified as being "in-style" or "out-of-date" merely by the public's judgment on its colour palette. This issue is especially prominent in the discipline of interior design. Change in colour trends in architecture and landscape architecture is relatively slower than in disciplines such as advertising or fashion design.

Cultural Factors

Interpretation of colour symbolism

The same colour may have very different meanings in different cultures. The symbolic meaning of colour acts as a kind of language that is highly dependent upon culture and time, and it permeates people's lives in a variety of ways.

Many of the symbolic meanings of colour have been influenced by the observation of colour in nature. For example, in many cultures, green symbolizes continuity or rebirth, and red is synonymous with heat, fire and blood, and can be further interpreted to represent love, warmth, pain, or excitement. These symbolic meanings are then

transferred to emotional association, which forms the basis for the sociological-cultural and religious experiences of colours (Mahnke, 1996: 59). Another type of colour symbolism is established, by arbitrary convention only, when the relationship between the colour and the idea is difficult to discover. Symbolism is essentially a linguistic function, and the availability of a colour vocabulary has a decisive role in the creation of any language of colour symbolism. Some colour symbolisms do not create a kind of universal validity that would appeal deeply to every human's feelings and needs (Gage, 1993: 83); they are just inventions of the imagination and its meaning is more a notion of tradition than of physiological or psychological effects. Examples of this type can be found from the lists of meanings associated with colour stated in the Appendix.

In many cultures, colours symbolize the rituals of birth, marriage, and death; however, the colours associated with the rituals may vary from one society to another. Scientific studies have shown that general attitudes and connotations toward colour are different from culture to culture. For instance, northern Europeans may associate light blue and green with winter - possibly an association with ice and snow - whereas people of the Mediterranean may have a different opinion - possibly an association with sky and grass. On the other hand, although different cultures do not necessarily use the same colour to represent an idea, a notable fact is that nearly all the basic concepts have colour symbols attached to them. In some situations a particular concept is represented by the same colour in different countries. The early Greeks, for instance, thought of the basic elements, earth, air, fire and water as blue, yellow, red and green respectively. The early

Hindus and Chinese used different colours to represent the different elements in their own cultures, but they all agreed that fire was red (Faulkner, 1972: 11).

It should be noted that even a slight modification to either the intensity or lightness of a major hue might create a different impression, and subsequently a different meaning than the hue in its pure form. For example, in some cultures, red is seen as a masculine colour for its association with aggressiveness and violence; however, pink is generally accepted as a feminine colour; a dark navy blue is seen as conservative, but light baby blue is seen as young and relaxing (Mahnke, 1996: 66).

Colour Preference

A striking regularity has been found in studies of "favourite colours" conducted since World War I. Blue is considered the favourite colour of more than half of the adults polled in the West (i.e. western Europe and the United States), but not in Spain and Latin America where red was placed ahead of yellow and blue. Green is the next favourite colour with around 20% preference; then white and red with 8% each. The remaining colours were found to be far behind these colours in terms of preference. The result is, however, different among children. Most western children prefer red over other colours; yellow or blue come in second place. They do not express colour preferences with cold colours until aged ten and over. The colour preferences of children vary according to country, age, and over time - so that results from 60 years ago may not be an accurate representation today (Pastoureau, 2001: 170).

In the East, the situation is different. For example, white is the colour preferred by most Japanese (30% of those polled), then black (25%) and red (20%) (Pastoureau, 2001: 174). These results create a challenge for international firms that need to manufacture products and run advertisement campaigns that will appeal to both domestic and overseas audiences. Distinct strategies may need to be adopted to account for these differences (Pastoureau, 2001: 174). This is an opportunity for designers to create local distinctiveness by using appropriate colour schemes that appeal to the target cultures. Although colour preferences are only one of the many contextual aspects to be considered in design, it is an important dimension of design in an age of globalization. Because of differences in colour preferences, designers are encouraged to avoid designs that are homogeneous and ambiguous, but to aim to appeal to a more specific audience.

In conclusion to this chapter, it is suggested that landscape architects should consider colour as a design detail that should respond to the project's physical, environmental, social, economical, political and cultural context, in order to facilitate a clear dialogue between a place and its users. In the next chapter, Chinese garden design concepts will be used to illustrate the contrast of colour schemes within one culture and based on the different contextual factors associated with the site. It will be argued that by applying the fundamental information provided in the previous chapter, landscape architects may be able to make colour choices that are appropriate to a particular locale.

Chapter Four

Cultural Distinctiveness in the Use of Colour in Landscape Architecture

Chapter Four
Cultural Distinctiveness in the Use of Colour in Landscape Architecture: The Case Study of Chinese Garden Design

Introduction

As discussed in the previous chapter, physical, social and cultural contexts may be determinants in the making of colour decisions in landscape architecture. This chapter will explore the implication of these factors through application to some case studies in Chinese garden design. Each of these factors will be briefly explained along with suggestions as to their influence on the colour scheme for the two main types of traditional Chinese garden design – the private residential garden and the imperial garden. Information from "Colour 101" will also be integrated into the discussion in constructing the argument for the interrelationship between colour and culture.

Cultural Context

Laying between the latitudes of 40°and 20° North, China covers about one and a half million square miles of land and is the most populated country in the world. Chinese civilization was crystallized along the Yellow River (Huang-Ho) about 3000 B.P. and evolved virtually uninterrupted for nearly five thousand years (Jellicoe, 1975: 68). Serious contact with the west is likely to have begun about the first century B.P. with the development of the Silk Road. Hence, the Chinese have a tradition of garden design that is unique to their culture and with little influence from the Western World until the eighteenth century.

The traditional Chinese view of landscape architecture is closer to the view of a garden as a place that offers a sense of separation from the outside world. It is often introverted and private. Landscape architecture in this sense often suggested the creation of walls and thresholds, real or implied, that allowed for one to leave one world and enter another. It is almost like a psychological space where one can escape the world and touch one's inner thoughts. The basis of garden design arose from two main sources - Chinese philosophy and Chinese painting and poetry.

Chinese garden design had its roots in the philosophy that believed in the unity of human, earth and sky/heaven. The Chinese placed high value on nature. Traditionally, they believed that humans were essentially in one spirit with other creations and that there should be a harmonized relationship between the two. Inner harmony within oneself can then be developed through the process of meditation and reflection on the landscape - the land and the sky/heaven. Humanity and design should participate to be in harmony with the spirit / characteristic of the space. Stillness was hence essential, for gardens were a vehicle for mediation, conversation, and intellectual activities (Yuzhe, 2001:6).

The tradition of Taoism greatly influenced the belief that solitude and one's sensitivity to the landscape were inseparable issues (Jellicoe, 1975: 68). There could not be peace for those who dwelled in the space without harmony between the different parties. This sense of harmony could be in part created through the balance of yin (eg. still water) and yang (eg. rocks, hill or mountain). The concept of yin and yang is relatively difficult to translate into the English language. In a simplified way, yang can be interpreted as the

"male" force, the power of the sun, the positive, the strong, the bright and the leading. Yin is then the tranquilizing "female" force, the power of the moon, the dark side, the dim and the subservient. Both yin and yang are neutral in nature (i.e. neither good nor bad), but it is the balance of the two forces that creates a sense of harmony between humans and the landscape. Traditional Chinese gardens crystallize ideology and philosophy with an intellectualized emphasis.

Early landscape designs in China also originated from and were inspired by Chinese painting and poetry – in an idealistic sense and in terms of visual relationship. Chinese paintings relied heavily upon analogy and symbolism in conveying a message about human fantasy, the landscape, and its component. In most traditional Chinese paintings, the presence of people was usually diminished for the purpose of intensifying the magnificence of the natural elements. The viewpoints in the paintings were usually above ground level, as though the observer was somehow a disembodied spirit integrated into the landscape (Jellicoe, 1975: 69). Chinese landscape design is the idealization of the similar relationship between humans and nature. It was a holistic replication of nature from an intellectual and philosophical point of view.

Colour Symbolism of China

In addition to the geographical and philosophical background of Chinese garden design, a basic understanding of colour symbolism in China may aid readers in understanding more fully the rationale behind the colour scheme for some of the designs reviewed in this

chapter. The following is a breakdown of some of the symbolic meanings of the more significant colours in Chinese culture.

Red

Red is the primary colour in Chinese culture. It represents beauty, joy, pleasure, honour, festivity, expulsion of demons, celebration, passion, youth and wealth. In ancient China only the rich and the powerful could paint their gates or doors red. In the late Han Dynasty (25-220 A.D.) only princesses and the wealthy could wear red (Lai, 1997:131).

Red is synonymous with femininity. In the Chinese language, many of the terms that relate to the female gender are described with the colour red; for example, the house of the prosperous are called "the Red House". "Red powder" or "Red face" are terms used to describe the appearance of a lady. On some occasions, red can also represent flowers and fruit. "Red snow" or "red rains" stand for the scene of falling cherry petals (Lai, 1997:132). However, "red dust" in the Chinese language would mean the secular world as opposed to the spiritual world in which the human mortal lives.

"Celebration" is probably one of the first words that come to the minds of the older-generation of Chinese when the colour red is mentioned. For Chinese New Year, the "red pocket" will be given out to as a blessing of good fortune for the coming year. The traditional Chinese wedding invitations and the bridal gown (known as kwa, a robe of brocade or richly embroidered satin) are red, and objects that are associated with the wedding are required to be covered with pieces of red paper, as a means of blessing the

marriage. Even a "red egg", which is a regular egg with its shell dyed red, is given out when a child is born to the family. When just the word "red" is used to describe a person, the Chinese usually refer to someone who is popular, or has achieved an excellent performance during a certain period of time.

It should be noted that orange is a fairly new colour in Chinese culture. There are few symbolisms that are associated with the colour and these are mostly influenced by western cultures in the modern age; for example its association with, cheerfulness, energy and joviality.

Yellow

In ancient China, yellow, green, white, red and black were considered the dominant colours and each had their own "position". Yellow is in the central position, and red represents the South, black the North, white the East and green the West (Lai, 1997:165). Yellow was an important colour in Chinese history, as it is a symbol of supreme wisdom and enlightenment; a colour reserved for the emperor, the Son of Heaven (Verlag, 1961:13). In the Chinese language, the pronunciation of yellow is almost exactly the same as the pronunciation of "king or emperor". The Emperor's robe was hence called the "Yellow Robe". Starting in the early Tong Dynasty (618-907 A.D.), only the Emperor was allowed to wear yellow, but even prior to that regulation, yellow had always been a colour reserved for the rich. Yellow was also used to describe the earth. This symbolism probably originated from the agriculture-oriented culture of ancient China, where yellow was the colour of the harvest field. (Lai, 1997:165).

In Taiwan, yellow also signifies high-spirits, luxuriousness and advancement in technology. In Taiwan and in Hong Kong, a "Yellow book" / "Yellow Magazine" refers to pornography. It has been suggested that the term "Yellow book" originated with the "Yellow book" published in England in 1894, whose contents appealed to the working class people and was tainted with pessimism and apathy towards work. The books were relatively popular, but the conservative considered the "yellow book" to be reading material of low moral value. The term eventually evolved into what it is today among some Chinese populations - similar to the use of "blue" in the English-speaking world (Lai, 1997:172).

Yellow is also used to describe the young and the inexperienced - similar to the symbolism of green in western culture; young children are called "yellow mouth" and inexperienced teenagers are described as youth with "yellow feathers". Extreme old age was referred to "yellow hair" in ancient Chinese literature (Lai, 1997:165). "Yellow fountain" means the underworld, the place where the Chinese believe a person will go after death.

Green

Like red and yellow, green has a long history in Chinese culture. In traditional Chinese culture, however, the concept of green is closer to what is known as a light-blue-green colour. Similar to some cultures, traditional Chinese philosophers believed that the world is made up of the five elements and each is represented by a colour: Green to represent wood, white for gold/metal, red for fire, black for water and yellow for earth/ soil. It

should be noted that recognition of the basic elements is different across different cultures. For American Indian tribes, the basic elements are different - fire, wind, water and earth. Each of these colours also corresponds to the different seasons - green for spring, red for summer, yellow for the period between summer and autumn, white for autumn and black for winter (Lai, 1997:179). Even the emperors were advised to wear clothing of these colours according to the different seasons. As mentioned before, the cardinal points were also assigned with specific colours.

In ancient Chinese poetry, a "green cloud" used to describe the beautiful black hair of a girl and a "green waist" was used to describe the smooth form of a dancing woman – purposely resembling the movement of the willow branch. "Robber of the green forest", describes a person who, like Robin Hood, "robbed the rich to gave to the poor".

