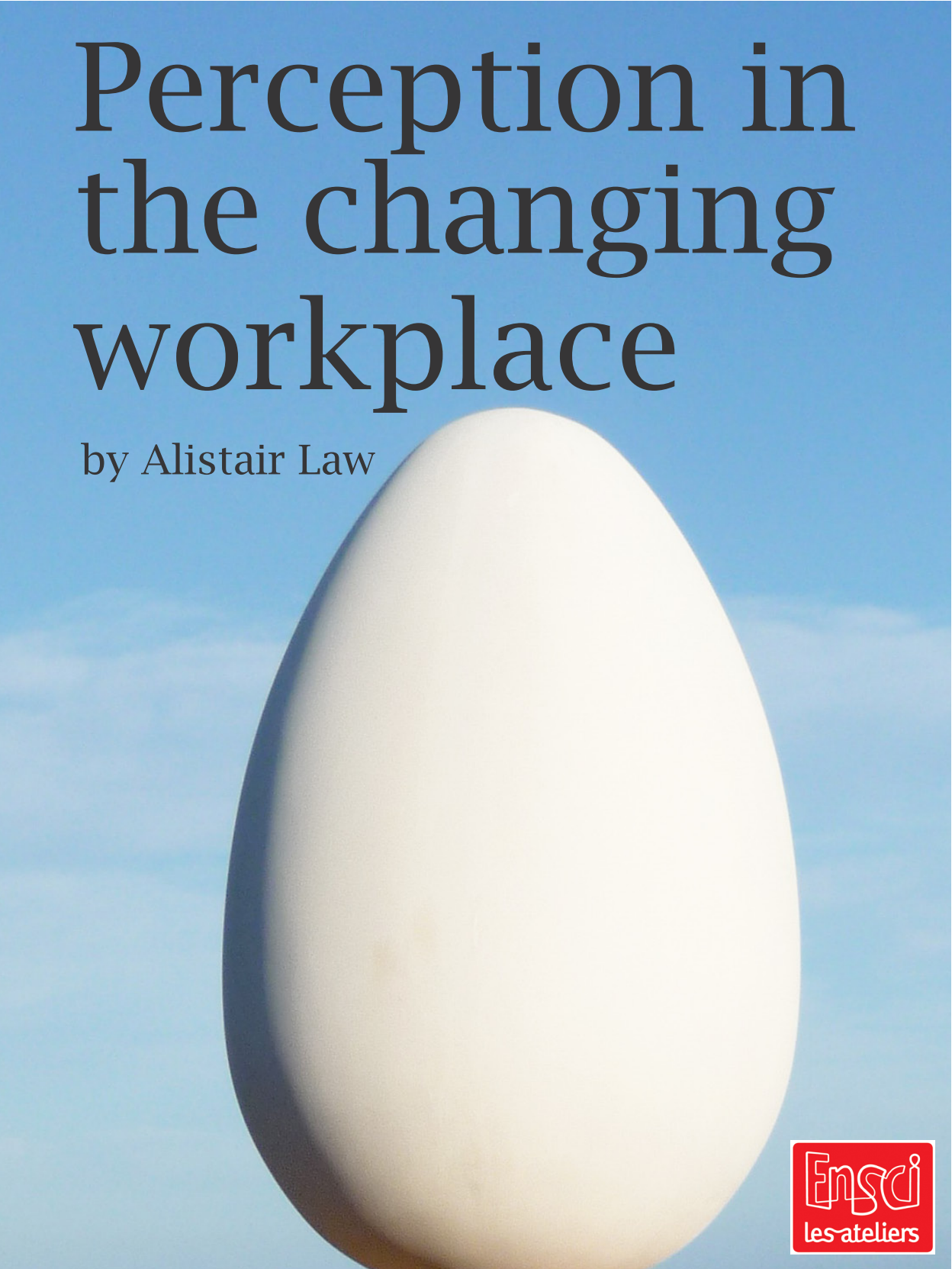
Perception in the changing workplace

by Alistair Law



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Abstract

The revolution in the workplace during the last ten to fifteen years is not comparable to anything we've seen since the industrial revolution almost a century before. Globalisation has brought with it a 24/7 networked culture. There is a growing trend in the migration of knowledge workers as they seek the best jobs. All these elements are placing significant stress on our wellbeing in the workplace. Although psychosocial factors often have the greatest impact on this, the physical environment can play a significant part. Place attachment in the workplace and revitalisation of our direct attention are fundamental to 'coping' with the new stresses brought by the 'digital age'. Key elements of nature have been shown to help with restoring our direct attention both through real contact or views of. This paper compares three different references to the use of nature in impacting our psychological wellbeing. Oliafur Eliasson uses his installations to enable us to 'see ourselves seeing', as a way of questioning our perception. He also attempts to reengage us with our surroundings. The traditional Japanese Garden uses visual perception and representation to give us an otherworldly experience helping with mental restoration. Jackson Pollock with his drip paintings captured the fascination element of nature with his complex fractal patterns. The universal cultural impact of these works provide clues to solutions for the emerging stresses of the workplace. Nature in its variety, forms a strong narrative to help individuals reengage with themselves, their surroundings and society bringing with it place attachment and restoration. The benefits if achieved are obvious.

Contents

All our knowledge is the offspring of our perceptions.

Leonardo Da Vinci

Bio

Alistair Law is a multidisciplinary designer born in 1980 in Paris, France. He studied civil engineering at Bristol University, England with a year studying in Perugia, Italy. He is currently undertaking a masters in ‘Création et technologie contemporaine’ at ENSCI Les Ateliers, Paris.

He has worked 8 years with Arup starting with Arup Associates in London before working for the Arup buildings team in London, Milan and Vietnam. Key projects he worked on whilst in Arup were designing and managing an exhibition ‘drawing water’ for charity Wateraid, inventing and patenting a new inflatable passerelle system, Airplank, and working on the structural design of the Centre Pompidou, Metz, France (Shigeru Ban), One New Change, London (Jean Nouvel) and Belfiore, Florence, Italy (Foster and Partners). As part of the design team with Woods Bagot Architects, his project was shortlisted in the Urban Splash Lex Walsall competition.