A survey conducted by Lai in Taiwan in 1995 shows that among the 2464 Taiwanese students who had completed the survey, green was their favourite colour. This contrasted with American students' favourite colours (Lai, 1997:104-127).

Blue

The colour blue probably has a longer history in eastern countries than in western countries due to the advancement of dye technologies. Blue was one of the cheapest dyes to obtain in ancient China, and hence blue cotton garments were common among the poor and the working class in these countries. (Lai, 1997:179) Furthermore, the colour blue is most commonly associated with the sky, hence the heaven.

Black

Although black is one of the five dominant colours in traditional Chinese culture and is also the colour representing water and the "North", it is not a popular colour in Chinese culture – it has a more negative connotation than a positive one. When the word "black" is used in describing a person, the Chinese usually refer to that person as having a streak of bad luck. Black is also usually used to represent evil and darkness.

White

White is the colour of mourning for the Chinese. It represents a kind of simplicity and emptiness in the soul as one honours the deceased (Lai, 1997: 226). White is worn on occasions of mourning, as a way of escorting the dead to the state of purity and perfection. White is also the colour representing the east, autumn, and metal in the five elements of China. Some parts of China also use white as the symbol of the sun, instead of red or orange. White also represents honesty and purity in the Chinese language.

Grey

The colour grey has a very similar symbolic meaning in Chinese culture to its meaning in western cultures. Some Taiwanese call grey the "mouse colour" since it resembles the colour of the mouse. It is a colour that is seen as neutral, calm, down-to-earth, mature, and modern. The colour also implies sadness, loneliness, boredom, ambiguousness and pessimism in the Chinese language. It usually has a strong association with men, the elderly and the sick (Lai, 1997: 230, 71).

The Private Residential Pleasure Garden

Social Context

Chinese Poets and scholars in the years of 420-590 A.D. who had become disappointed with the social system, the superiority of the emperors and the continuous conflict between political powers in capital cities originated the private residential garden. They decided to move to the countryside to create a utopia within their private houses.

Environmental Context

Most of the private gardens, for example, Wang Shi Yuan (Figures 11 and 12) and Zhou Zheng Yuan (Figures 13 and14) were therefore located in the southern part of China, where it was politically more stable and more plentiful in natural materials because of the warmer climate (Lau, 2001: 167).

Figure 11 –Wang Shi Yuan Axonometric Projection (Yuzhe, 2001: 120).

Figure 12 –Wang Shi Yuan, Suzhou (Lau, 1994: 136).

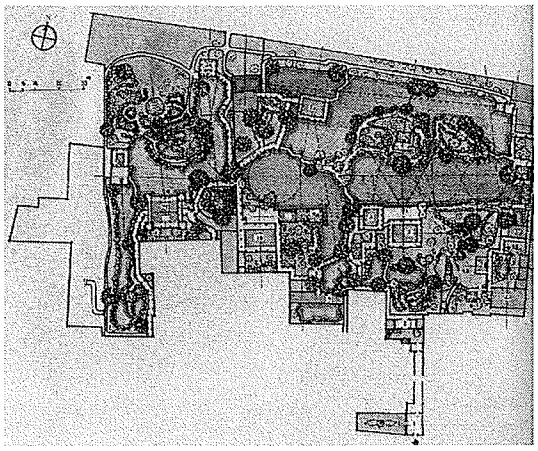


Figure 13 – Plan of Zhou Zheng Yuan, Suzhou (Yuzhe, 2001: 114).

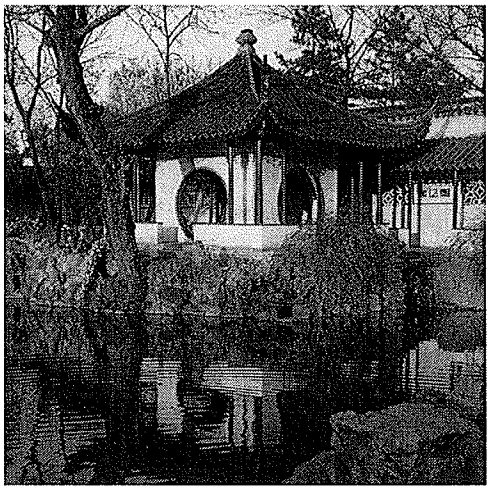


Figure 14 – Zhou Zheng Yuan, Suzhou (Lau, 1994: 147).

Physical Context and Design Concept

Most Chinese private residential gardens are situated in smaller scale site as compared to the imperial garden. Landscape elements are seen from close proximity, in which the subtle shades of colour or the fine details of architectural elements are perceivable to the visitors/ users. This type of Chinese garden design, however, is more than a scaled-down version of nature designed to fit inside a courtyard site. It is the replication of the spirit / essence of nature that designers were striving for. With water, rock and vegetation as the three main elements in the creation of these small-scale, idealistic landscapes, the arrangement of these elements is crucial (Yuzhe, 2001: 23,38).

Natural bodies of water are the ideal water elements in Chinese landscape architecture. Nevertheless, since some of the traditional Chinese gardens are situated in the inner part of the land geographically, artificial lakes are widely used in Chinese garden design. The size of the artificial water bodies is highly dependent on the size of the site. Irregular

edges are desired over straight, with the exception to edge treatment alongside buildings, where a geometrical relationship with the architectural elements is desired. Bridges are often utilized in ponds to break up the area and to produce spaces of different experience and quality (Lau, 2001, 173, 174). Fountains are very rare in Chinese gardens for they would take away the naturalistic quality of the place. For creating movement in the water, the Chinese constructed artificial rivers in the gardens. These artificial rivers originated from the base of groups of rocks or other architectural elements on site – another attempt to create balance between the yin and the yang.

In these landscapes, water and rocks symbolized the balancing act of yin and yang, with each speaking to their audience in a mythical manner through meditation. There are strict rules regarding the shape and arrangement of rocks in Chinese garden design. Rocks of more rustic appearance and of moderate size and length are preferred over smoother stones. They should be arranged in groups of different heights and different sizes, with each rock creating a rhythmical and hierarchical relationship with each other (Yuzhe, 2001: 38). The rock should be firm in its location, anchoring to some solid objects both visually and physically. Grouping of rocks should also be accompanied by vegetation to create a balance between the hard and the soft elements in the landscape.

Continuing with the naturalistic approach of Chinese garden design, the plantation of vegetation strives for asymmetrical, ever changing, yet balanced scenery within a confined space. The arrangement of vegetation should create harmony with other features, while also being sensitive to issues such as viewing distance, orientation and

climatic context. Further to being an accompanying element within the hard landscape, vegetation serves an important purpose in eliminating the restrictive or hostile boundary created by the walls of the architecture, while creating a dialogue with the sky or heaven. Some private gardens have a certain plant as the central theme in creating an atmosphere that would be consistent with the overall design intent. (Lau, 2001: 177) For example, in Chinese culture, lotus flowers can be used to denote a person who is upright and pure even in situations overrun with corruption and dishonesty. In a sense, this kind of central feature becomes the "host" of the garden and all other elements become its "guest".

In addition to the elements of water, rock and vegetation, designers used curvilinear pathways and corridors to connect the different spaces. This allowed for the extension of the viewing experience in the restricted landscape (Figure 15). In conjunction with the use of window frames and openings along the circulation system (Figure 16), the landscape creates different points of interest at various locations expanding the possible content of the designed space. By contrast with the overwhelming effect created by large-scale royal gardens, residential private gardens used various techniques to create ever-changing spaces within a confined site.

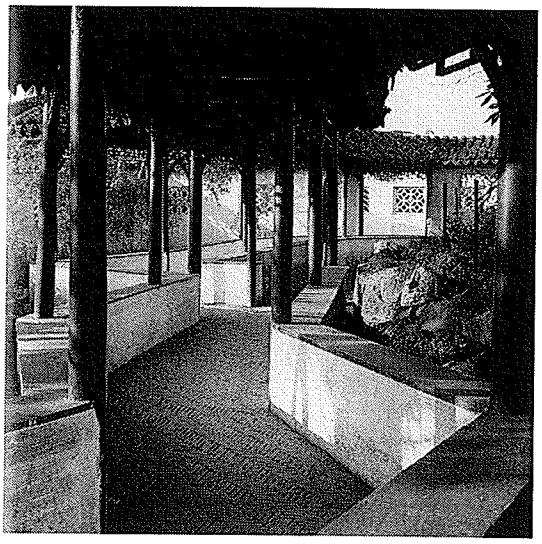


Figure 15 - Covered Corridors, Suzhou (Lau, 1994: 135).

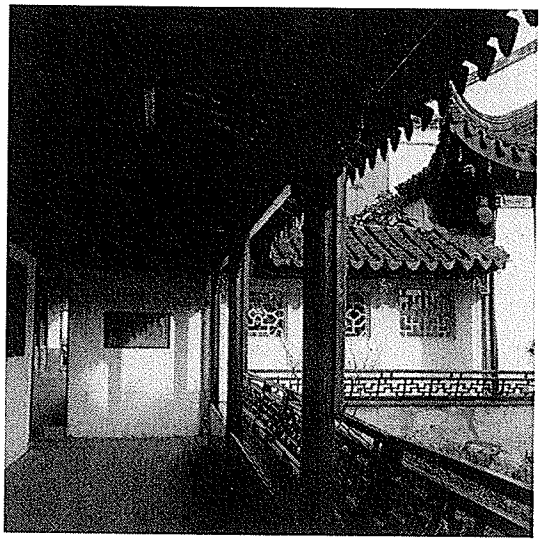


Figure 16 – Windows and Opening along Covered Corridors Wang Shi Yuan, Suzhou (Lau, 2001: 172).

Colour Scheme

Most residential private pleasure gardens embraced a more monochromatic scheme in creating a naturalistic and quiet impression. These gardens were built with the objective of providing "privacy, quietness, protection from man and the elements" (Jellicoe, 1975: 74). They had a meditative quality that allowed separation from the urban landscape. The gardens were intended to create a sense of inner sanctuary and peacefulness that can be obtained by association with nature in repose. Some of these gardens, for that reason, interpreted these objectives as a way of bringing the ideal landscape into the domestic garden.

Colour designs for the private gardens are more tranquil, calm and meditative in nature. Bright saturated colours are rare; architectural elements are usually white, grey or brown in colour. Bamboo, willow and evergreen plants are some of the more common

vegetation employed in the landscape. Vegetation of colours other than green - for instance flowering plants or water lilies - are used with caution and are displayed as seasonal, decorative elements when appropriate to the overall atmosphere (Lau, 2001: 285-287).

The Imperial Garden

Social Context

Another classical category of Chinese landscape design is the imperial garden such as the Summer Palace (Figures 17 - 20). Similar to many European royal gardens, these large scale gardens usually started as hunting grounds for royalty and were later converted into luxurious, multi-functional villas for the emperor for purposes such as celebrations, entertainment or gatherings.

Environmental Context

Most of the imperial gardens are located in the Northern part of China, in or near Beijing, the political centre of the country. The climate is more extreme than the southern territories of China. The bright blue sky or the white snowy scenery of the Northern territories can be a backdrop for the garden features.

Physical Context and Design Concept

Most imperial gardens are situated in large-scale sites. Landscape elements are viewed from various distances. In addition to the grouping of rocks and ponds surrounding the villa, the imperial garden is composed of artificial lakes and mountains (created through excavation), artificial islands, numerous pavilions, temples, palaces, colonnades,

pagodas, bridges and even market places. Emphasis is placed on the skillful arrangement of these natural and artificial elements.

These imperial gardens usually had large artificial lakes that could be as large as half of the size of the site, with other smaller lakes, ponds and rivers located in various parts of the garden. Excavation of the land in creating these lakes was then used to build artificial "mountains" thereby creating a balance between the high (i.e. mountain) and the low (i.e. water body). There were usually gardens within gardens in royal sites. They would either have the residence as the central element surrounded by groupings of rocks, water, and vegetation, or an architectural element - for example, a pagoda - that would be used as a decorative accessory within the lavish plantation. These individual gardens were related to each other with artificial mountains, corridors and walls, crafting a united garden with each garden having its unique visual focus (Lau, 2001: 149-166).

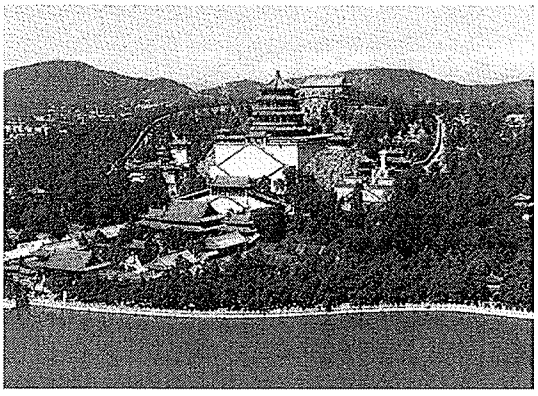


Figure 17 – Longevity Hill, Summer Palace, Beijing (Lau, 2001: 157).

Figure 18 – Longevity Hill and Kunming Lake, Summer Palace, Beijing (Lau, 1994: 112).

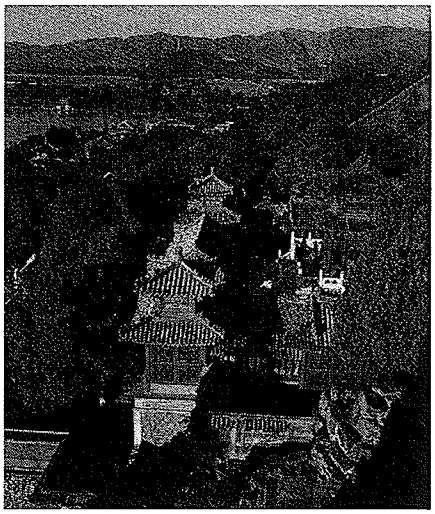


Figure 19 – Pavilion of Precious Clouds, Summer Palace, Beijing (Lau, 1994: 115).

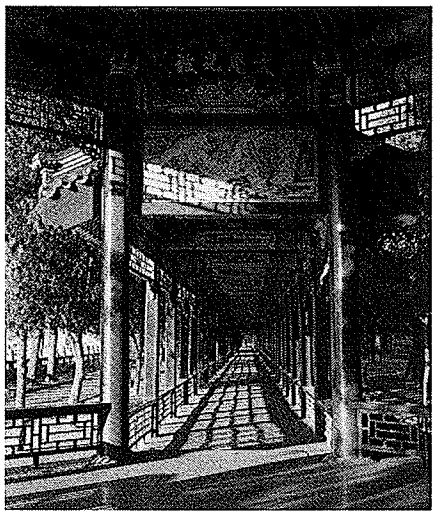
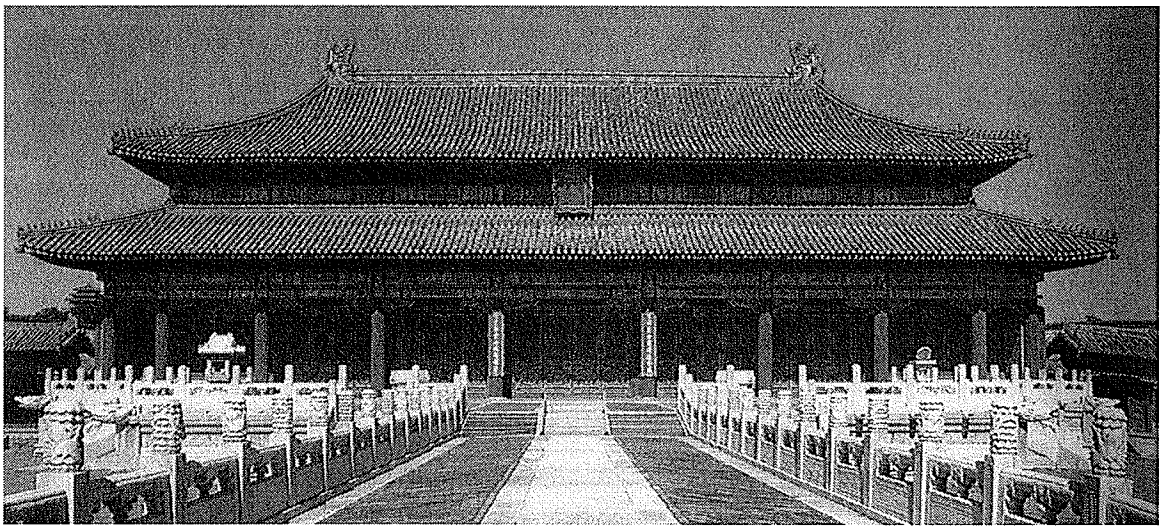


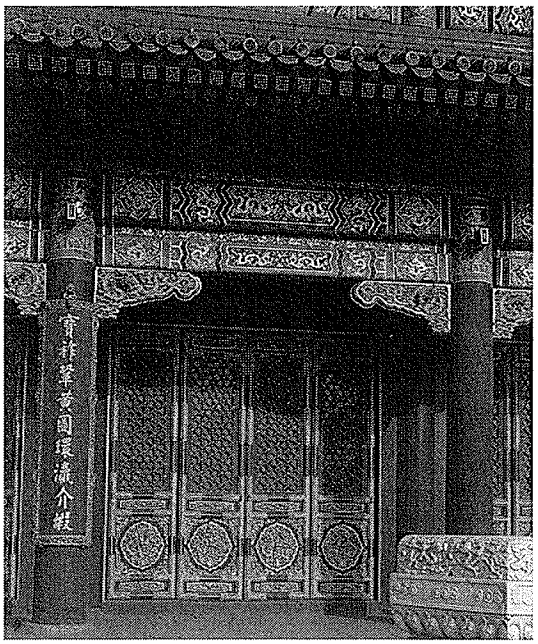
Figure 20 – Long Corridor, Summer Palace, Beijing (Lau, 1994: 118).

Colour Scheme

The imperial gardens are signified by their sharp and intense colour contrast – an amplified demonstration of the relationship between the yin (e.g. colours such as black, blue, green) and the yang (e.g. colours such as red and yellow). The first noticeable colour contrast of the imperial gardens is the golden-yellow colour of the roofline. Roofs in the imperial gardens are yellow for two reasons. Firstly, since most of the imperial gardens - for example the Forbidden City (Figures 21 and 22) and the Summer Palace (Yi He Yuan - are situated in Beijing, the saturated yellow creates a sharp and noticeable contrast with the bright Beijing blue sky that differentiates the imperial architecture from that of public architecture - a symbol of status in the social ladder. Secondly, yellow is believed to be in the "central position" among the five dominant colours in ancient Chinese philosophy - it is the most significant of all colours, and it is the colour reserved for the emperor (Lau, 2001: 279). For this symbolic reason, it is logical for the architectural elements that are most significant and "closest to the Heaven" to be yellow.

Red and Green are the contrasting pair of colours that is most often used in the imperial landscape. Similar to yellow, red and green are also two of the five dominant colours in ancient Chinese philosophy (Lau, 2001: 280). The Chinese are well known by people of other countries for the culture's passion for red. The colour is a symbol of good fortune, celebration and wealth in Chinese culture. Hence, red was used extensively in Chinese architecture and created pleasant contrasts with the surrounding green vegetation.





Top: Figure 21 – Architecture of the Forbidden City, Beijing (Lau, 2001: 280).

Left: Figure 22– Architectural Detail of the Forbidden City, Beijing (Lau, 2001: 28).

Comparison of the residential private garden and the imperial garden of China shows that even within the same cultural context, the colour scheme is different between the two types of garden design, according to the different social status, physical and environmental conditions. Both types of garden employ the same colour symbolism, but fulfill different purposes.

This comparison demonstrates that colour application is more than just an artistic and intuitive decision influenced by the designer's taste, but rather that it is a reflection of a range factors associated with the context. In the next chapter attention will be drawn to some examples of colour application by artists, architects and landscape architects. It is hoped that these examples will demonstrate the numerous opportunities that colour presents in the practice of landscape architecture.

Chapter Five

Colour in Artists', Architects' and Landscape Architects' Worlds

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To shift the focus from the fundamental of colour and context, this chapter will explore the different projects to which colours are applied. The main intention for the selection of these examples is to suggest the possible benefits of colour application in the constructed landscape and to provide a source of inspiration for future projects in landscape architecture. Projects of strong colour content by James Turrell, Luis Barragán, Martha Schwartz and Claude Cormier will be studied in order to demonstrate how some of the colour and contextual factors may - or may not - have contributed to the design.

Colour in the Artists' World

James Turrell

The colour scheme for the *Hauptverwaltung der Verbundnetz Gas AG* (Figures 23-24), a permanent installation by artist James Turrell, is informed by the outdoor space. The project involves a lighting concept for the administrative tower of the Central Headquarters of the Affliated Gas Companies Network building in Leipzig, Germany. The design is related to the energy control system of the administrative tower, in which it reacts automatically to its surroundings and coloured lights ranging from pale pink to orange to red to various shades of blue are produced as a result (Figures 23-24). Both the energy requirements and the lighting of the tower can be adjusted to react to different conditions such as lighting, climate and temperature. The illuminated glass façade

creates an interactive relationship with the adjacent outdoor space (Birnbaum and et al., 1999: 209).

Hauptverwaltung der Verbundnetz Gas AG is a demonstration of the implementation of colour in an outdoor setting. While the context informs the colour application, colours create an identity in the context. Through technology, the display colour symbolizes the different conditions of the physical context. Colour becomes an informative and interactive tool of the landscape. On the other hand, the distinctive colour-changing glass façade creates unique sensational experiences and allows curious observers to establish an identity that can be associated with the tower and its surroundings.

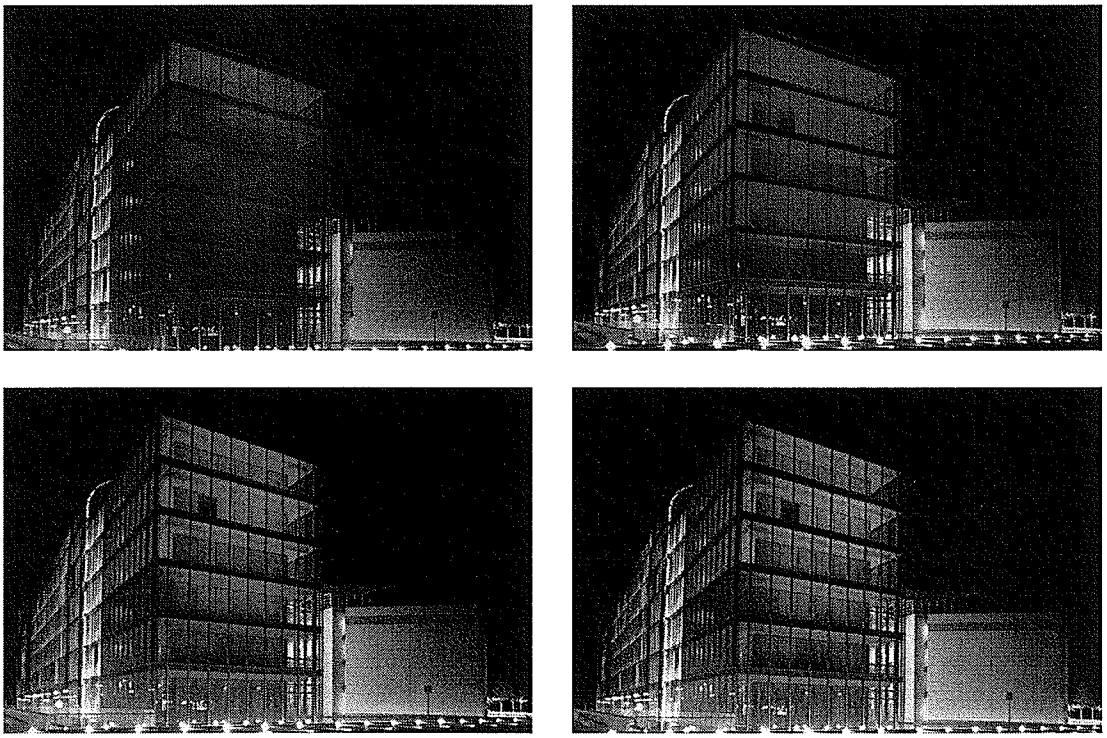

Figure 23 – *Hauptverwaltung der Verbundnetz Gas AG.* 1997. Permanent installations at the Affiliated Gas Companies Network building, Leipzig, Germany (architecture by Becker Gewers Kühn & Kühn) by James Turrell (Birnbaum and et al, 1999: 208).