In product design he has designed an aluminium chair used by Audi in Vietnam at their launch event of the new A8L in 2010. He went on to design a collection of aluminium furniture around this chair. He has designed a cardboard wall clock and light for the Muji design awards. His project ‘lightscape’ as part of AsA collectif won the ‘anonymous d.’ ‘Under the (computer) moon’ design award in 2012.

Introduction

I started my career in a building occupying one of the most beautiful and best preserved Georgian squares in London, Fitzroy Square. My seat was on the first floor with high Georgian ceilings and views out on to a beautiful tree lined square. I was proud and excited to go to work every day, feeling real attachment to the office. When I needed a break I either walked out into the square or stared out the window at the trees.

Not everyone has such luck with external views or work location. Many workplaces, in this increasingly urbanised world, have limited visual aspect and almost no access to nature. People feel no connection to their workplace, they are there to do a job and that is it. For nomadic skilled workers this lack of place attachment can have serious consequences leading to a sense of temporality. Also if individuals feel no connection to their workplace it will be difficult to feel comfortable when there.

How can the knowledge worker not only survive but flourish in this frenetic globalised workplace where e-mails arrive at all times of the day, one can always be contacted by phone and we are saturated with information? The effects of this 'digital revolution' are causing a growing disconnect between society, our surroundings and even ourselves. How do we remain productive without losing our senses?

Reconnecting mentally with ourselves, society and our surroundings is a start. The physical environment offers many possibilities in how this can be done. Our psychological health being so connected to our physical health means that a lot is at stake. We spend most of our life at work so getting this right in the workplace will have knock on effects in all areas of our life. As 'knowledge workers' (Drucker (1959)) we also have significant interest in protecting our psychological health.

Keeping up the pace of working in the 'digital age' will require us to understand our limits. To remain effective we will need to regularly revitalise our psychological health so we do not 'burn out'. The importance of nature in restoration is widely known. It has also been the subject of manipulation by scientists and artists alike to distil its essential properties.

This paper will explore psychological health, from the point of view of 'knowledge workers', in the context of the above and discussing:

- The trends and obstacles emerging from the changing workplace in the 'digital age'.