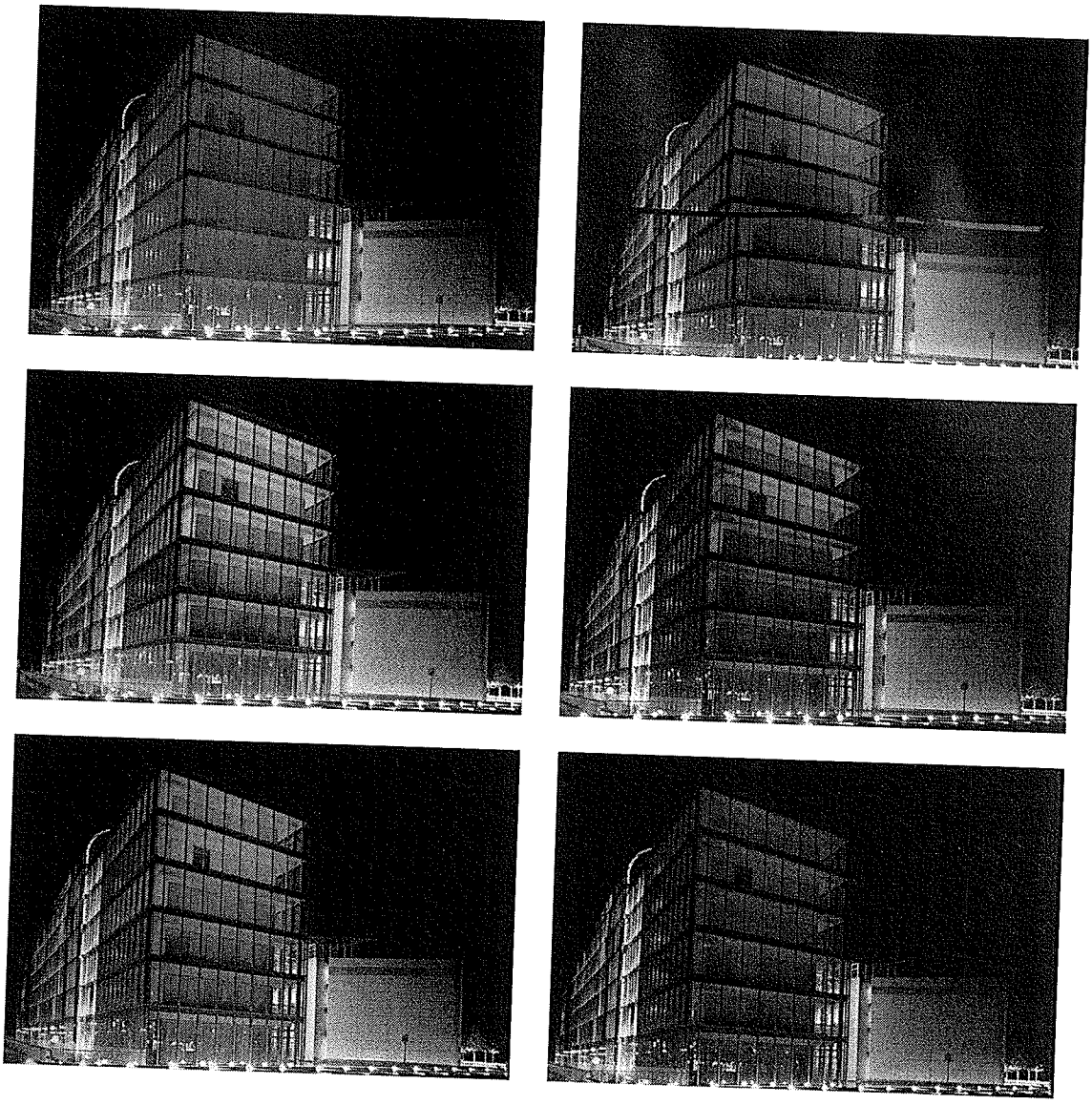

Figure 24 – *Hauptverwaltung der Verbundnetz Gas AG.* 1997. Permanent installations at the Affiliated Gas Companies Network building, Leipzig, Germany (architecture by Becker Gewers Kühn & Kühn) by James Turrell (Birnbaum and et al, 1999: 209).

Colour in the Architect's and Landscape Architects' Worlds

Luis Barragán

The *Folke Egerstrom House*, Mexico City is one of the most colourful and photographed projects by Luis Barragán. The house is located in Los Clubes, a large residential development owned and designed by Luis Barragán. He was involved in the design of the master plan, the architectural elements and the public landscape (Portugal, 1992: 120).

Luis Barragán collaborated with architect André Casillas in the architectural and landscape design of the *Folke Egerstrom House* (Figures 25-30) (Portugal, 1992: 138). The house itself was built in white concrete and surrounded by gardens, patio, swimming pool, stable, horse pool and an exercise ring. In contrast to the more traditional forms and colours of the house and the stable, the surrounding walls of the outdoor landscape are remarkably colourful. These brightly coloured walls accommodate the landscape artistically and functionally. The walls are painted with red, pink, rose, deep violet and rusty-brown, and each colour acts as a code for the function of the wall: pink walls mark the gateway and perimeter between the exercise ring and the patio; the gate for stablemen and grooms is signified by violet, and acts as a barrier between the horse and the human living areas is the reddish double-walled fountain (Portugal, 1992: 138). As Armando Salas Portugal observed,

> "The change and contrasts in the colour walls mark a new development in Barragán's architecture. Not only does colour emphasize pure and planar qualities, but it also defines, and is defined by, function and form; colour has claimed Barragán's architecture."
>
> (Portugal, 1992: 138)

The bold colour choices are appropriate in that they echo the colours characteristic of vernacular Mexican architecture, while also creating distinctive contrasts with the blue Mexican sky and the vegetation in the background. Barragán's colour application informed, and is informed by, the context; it changes the perception of the spaces, stimulates imagination and evokes sensations (Martinez, 1996: 186).

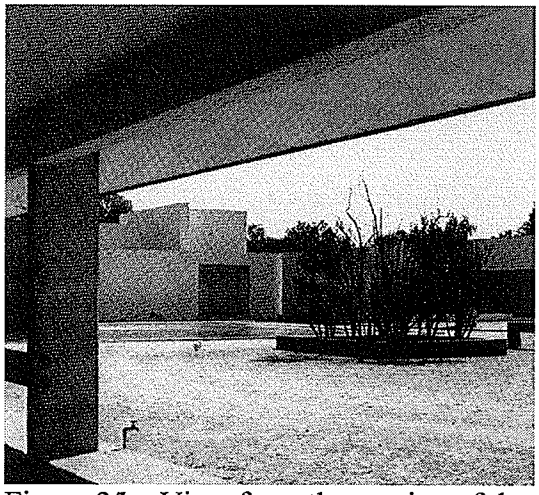

Figure 25 – View from the portico of the stables, *Folke Egerstrom House*, Mexico City, 1966-68 (Rispa ed., 1996:192).

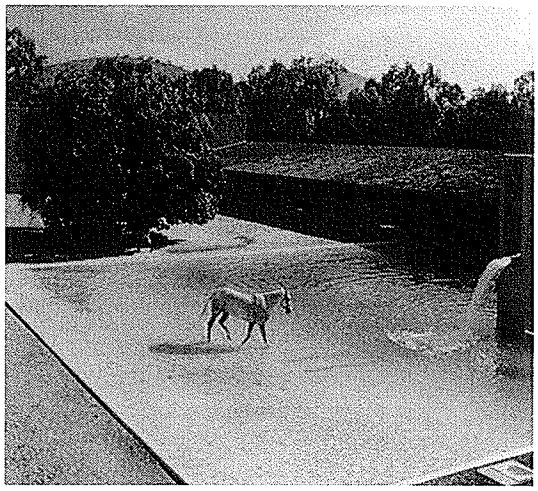

Figure 26 – The Horse Pond, *Folke Egerstrom House*, Mexico City, 1966-68 (Martinez, 1996:115).

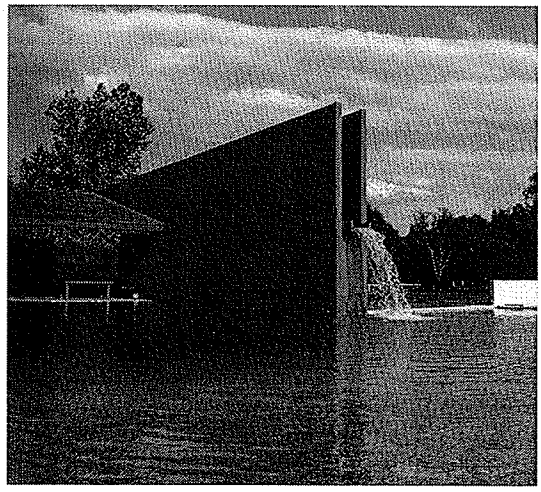

Figure 27 – The Horse Pond, *Folke Egerstrom House*, Mexico City, 1966-68 (Martinez, 1996:115).

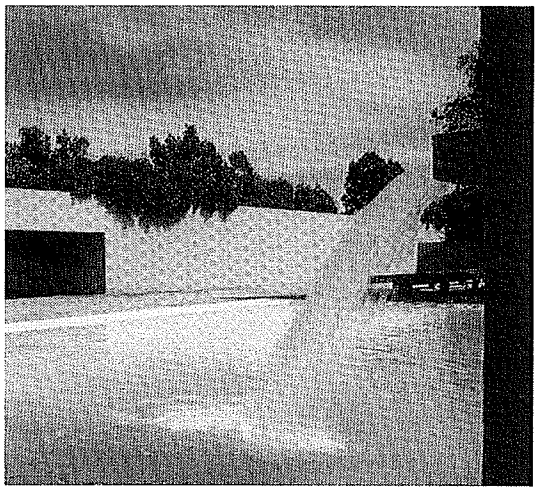

Figure 28 – The Horse Pond, *Folke Egerstrom House,* Mexico City, 1966-68 (Martinez, 1996:117).

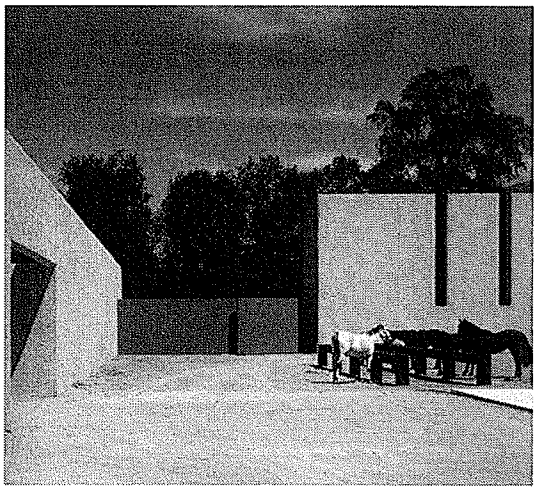

Figure 29 – The Training Area, *Folke Egerstrom House,* Mexico City, 1966-68 (Portugal, 1992:141).

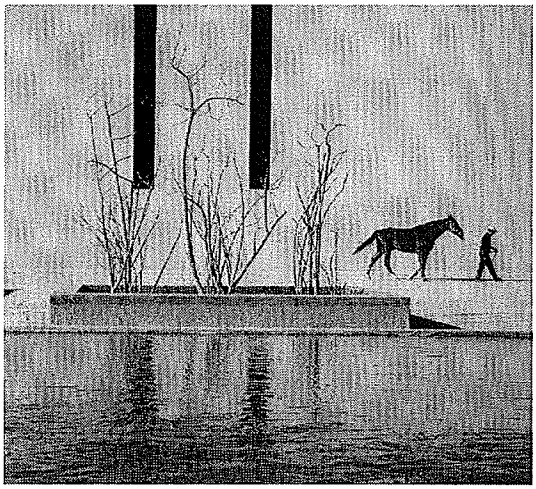

Figure 30 – The Horse Pond, *Folke Egerstrom House*, Mexico City, 1966-68 (Martinez, 1996:114).

Martha Schwartz

Martha Schwartz has created many projects that provoke discussion of the relationship between contemporary art and landscape architecture. She challenges the notion of landscape architecture as an isolated discipline by drawing references from other fields of study; encouraging landscape architects to draw greater attention to issues of scale, colour, composition and material, as opposed to just form and function. Through the artistic arrangement and colour choices of her designs, there is evidence of influence from Pop Art and Minimalism (Darley, 1998:82).

Martha Schwartz works with a bright colour palette in many of her landscape designs. Her method of incorporating colour in her projects creates an atmosphere of freedom for people who are engaging in the landscape and creates a sense of delight and relief (Schwartz, 1997:107).

One of Schwartz's most recent projects is the landscape of an apartment house complex at Kitagata in Gifu Prefecture, Japan. The design, along a strong central spine on an east-west axis, is part of an experiment in "feminism in housing design" which also includes four apartment buildings designed by female architects from Japan (Akiko Takahashi and Kazuyo Sejima), Britain (Christine Hawley) and the United States (Elizabeth Diller) (Martha Schwartz, Inc., 2002). It is the aim of this complex to increase the exposure of women architects and artists, and to provide users with a more enriched social housing environment than other Japanese social housing projects. In the project master plan, the landscape space lies between the four separate housing blocks designed by these architects. Because of the diversity of architectural design found within the project, a constellation of pieces using strong imagery and geometry was created to harmonize the distinct parts of the project, to offer a variety of opportunities for passive enjoyment or active play, and to give the project a memorable identity. The design was a series of inter-connected outdoor rooms/gardens of delight and surprise, exploring the relationship between the spirit of context and the expression of contemporary art, architecture, landscape architecture and culture.

One of the gardens in the design is the *Four Season Gardens,* located at one of the main entrance points on the east end of the site (Figure 31-33). It is a series of four small size gardens that capture the spirit of each of the seasons. Each one is enclosed by walls of small Plexiglas panels - in red, green, yellow and blue - set in aluminum frames. The red garden, symbolizing autumn, is filled with dense "Burning Bush" shrubs. The wooden birdhouses that rise above the height of the wall feature as a sanctuary and sculptural

piece in the garden. Next to the red room is the green room representing summer. The garden is bedded with un-mown grass with a single tree planted in the centre of the structure to illustrate seasonal changes. Wall-mounted lugs are provided for residents to hang hammocks for relaxation. In the yellow, spring, garden, an S-shaped loveseat provides a strong visual accent. Two life-sized cast-bronze chipmunks sitting on top of two square posts are another features in the yellow garden. The blue garden draws attention to a stone cylinder with a small depression that is intended to freeze in winter, set in a field of gravel with bamboo spotted around the perimeter (Treib, 2002:64-67).

Each of these rooms provides a unique experiential opportunity for the people who live in this community. They create a framework for interpretation and allow visitors to find possible meaning and identity in each of the enclosed coloured spaces. The colourful landscape architecture of Kitagata also encourages housing officials, developers, builders and architects to consider more fully the importance of landscape architecture in the realm of housing in Japan (Treib, 2002:64-67). Together, they create a delightful atmosphere among the relatively dull coloured apartments.

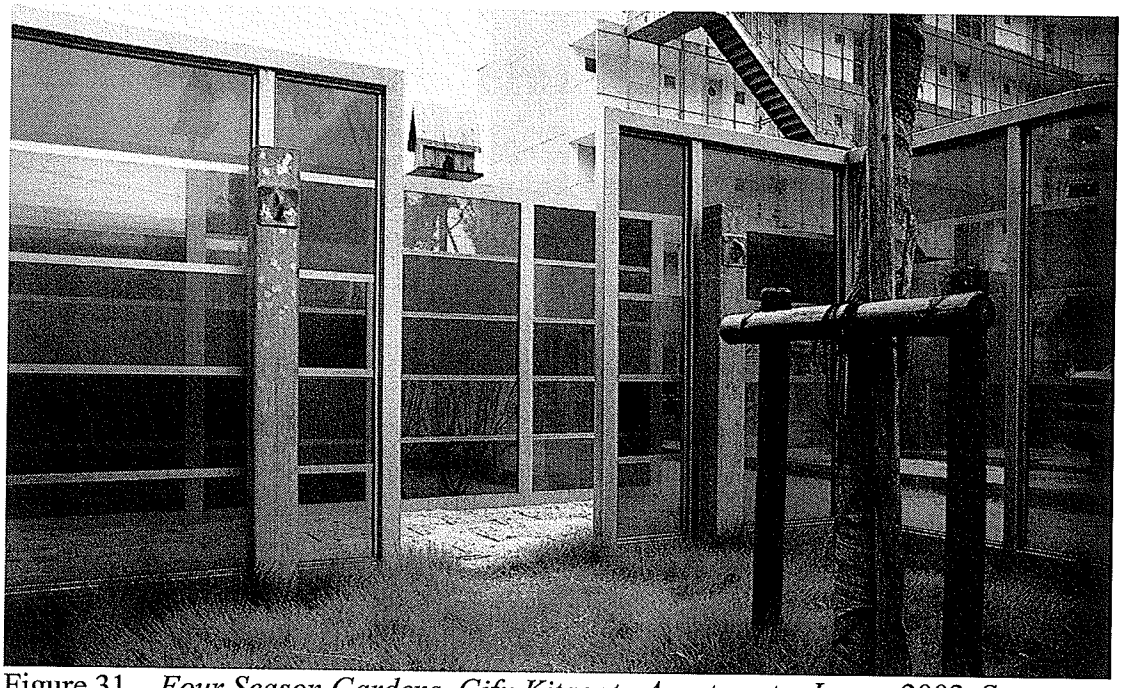

Figure 31 – *Four Season Gardens, Gifu Kitagata Apartments, Japan.* 2002. Summer Garden bedded with unmown grass by Martha Schwartz (Treib, 2002:62).

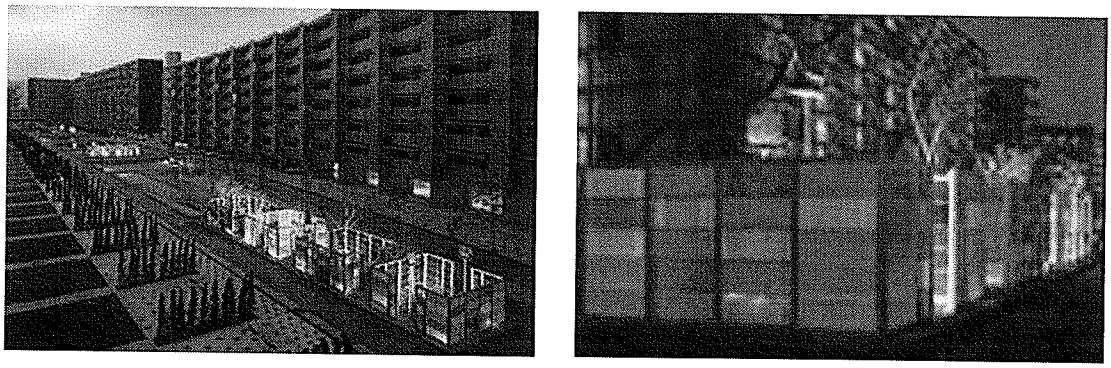

Figure 32 – *Four Season Gardens, Gifu Kitagata Apartments, Japan.* 2002. Night Scene of the Four Season Garden (Martha Schwartz, Inc., 2002).

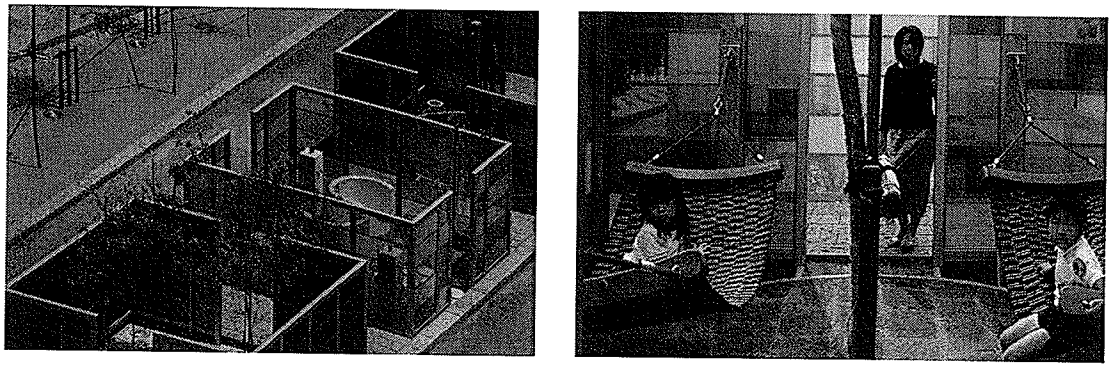

Figure 33 – *Four Season Gardens, Gifu Kitagata Apartments, Japan.* 2002. Overview of the Four Season Garden by Martha Schwartz, and interior of the Summer Garden with hanging hammocks (Treib, 2002:62).

The colour scheme for the Four Season Gardens, however, is an example that illustrates the imposition of the western colour symbolism scheme. In traditional Japanese culture, different colours represent each season. As demonstrated in Figure 34 below, the Japanese wore the different colour of Kimono for each season. The Japanese tended to use different shades of a hue in traditional design; hence bold red was actually rarely used. Martha Schwartz may have imposed the western colour symbolism scheme onto an eastern setting.

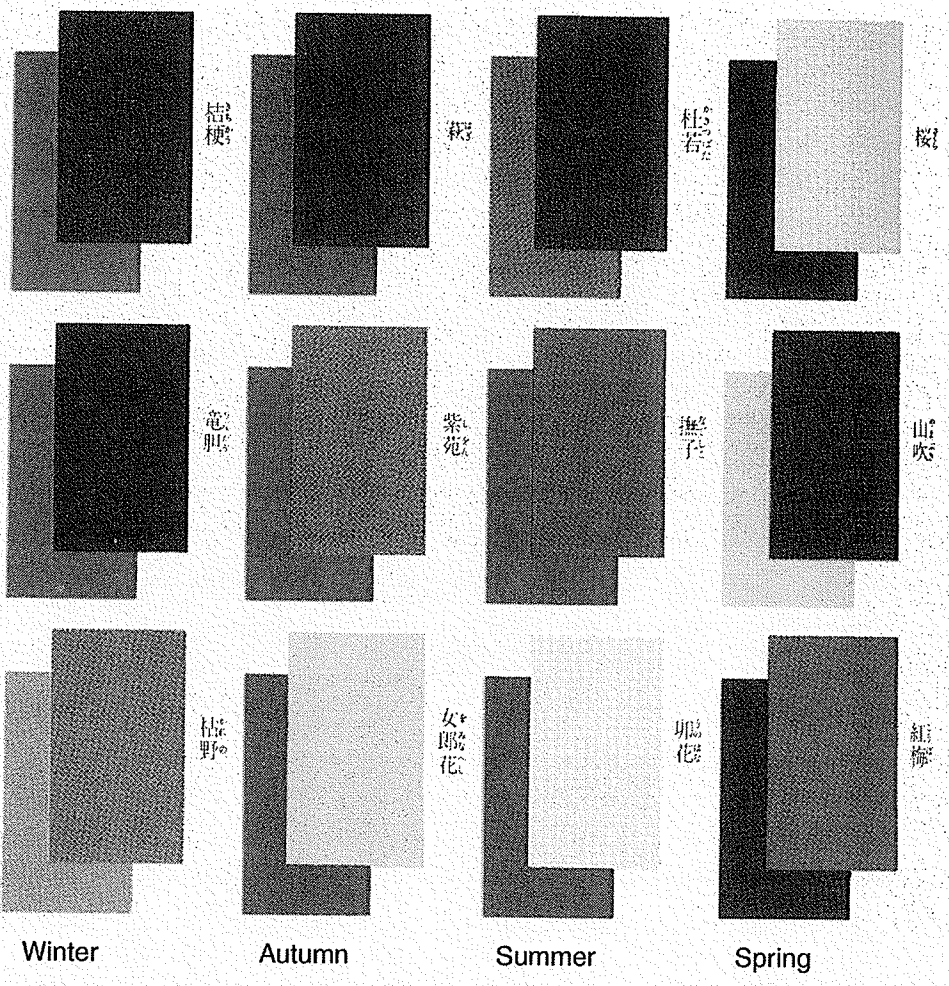

Figure 34 – Colours of Japanese Kimono worn for each season (Jiten, 1981: v).

Claude Cormier

Having studied and worked under Martha Schwartz in the early 1990s, Claude Cormier's work continues the exploration of material and usage of colour. Although many of his works are considered controversial, they encourage the viewer to experience the landscape, or the elements in the landscape, from a different perspective, while challenging the profession about the relationship between nature, landscape and artificiality. The reading of the given site and the understanding of the ecological, geological, botanical and geographical variables are considered to be crucial in Cormier's designs (Hammatt, 2002: 96).