- The scientific studies highlighting the importance of the physical environment on creating place attachment and mental restoration with particular attention placed on nature.

- How three different fields use the essential qualities of nature to positive effect on mental restoration and place identity with the analysis of design methods. These fields are i) Oliafur Eliasson and the Light space movement ii) The Japanese Garden iii) Jackson Pollock and his drip paintings.

Fitzroy Square, London

The changing workplace

Pose the question “Where do you work?” to different people and I’m sure you will be surprised by the answers. Answers will include ‘on the train’, ‘in the departure lounge’, ‘lying in bed at night’ or ‘from my Blackberry’.

Technology has had a profound effect on the way we work and in doing so has opened up significantly the places where we can work. Traditional manufacturing industries will continue to be constrained by their fixed assets but the opportunities for the knowledge worker are endless. Hence the emergence of new trends such as flexitime, flexible work spaces, the rise of the consultant and coworking.

A increasing trend in multiculturalism from a global workforce who are willing to migrate mean that employers are facing similar immigration problems to the countries they are in. How do you make these new skilled migrant workers feel welcome, thus allowing them to work at their best?

Then there is the generational gap that is shaping the workplace between those that grew up with the emerging digital age and those having to adapt to it. It is not only a question of technology itself but also new revenue streams being facilitated by this technology. This is often described in the stark differences between what is known as the Generation X-ers and the Generation Y-ers. Generation X being the baby-boomers born between 1950 to around 1982 with Generation Y or the Millennial generation being born between 1982 and 2000.

The impact of the global financial crisis on the work place is still unclear. Some of the trends previously described may disappear or mutate but there is likely to be greater competition in the workplace in the future owing to greater migration. The gap between the rich and poor will not just be over money but will be driven by knowledge. Those that have it and those that don’t.

The digital revolution

Are the challenges to the workplace today any different to those suffered by our forbearers during the industrial revolution? Not necessarily; the reactions to the digital workplace have many similarities.

The industrial revolution was a major period of change for western economies, starting in Great Britain it increased the average GDP by an order of 10. It was dominated by the rise of the machine, which was powered by the growing number of coal mines in the UK. Mass production was with us and it changed our landscapes. With it brought new inventions such as the electric light bulb, the elevator, the telephone and the typewriter, which form core elements of our workplace today in varying guises.

At the same time there were counter movements such as the Arts and Craft movement founded by William Morris. This was a reaction of disgust to this move towards mass production and the disfigurement of the landscape by new factories and coal mining. William Morris extolled the virtues of nature as an idealised source of harmony. He brought ornament to utilitarian objects while industrialisation, he said, destroyed it. He stood for the skill of the craftsman that harked back to medieval periods, even creating associations and guilds to nurture their skills.

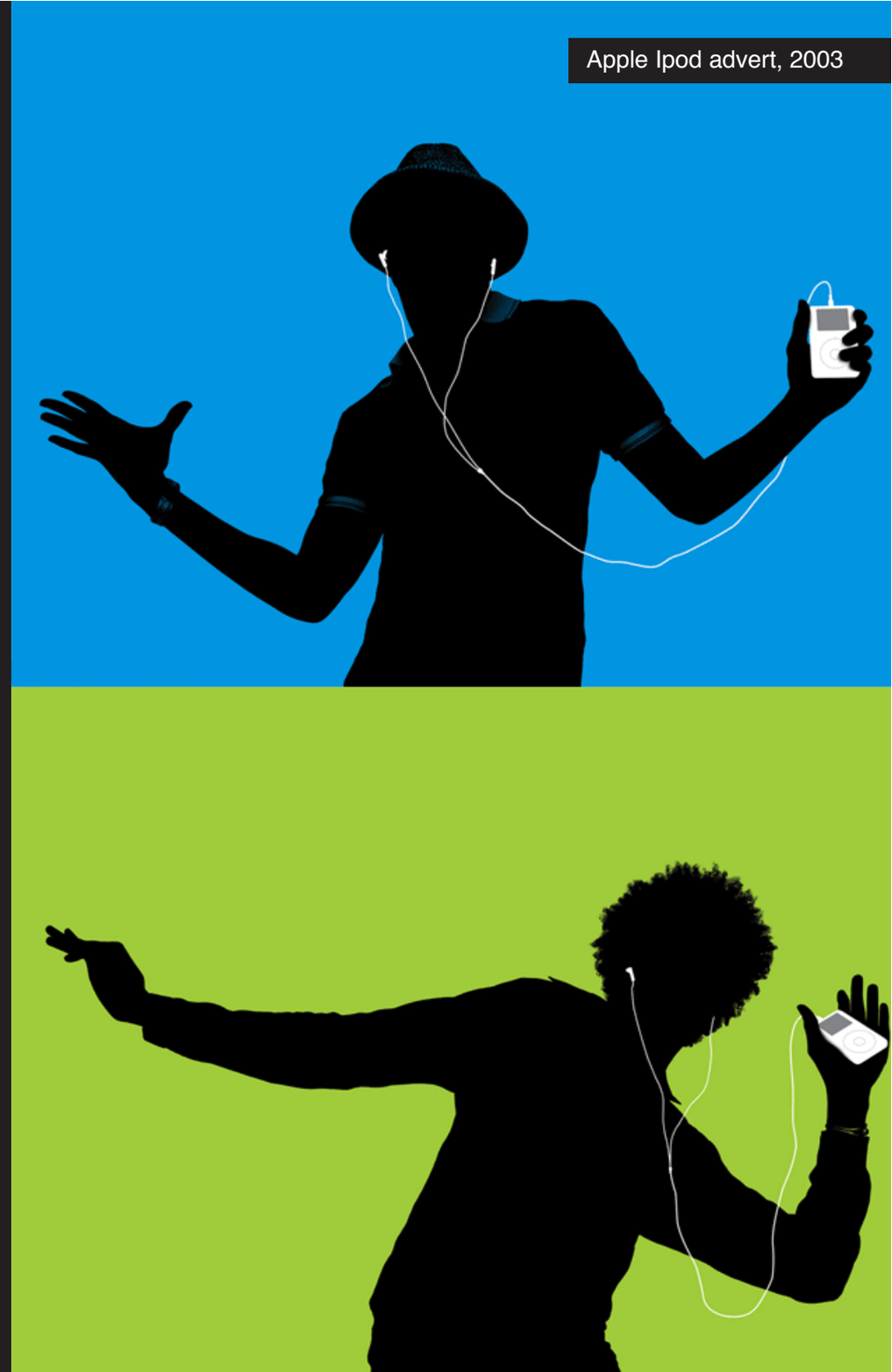
There were other reactionist humanist movements coming out of the industrial revolution. For example that started by Louis Sullivan. He felt that a more societal element was required in architectural design, fathering the modernism movement coining the phrase 'form follows function'. He used the latest industrial techniques such as the advent of steel to incorporate these humanistic elements into his design in turn inspiring the likes of Frank Lloyd Wright and those that followed.

So what relevance does this have to today? The digital revolution also significantly impacted the world economy, facilitating globalization by improving the connectivity between world populations. The digital revolution was founded on the democratisation of technology following inventions such as the personal computer, the world wide web and the mobile phone.

The IBM Personal Computer came out in 1981 and brought computers into the home and to the entrepreneurial businessman. This coupled with the invention of the world wide web and the internet protocol in 1982 meant that by the end of the 80's and early 90's, with computer prices dropping, the public really started using the internet.

The mobile phone like other inventions did not just arrive overnight but has been developing over decades. 1973 brought the first private mobile phone call by Motorola but it wasn't until the early 90's that mobile phones became ubiquitous. A greater antenna network meant relays between phone and antenna were shorter reducing battery requirements and thus size and cost.

These three technologies, the computer, the internet and the mobile phone now form the backbone of how we work today. With the additional development of wi-fi networks, VOIP, smartphones and tablet computers the traditional desk is becom-



Apple Ipod advert, 2003

ing redundant. The digital revolution is now moving from hardware to software. Inventions such as Facebook and Skype are the new PC computers. Skype opened up video phone calls to the masses, facilitating traditional family and cultural relationships at long distance .