In his *Blue Stick Garden* (Figures 35-37), one of the nine gardens featured in the Festival International de Jardins de Métis (2001) an international festival of avant-garde design at the Reford Gardens in Québec, a link between the history of the garden and the art of modern landscape architecture was created (O'Connell, 2001: 99). The design was site specific and addressed both the physical and the cultural quality of the site. It took inspiration from Elsie Reford's Allée Royale, adopting a similar grammar – framing of an alley, pointillist approach to colour and the strategy of a vegetation screen as a contrasting backdrop while using a very different vocabulary (Cormier, 2001: 15). Cormier's densely planted rows of painted sticks in lieu of flowers are a symbolic reference to the evolution of our visual culture. The wildflowers in the backdrop represents the impressionist brushstrokes, while the blue sticks are a representation of a pixilated Himalayan blue poppy, the signature flower of Reford's gardens (Cormier, 2001: 17). Surrounded by coloured sticks of varying heights, visitors' perceptions of the

garden and its environment shift, as they move through the corridor, the labyrinth and the turnaround created in the design. Viewed from one direction, the sticks are all painted blue, a colour that represents the Himalayan blue poppy. When viewed from the opposite direction, the visitor sees the backs of the sticks which are painted bright orange, symbolizing the colour of the poppy's centre and presenting an unexpected colour contrast. The sticks also created the pointillist effect of a monochrome volume depending on one's position in the garden (Cormier, 2001: 19).

The garden provides another level of meaning to the visitors' experience of nature by drawing connections between the constructed landscape and its context. It was able to awake visitors' senses and perception, stimulate the imagination and shape people's perceptions of the natural world (Cormier, 2001: 19).

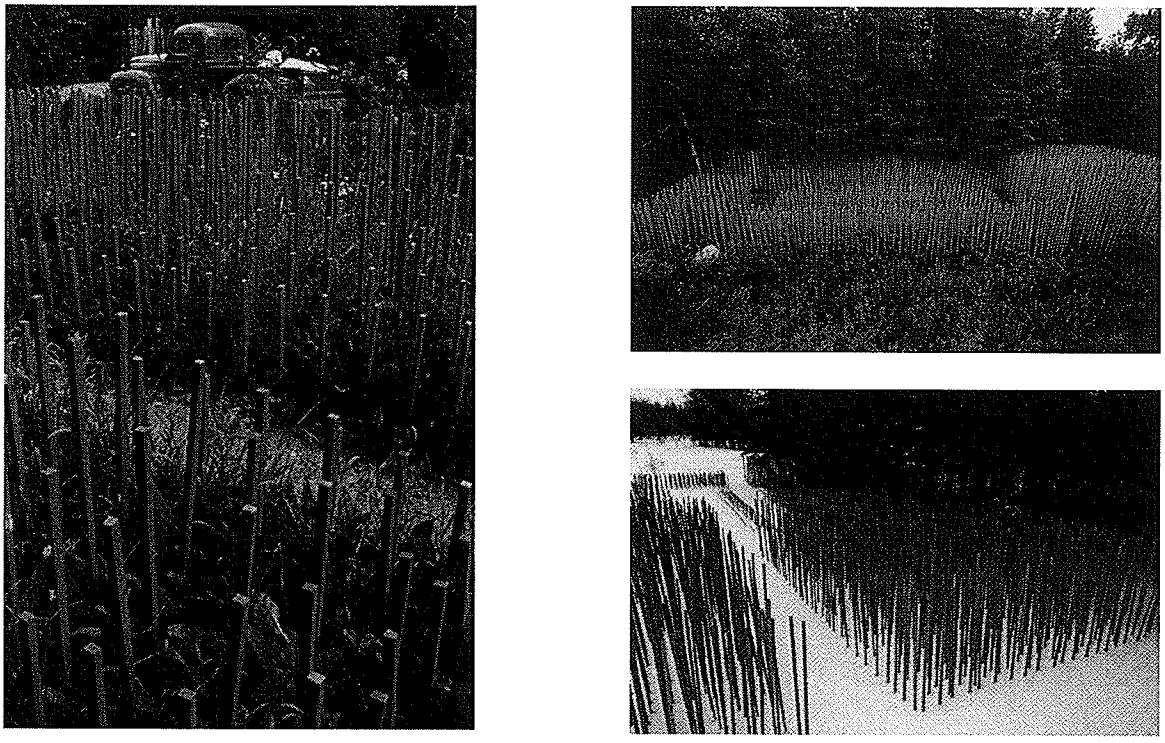

Figure 35 – *Blue Stick Garden, Reford Gardens,* Québec, Canada. 2001. Overview of the *Blue Stick Garden* by Claude Cormier (Cormier, 2001: 16, 18)

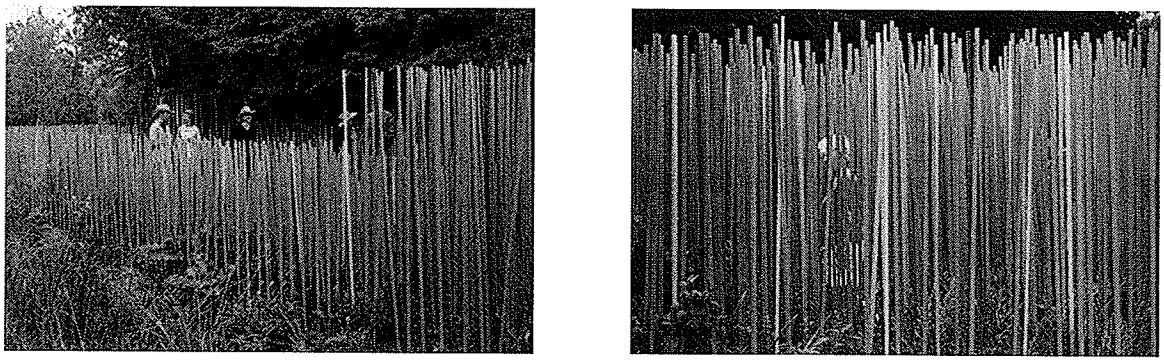

Figure 36 – *Blue Stick Garden, Reford Gardens,* Québec, Canada. 2001. People experiencing the *Blue Stick Garden* by Claude Cormier (Cormier, 2001:16,18).

Figure 37 – *Blue Stick Garden, Reford Gardens,* Québec, Canada. 2001."Impressionist Brushstrokes & Digital Imagery" (Cormier, 2001:17).

The *MAC Lipstick Forest* (Figures 38-39) in the north-facing gallery of Montreal's *Palais des Congrès* is another example of colour application in landscape architecture created by Claude Cormier. Instead of filling the indoor space with tropical plants as in many North American malls, the design used artificial trees to bring a cheerful spirit to the winter garden. Only the fiberglass tree trunks are situated in the forest, as the foliage was omitted to represent winter. The Day-Glo lipstick pink colour of these trunks is a symbol of Montreal's inexhaustible "joie de vivre". (www.claudecormier.com, 2003)

The colourful design has brought a cheerful spirit to the winter garden, while attracting attention from the street. It stimulates the imagination by questioning the traditional notion of interior garden and challenging people's perceptions of everyday objects. From a utilitarian point of view, the design also minimizes the level of maintenance compared with the requirements for a biotic interior tropical garden.

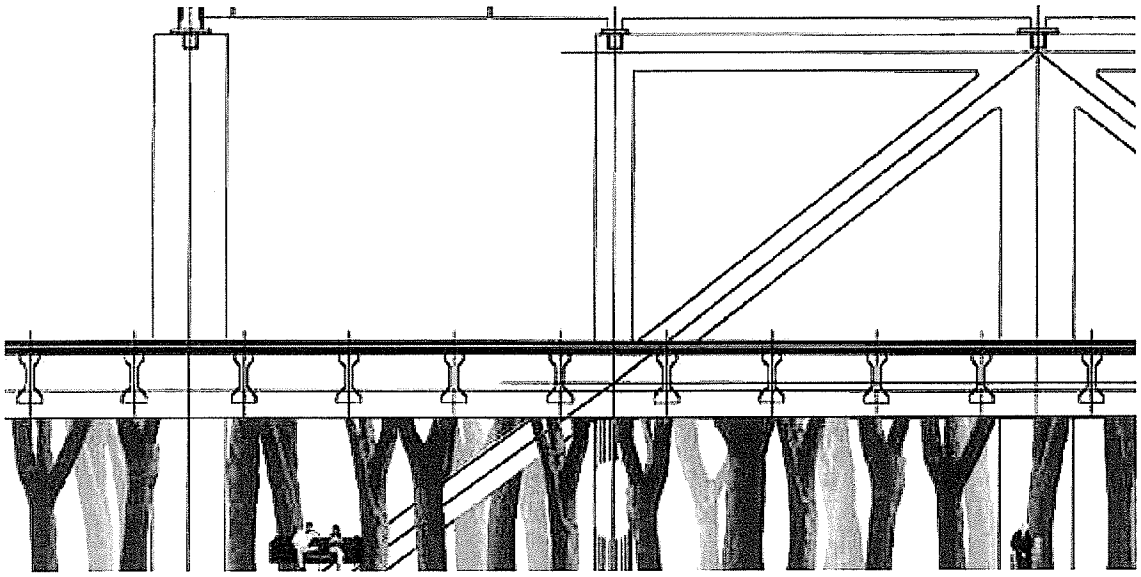

Figure 38 – *Lipstick Forest, Palais des Congrès,* Montreal, Canada. 1999 (www.claudecormier.com, 2003).

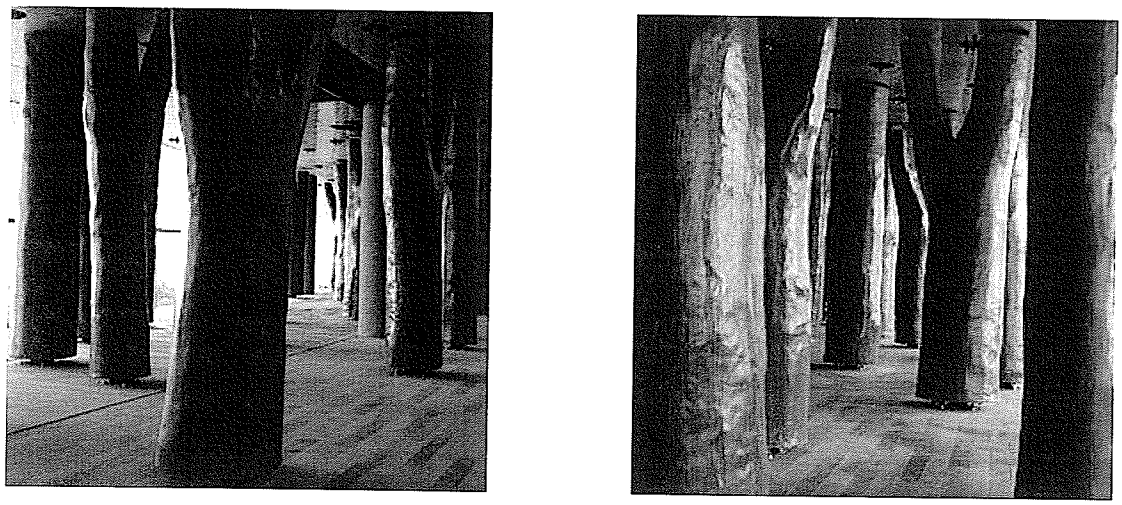

Figure 39 – *Lipstick Forest, Palais des Congrès,* Montreal, Canada. 1999 (www.claudecormier.com, 2003).

This chapter pays attention to examples of colour application by artists, architects and landscape architects. Their works demonstrate the impact of colour in a designed environment and the possible impressions that colour design can have on the visitor. They promote the use of rational colour choices informed by the context and suggest the possible benefits of colour application in landscape architecture.

Conclusion

Conclusion

Colour plays a critical role in landscape architecture and should be used in a greater variety of ways in the discipline. Colour can enhance the functional aspect of a landscape design and enrich the artistic value of the places which landscape architects design. Colour can create a framework for interpretation, which subsequently creates an opportunity to promote local distinctiveness in the age of globalization. Colour usage in a constructed landscape can also achieve instructional/ educational purposes. It can help landscape architects communicate design intentions in an effective manner. In short, it can expand the possibilities of created landscapes beyond their constructed components.

In order to be effective, colour decisions need to be based on the nature of colour and the given context. Colour in landscape architecture should facilitate a clear dialogue with a project's context. Landscape architects should consider the following factors when making decisions about the use of colour in landscape projects:

Checklist for Colour

Colour Theory

- ❑ What is the most appropriate colour system for the project?
- ❑ What is the relationship between the existing and the proposed colour scheme?
- ❑ Is the proposed colour scheme following any rule in colour harmony? Why / Why not?

Physiological Factors in Colour Perception

- ❑ What is the ability of the surfaces and finishes of the object in view in absorbing, reflecting or transmitting light (i.e. its spectral characteristic)?
- ❑ Is the visibility level of the proposed colour scheme achieving its intended purpose?
- ❑ Is the colour scheme appropriate for the chromatic sensitivity of the user group?
- ❑ Is afterimage going to be an issue in the proposed colour scheme?
- ❑ How will the proposed colours be perceived when juxtaposed with each other and with the existing colours?

Non-physiological Factors in Colour Perception

- ❑ What is the perception of colours in the culture where the project is located?
- ❑ What is the range of colour vocabulary that is commonly used in the culture?
- ❑ How does the personal background of the user group affect their range of "describable colours"?

Colour Attribute

- ❑ Is the perceived temperature of a colour an important aspect in the project?
- ❑ Is the perceived depth of a colour an important aspect in the project?
- ❑ Is the perceived weight of a colour an important aspect in the project?
- ❑ Is the proposed colour scheme appropriate for the noise level of the site?

History and Evolution

- ❑ Is the project intended to make reference to a particular historical period, artistic impression or architectural style?
- ❑ Is the proposed colour scheme reflecting the colour scheme of its past?

Checklist for Context

Physical Factors

- What is the scale of the site? What is the distance from which colour will be viewed?
- What is the size of the user group? Do they have any "insider knowledge" on any particular colour or colour scheme?
- What is the character of the location? Is the proposed colour scheme appropriate to the atmosphere and mood of the space, and supports the function of the landscape? Will it create a negative effect on the users?
- What is the existing colour combination?
- How will the proposed colour scheme impact the surrounding neighborhood?

Environmental Factors

- What is the amount and quality of natural light of the site?
- What is the amount and quality of existing and proposed artificial light of the site?
- What is the general climatic condition of the site?
- Is the proposed colour scheme and material choice suitable for the micro-climate?

Social Factors

- What is the impact of the proposed colour scheme on the people?
- What are the vernacular values on colour selection for the locale? What is their ability in accepting polychromatic colour scheme? What is considered as "acceptable" or "appropriate" colour choice? Is "colourphobia" an issue?
- Does the proposed colour scheme follow any particular colour trends or style? Why? / Why not?

Cultural Factors

- Is the proposed colour scheme reflects the colour symbolism understanding of the particular culture?
- What are the preferred colours for the particular culture or user group?

In conclusion, colour application in the constructed landscape should not be reduced to an irrational and subjective approach to design. It should not even be limited to use as an intuitive tool in the beautification and creation of atmosphere, where its application and selection is only a matter of taste and personal preference. Colour is an art and a science that requires a holistic approach. Careful analysis of the context and an understanding of the nature of colour are important in establishing a rational base for colour application. Colour should be considered as a design detail that is sensitive to the project's context in order to facilitate a clear dialogue between the landscape and its users.

Appendix

Appendix

Colour Symbolism in the West

General Study

Frank Mahnke conducted a study on colour association between April 1991 and April 1993 using human subjects primarily from America and in the 25 to 60 age group. He gave subjects the following instructions:

> "Please assign colours to the below-listed terms without thinking about specific objects (such as clothing, flowers, tapestries, rooms, and the like). We are interested in the association you make with the concept or idea of the terms. Don't stop at only one colour that you feel is closely allied to the term listed or gives the best colour expression of the term; select a second if you so wish."
>
> (Mahnke, 1996: 55)

The results of the study were:

Term	Colours Chosen	Percentage
Love	Red, Red-Violet	81%
Hatred	Black, Red	89.6%
Peace / Tranquility	Blue, Blue-Green, Green	93.6%
Morning / Sorrow	Black, Grey	86%
Happy	Yellow, Orange	63%
Jovial	Orange, Yellow	50%
Life	Green	73%
Luminous	Yellow	65%
Noble	Blue, Blue-Violet, Violet	81%

Table 1:
From Frank Mahnke's book, *Colour, Environment, and Human Response* (New York: Van Nostrand Reinhold, 1996:55)

Mahnke conducted a similar test in Europe in 1993, where participants came primarily from Germany, Austria, and Switzerland and were aged between 20 to 60 years old. Percentages for each hue are shown individually instead of as a group in this study.

Term	Colours Chosen	Percentage
Love	Red	72%
	Red-Violet	27%
	Pink	15%
Hatred	Black	58%
	Red	36%
	Yellow-Green	18%
Peace / Tranquility	Blue	56%
	Green	42%
Mourning / Sorrow	Black	76%
	Grey	30%
	Brown	18%
	Violet	18%
Happy	Yellow	61%
	Orange	45%
	Yellow-Green	24%
Jovial	Orange	48%
	Yellow	21%
Life	Green	68%
	Red	41%
Luminous	Yellow	62%
	Yellow-Orange	21%
Noble	Violet, Red Violet	41%
	Blue	41%

Table 2:
From Frank Mahnke's book, *Colour, Environment, and Human Response* (New York: Van Nostrand Reinhold, 1996:55)

The results of Mahnke's studies show significant parallels in the dominant colour groups chosen by subjects in the United States and Europe. It is not feasible, however, to determine from these results what percentages are choices based on innate or learned responses. The following sections provide a breakdown of the symbolic meaning associated with some of the colours:

Red

Red, in general, symbolizes passion, strength, activity, warmth, aggressiveness, rage, intensity, fierceness and blood. The colour is associated with an aggressive nature that connects with combat, dominance, and rebellion. For example, in astrology, the impatient, hot-tempered, trail-blazing leader, Aries, was assigned the colour red, the same as the planet Mars, representing the god of war (Mahnke, 1996: 60). Roman legions would hoist a red flag, also called the blood flag, to signal an attack; the Communist revolutions were connoted with the colour red, and the red shirts and flags of Garibaldi's men signified a revolution in Italy (Mahnke, 1996: 61). In France, the tricolour flag is the flag of order, victory, glory, liberty, legitimacy and popular sovereignty, but the red portion of the flag represents the defeated populace of socialist and revolutionary parties and of the "far left" (Pastoureau, 2001:153).

While red is the colour associated with killing and bleeding, it is also considered to be the life-giving colour. Since red is the colour of the blood that summons from within to the surface of the skin, symbolizing health, energy, confidence and strength, it is a common practice among certain people to artificially apply the colour to the exterior surface of the

skin. In many ancient and primeval societies, a touch of red, for example the daubing of a corpse with red ochre, was used to prepare the deceased for their afterlife. In ancient Egypt, where extremes in one's complexion were highly prized, facial reddening applied not only to the dead, but also to the living and the inanimate (Porter, 1982:14,15).

Although other colours have also been known as remedies in magic healing, the colour red is the most widely used in certain ancient cultures. For example, red objects - usually a piece of fabric, gems or thread - were used for treating scarlet fever in Ireland and Russia, for relieving sprains in Scotland, for preventing fevers in Macedonia, for relieving head troubles in Portugal and for preventing bleeding by soldiers and women in ancient Egypt (Birren, 1961: 36).

Love is also represented by the colour red. In many religions it represents the sacrifice and love given by humankind to their god, or by their god to humankind (e.g. the blood of Christ). Red also signifies passionate, sensual and erotic love. The colour was the mark of prostitutes in antiquity and in the English language people speak of "red-light" districts rather than blue ones. When translating Hebrew or Greek into French, German, and English, the word red is used abundantly so that the original text denotes not colouration but richness, force, prestige, beauty, love, death, blood and fire (Pastoureau, 2001: 19).

Furthermore, in western culture, red is considered more a masculine quality than a feminine quality. The opposite applied in eastern cultures. "A red letter" refers to a

happy day or a happy occasion. When reference is made to someone as "Red" it usually means their skin colour or, more specifically, the native Indian people (Lai, 1997:131).

From a psychological/ behavioural point of view, red tends to distract the equilibrium of the body by raising blood pressure and the pulse rate, although these effects will be followed by a reversal after a period of time. Time is often over-estimated and weights are experienced to be heavier under the influence of red colouration. Red also tends to increase restlessness and nervous tension; hence, it has its value in commanding human attention (Birren, 1961: 258).

Orange

Orange shares similar qualities to red but is less primitive. The colour portrays a cheerful and flattering spirit. The colour association and impressions of orange are jovial, lively, energetic, extroverted and sociable. Light orange appears cheery, while bright orange is exciting and stimulating (Mahnke, 1996: 60). Although orange is the actual colour of fire, red is often more symbolic of fire.

Orange in its pure form is not used often in North American culture, other than in some food-serving environments where the colour's high appetite appeal is desired; its tints (peach, salmon) and shades (brown) are widely used in the environment (Birren, 1961: 259). As a darkened tone of orange, or brown, is closely related to the hues of earth and wood; it represents comfort, stability, and security. (Mahnke, 1996: 60) Certain tones of brown, however, may appear glum, grubby, and drab.

Yellow

Yellow is known as a happy colour in Western culture. The colour is said to be cheerful, high-spirited and suggestive of the life-giving sun. It gives the impression of a bright future/ hope and a sense of expansiveness. For example, yellow ribbons is a symbol of honoring people who came home from war (Lai, 1997:166). The yellow of the Shell Company's logo represents the search for new horizons, while the red signifies the fuel to power vehicles (Mahnke, 1996: 62). The colour is also widely used in packaging and advertising to express activity, cheerfulness and a sense of enlightenment. Yellow is also believed to be the colour that will stay in peoples' memory longer.

Yellow is considered the brightest of hues when fully saturated, and the human eyes are sharply focused on the colour yellow; hence the colour is often widely used for safety purposes. The colour tends to have an incandescent appearance. The hue is highly visible and tends to appear brighter than white in some environments (Birren, 1961: 259). Diluted yellow, however, may express a sense of envy, betrayal, falseness, doubt, distrust and unreason. For example, Judas was shown in dim yellow in Holbein's "Last Supper" (Verlag, 1961:85). Gold, seen as a variable of yellow, is a symbol of wealth and luxury. The colour often suggests the "beyond", the marvellous, transfiguration and the kingdom of sun and light in religious paintings.

The following are some of the connotations associated with the colour yellow from the Concise Oxford Dictionary (Pearsall ed., 1999: 1658):

- Yellow – (offensive) having a yellowish or olive skin (as used to describe Chinese or Japanese people; (informal) cowardly, (archaic) showing

jealousy or suspicion; (of a book or newspaper) unscrupulously sensational

- Yellowback – (historical) a cheap novel in a yellow board binding
- Yellow-belly – (informal) a coward
- Yellow bile (historical) another term for Choler
- Yellow dog – (American informal) a contemptible person or thing
- Yellow flag – a ship's yellow or quarantine flag, used to indicate the presence or absence of disease aboard; to signal to drivers that there is a hazard ahead in motor racing
- Yellow jacket – (American informal) a wasp or hornet.

Green

Green is a restful colour. It represents tranquility, freshness, quietness and naturalism. A yellowish-green is often more stimulating, lighter and less serious when compared to bluish-green, which is more fastidious, sensitive and cold. The pure form of the colour green has obvious association with the colours of nature and vigorous growth. It is often known as the "ecological colour". It is the quintessential colour of life, fruitfulness and contentment. Brides of ancient Palestine were said to wear green as the colour of hope for a happy life and fertility. Some feel that green is the colour of spring, hope, resurrection and immortality in Christianity. On the other hand, it should also be noted that green can also be identified as a colour relating to poison in some cultures because it is also the colour of mould, decay sickness, and death in humans. (Mahnke, 1996: 63) In Lai's book Colour Psychology in Design, 1997, she stated that about 44% of the world's national flags include the colour green (with 41 out of the 51 African countries having green on their flag). There are three possible reasons for the colouration: Nations

that are rich in vegetation and natural resources; nations that have green as a symbol of hope, improvement and dynamism and Islamic countries that have green as their holy colour. Hence, green is used more commonly as a flag colour in African and the Middle East (Islamic countries). Ireland and Italy are two of the few Western countries that utilize green in their flag (Lai, 1997:181).

Psychologically, green signifies a withdrawal from stimulus and is said to create an ideal atmosphere for reducing nervousness and muscular tension (Birren, 1961: 259). Green is considered a cool colour in western societies, but more toward a neutral tone in the eastern culture.

Some of the other associations with the colour green from The Concise Oxford Dictionary (Pearsall ed., 1999: 623, 624) are:

- Green – as an adjective: concerned with or supporting protection of the environment as a political principle
- Green – as a verb: make less harmful to the environment.
- Green Cloth – (Britain) the Lord Steward's department of the royal household
- Greenfeed – (Australia / New Zealand) forage grown to be fed fresh to livestock
- Green fingers – (British informal) natural ability in growing plants. (Green thumb in N. America)
- Greenhorn – (informal, chiefly N. America) an inexperienced or naïve person
- Greenie – (informal, often derogatory) a campaigner for Green issues

- Greenmail – (Stock Exchange) the practice of buying enough shares in a company to threaten a takeover, forcing the owners to buy them back at a higher price in order to retain control

- Green man – (Historical) a man dressed up in greenery to represent a wild man of the woods or seasonal fertility

- Green Paper – (Britain) a preliminary report of government proposals published to stimulate discussion

- Green Room – a room in a theatre or studio in which performers can relax when they are not performing.

Blue

Blue was of little value to the western cultures of antiquity. To the Romans, for example, it was the colour of the east and the barbarians, and thus had a negative connotation. The colour had little symbolic value because of its inability to communicate ideas or to represent status, hence it was of little significance to social life, religious practice or artistic creation for a long period of time in European culture. Red, black and white were the more common colours. However, with increasing use of blue in objects and images dedicated to the Virgin Mary, and luminous blue stain glass made in the eleventh and twelfth centuries, the colour became more widely used in religious settings. Blue was also used on the coat of arms for the French King and King Arthur at the end of the twelfth century - both of which promoted its "status" in society. The advance in the dyeing industry to create a stable, intense and luminous blue on clothing and the heraldic azure during the thirteenth and fourteenth centuries also promoted the use of blue. The colour was positively reinforced by the Protestant Reformation - blue as the colour of dignity and morality, in the Romantic Movement - colour of enlightenment and dreams and in the American and the French revolutions - the colour of liberty. The publicity of

blue became more widespread with the popularity of the blue jeans since the 1950s. Blue has eventually come to be regarded as the most beautiful and the noblest colour by the majority of western societies. As noted by Pastoureau, the promotion of the colour blue is the expression of changes in social order, systems of thought, and modes of perception. (Pastoureau, 2001: 11, 14, 35, 50, 60, 62, 80, 81, 124, 161)

The popularity of blue surpasses green and red as Europeans' favourite colour (Pastoureau, 2001: 11). It has a restful, calming, and sedate quality. Some researchers believe blue has the antithetical quality to red (Birren, 1961: 260). The colour is said to slow the growth of plants, decrease hormonal activity, lower blood pressure and pulse rate. As opposed to red, time is often underestimated and weights are judged as being lighter. The colour may be used in almost any form and shade, but in general is not very successful when applied to offices, industries, schools, and hospitals unless used in medium or deep tones or in children-related areas.

Blue has positive impressions of calmness, relaxation, security, comfort, sobriety and contemplation, while its negative association is frightening, depressing, and cold (Mahnke, 1996: 63). Blue was considered a "warm" colour in medieval and Renaissance Europe and not until the seventeenth century did it begin to become a "cold" colour in the nineteenth century (Pastoureau, 2001: 185). Passivity, quietness, wetness, cleanliness, odorlessness, mental reflection, melancholy, sadness, sea, water, sky, travel, vacations and the infinite are some of the other terms associated with the colour. Blue only started to be used as a symbol of water on maps and drawings after the late fifteenth century.

Water had previously been shown as green (Pastoureau, 2001: 185). In the modern time, blue is also a colour employed to signify confidence, security, nobility, dignity, poise, reserve, trust and high quality. Blue has a quality associated with spirituality and wisdom – for example the IBM Deep Blue chess player, the term "Recruit Colour". In Christian, Hebrew, and Hindu tradition, there is also a connection with blue. It is associated with virtue and holiness. In secular culture, blue is the only colour with an art form named after it: melancholy jazz and *blues* music. It is also interesting to note that in Germany, when saying that someone is blue, it means that the person is totally drunk, suggesting a clouded mind and numbed senses, unlike the English-speaking culture's meaning that someone is depressed.

From the political aspect, blue was first the colour of progressive republican parties, then that of the moderates and centrists, and finally of conservatives in some European countries. By contrast, the left is represented by socialist pink or communist red and the ultra-right is symbolized by black, brown or white of clerical, fascist, or monarchist parties. Blue is relatively neutral in terms of symbolism when compared to other major colours like red, black or green. It is not a violent or aggressive colour and tends to be reassuring and peaceful. Major international organizations, for example, the United Nations (UN), United Nations Educational, Scientific and Cultural Organization (UNESCO) and the European Union, have chosen blue as their emblematic colour for a similar reason (Pastoureau, 2001: 158,180).

Here are some of the other associations / meanings given in the Concise Oxford Dictionary (Pearsall ed., 1999: 189-151):

- Blue – as an adjective: (informal) melancholy, sad, or depressed; (informal; of a film, joke or story) with sexual or pornographic content; (British informal) politically conservative; (or a ski run) of the second-lowest level of difficulty.

- Blue – as a noun: (Britain) a person who has represented Cambridge University or Oxford University in a particular sport; (Australia / New Zealand, informal) a nickname for a redheaded person, or an argument of fight.

- Once in a blue moon – (informal) very rare

- Out of the blue / Out of a clear blue sky – (informal) without warning; unexpected

- Talk a blue streak – (North American informal) speak continuously and at great length

- Bluebeard – a man who murders his wife

- Blue Blood – noble birth

- Blue Book – (in Britain) a report bound in a blue cover and issued by Parliament or the Privy Council; (in America) an official book listing government officials

- Bluebottle – (Australia & S. Africa) the Portuguese man-of-war; (British, informal, dated) a police officer

- Blue chip – denoting companies or their shares considered to be a reliable investment, though less secure than gilt-edged stock

- Blue-collar – of or relating to manual work or workers, particularly in industry

- Blue-eyed boy – (British informal, chiefly derogatory) a person highly regarded and treated with special favor

- Blue helmet – a member of a United Nations peacekeeping force

- Blue law – a law prohibiting certain activities, such as shopping, on a Sunday. (Originated during the eighteenth century in reference to strict puritanical laws in colonial New England, originally printed on blue paper

- Bluenose – a person from Nova Scotia; a priggish or puritanical person

- Blue Peter – a blue flag with a white square in the center, raised by a ship about to leave port
- Bluestocking (often derogatory) - an intellectual or literary woman.

Purple

In the ancient world, purple was a very rare and expensive dye - it was said that for every gram of purple dye, two thousand seashells of a specific kind were needed as source material (Lai, 1997:181). Purple garments were uncommon and were reserved for the rich. In ancient Rome, only emperors could wear purple. In English "born in purple" had a similar meaning to "blue blooded" in describing someone of noble birth. Violet, lavender, and lilac were the more popular shades of purple in Western countries. These colours signify a mild, feminine quality in the West.

Purple tends to suggest regality, dignity and exclusivity when considered positively; and loneliness, mournfulness, degeneration, morbidity, narcotics and pomposity when associated negatively. The colour also symbolizes internalization and depth of feeling, dignity, wealth, mysticism and magic in the spiritual realm. Purple slipping towards red becomes sensual, seductive, and secretive, while also sweet, cosmetic and intimate (Mahnke, 1996: 64).

Some of the associations of purple from the Concise Oxford Dictionary (Pearsall ed., 1999: 1163) are:

- Purple passage – an excessively ornate passage in a literary composition
- Purple patch – (informal) a run of success or good luck

- Purple prose – prose that is too ornate.

Black

Black tends to have more negative connotations than positive ones. It is the colour of darkness, fear of the unknown, grief and death. Although the exact reason why black has become the dominant colour in funerals and memorial services in the west is uncertain, one theory suggests that it started during the reign of Louis XII of France. The king had declared black to be the colour of mourning and the tradition may have continued into the modern age (Mahnke, 1996: 65).

Black garments have significant meanings among different social groups. For example, followers of the punk culture tend to wear black outfits as symbols of defiance; Hitler's SS troops wore black uniforms to signify their desire to have the power of "the mighty" to induce fear, and priests and nuns wear black as a sign of self-denial. Among the general public, however, fashion in black generally suggests status, elegance, richness, and dignity – for instance black gown, black business suits, black tie and black evening dress. This representation maybe traced back to the practices of patricians and wealthy merchants during the mid-fourteenth century. As the sumptuary laws of the time prohibited these elite groups from wearing luxurious red and certain bright blues, they hired weavers and tailors to produce expensive black fabrics that were "darker, crisper and more seductive than the norm" (Pastoureau, 2001: 96). This allowed them to dress in style without violating the authorities and the moralists (Pastoureau, 2001: 96).

Combinations of black and other colours create different associations. For example, the combination of red and black tends to suggest hatred in western cultures, and the combination of black and gold expresses a sense of sophistication, luxury, and quality.

Some of the associations or meanings given in the Concise Oxford Dictionary (Pearsall ed., 1999: 140-142):

- Black dog – (informal) melancholy or depression represented metaphorically: "I'm happier, but the black dog is still there"
- Black flag – (historical) a black flag hoisted outside a prison to announce an execution
- Black list – a list of people or groups regarded as unacceptable or untrustworthy
- Black magic – magic involving the supposed invocation of evil spirits for evil purposes
- Black market – an illegal trade in officially controlled or scarce commodities
- Black sheep – (informal) a member of a family or group who is regarded as a disgrace to it.

White

Considered the opposite of black, white signifies light, the celestial, hope, holiness, innocence, chastity, purity and joy. White represents goodness and black represents evil. White also represents peace - for example white dove of peace - and a sense of a new beginning or hope of a brighter future (Mahnke, 1996: 64). Since the eighteenth century the blank white flag has become a sign of surrender for all the armies of Europe in the context of war. Moreover, white was also was the symbol of the king's military command in France. White also signified counter-revolutions or reactionaries in history. Black was

the colour of the clergy and the house of Austria, the homeland of Queen Marie, and blue was the colour of republicanism. The French tricolour flag was the symbol chosen by counter-revolutionaries supporting the evolving Revolution in 1789 (Pastoureau, 2001: 154,157).

White is the colour that is most commonly associated with laundry product commercials. White means clean and people expect white to be pure white, without any hint of blemish. The practical use of white substances also has the possibility of translating into symbolic meanings. In seventeenth-century Britain lime was regarded as a useful fire-retardant and was painted over all internal and external surfaces of structures. Hence, in England, white was associated with good luck, and its bearers, the white witches, who, as it was suggested, were encouraged to enter buildings through white-painted windows (Lancaster, 1996: 65).

Nevertheless, white is one of the least-favourite colours. Perhaps this is due to the fact that for many, white is a non-colour. Furthermore, in the case of interior design, people rarely choose white over "colours". When white is applied to interior space, it tends to give a sense of detachment that may not be appropriate in some situations, for example in hospitals, a place that involves human caring.

Some of the associations or meanings given in the Concise Oxford Dictionary include: (Pearsall ed., 1999: 1623):

- White-bread – (N. American informal) bland and unchallenging in a way thought characteristic of the white middle classes

- White-collar – of or relating to the work done or people who work in an office or other professional environment

- White elephant – a possession that is useless or troublesome, especially one that is expensive to maintain or difficult to dispose of

- White feather – a white feather given to someone as a sign that they are considered a coward

- White goods – large domestic electrical goods such as refrigerators and washing machines

- White hope – a person expected to bring much success to a team or organization

- White information – positive information about a person's creditworthiness

- White land – open land not designated for development or change of use, or on which development is not allowed

- White lie – a harmless lie told to avoid hurting someone's feelings

- White–list – (informal) a list of people or products viewed with approval

- White magic – magic used only for good purposes

- White night – a sleepless night

- White noise – (Physics) noise containing many frequencies with equal intensities

- White Paper – (Britain) – a government report giving information or proposal on an issue

- White-shoe – (American informal) denoting a law firm or other company run by members of the *Wasp* elite and regarded as conservative

- White slave – a woman tricked or forced into prostitution in a foreign country.

Grey

Grey is seen as a neutral colour. On the positive side, it represents conservativeness, quietness and calmness; but it is also seen as dreary, tedious, passive and without energy or life (Mahnke, 1996: 66). It represents neither tension nor relief; it is ambiguous and ill-defined. The colour is used more often in combination with other colours and is used more commonly in architecture, as it is generally accepted as the colour of concrete and metal.

Some of the associations or meanings given in the Concise Oxford Dictionary include (Pearsall ed., 1999: 624-625):

- Grey area – an ill-defined area of activity not readily conforming to an existing category or set of rules
- Grey economy – (of financial or trading activity) not accounted for in official statistics
- Grey power – (informal, chiefly North America) relating to old people as a group
- Grey water – (technical) the relatively clean waste water from baths, sinks and washing machines.

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