As with the industrial revolution, reactive movements have developed from the digital revolution. One such example is the Slow Movement, which believes that because of technology the speed of life is so fast that people have lost their connection with living and thus with the world around them. The most successful aspect of this has been the Slow Food part of the movement with restaurants applying the approach all round the world. Online social networks are a different type of movement but probably one of the most powerful of recent times. Made famous by the likes of Facebook and its predecessor Friends Reunited, their success is probably down to a growing disenfranchised population seeking comfort in their nomadic lifestyles. These movements are natural reactions to the disorientation caused by rapid change. Some look to their past as a way of finding comfort such as William Morris and the Slow Movement and others see opportunities to humanise these massive elements of change such as Louis Sullivan and Facebook.

So what does this all mean to the workplace? These reactive movements give clues to the trends in the near future similar to Louis Sullivan and the start of the modernist movement. The coworking movement is a likely result of the growing importance of social networks and community as a way of doing business facilitated by technological advances. I will enter into more detail on this later. Similarly, the Slow movement has also generated interest in a global trend of ‘going local’, small community businesses that use technology to distribute local, good quality services or products globally at low cost. Local is becoming a euphemism for a network of small businesses that behave as a community servicing each other with similar values. The importance of work-life balance among the Gen Y-ers also links closely with the aims of the slow movement.

Our physical workspace has also changed as mobile telephony and ubiquitous internet access has meant that we are finally no longer linking desks together but people. The answer phone message ‘sorry, I’m away from my desk at the moment’ has been replaced by something much more pertinent ‘sorry, I’m busy at the moment’. As such, new trends will emerge as we try to manage these new disturbances created by the technology we have adopted.

Where once workers were arranged around the furniture, the future is the furniture arranged around them. Hot-desking is one reaction to this. In a world where people are more nomadic and real estate more expensive, it is seen as a way of optimising space. But the traditional office has to change to compensate for this upheaval. Vischer (2010) says that offices create emotional ties, leading to territoriality among employees that can be disrupted by hot-desking.

The digital revolution has also challenged the health of the relationships between young and old. Gen X-ers who have progressed up the work ladder through experience are being challenged by the emerging Gen Y-ers who see new possibilities through technology. The tradition of respecting experience is being lost by the confidence Gen Y-ers have from large social networks. The Association of British Recruiters described them as the ‘Diva generation’ (Stern(2008)). So how can we not only facilitate the coexistence of both in the workplace but also make it a healthy productive combination? If we get this wrong we will lose generations of tacit experience.

Nomadism and multiculturalism

Multiculturalism in the work place is a direct result of the trend towards nomadic lifestyles whilst the fruits of the digital revolution have made things a lot easier. The search for work and a better quality of life is driving people to change more often where they live. This has led to rapid urbanisation. As a result our cities and our workplaces are facing significantly new challenges to adapt or be replaced by those that do. The health of our cities is at stake.

Cities are competing to not only entice the best organisations to relocate to them but are also working with organisations to create conditions to retain the best talent. Detroit is a good example of how the health of businesses directly impacts the health of cities. When Americas big three carmakers faced financial destruction it was not only the companies that were at stake but also the lives of millions of inhabitants in Detroit. A healthy city like a human being needs to be able to adapt to changing markets with a diversified offering.

Cities like New York, London, Paris and Sydney have always attracted migrants looking for new opportunities. In part this is down to their accessibility to foreigners helped by their historical significance and thus employment opportunities. The cluster effect of these metropolises add to their value for global businesses but in the war on talent everything matters. Cities like Auckland in New Zealand are hoping to attract and retain talent not only through good urban planning and infrastructure but by offering free wi-fi throughout the city (Schuetze (2011)).

These migrant populations for the knowledge economy represent some of the best talent. Desrochers (2001) notes the connection between diversity, creativity and regional innovation. The benefits of this diversity and the importance of embracing it were shown in an empirical study of Silicon Valley (Saxenian (1999)), which noted that approximately a quarter of new business formations had a Chinese or Indian born founder and roughly a third of the region’s scientists and engineers were foreign born.

So how can workplaces adapt to this new nomadism? As estate agents say ‘Location, location, location’. The best talent will not move everywhere and livability, an index cited in many surveys, will help entice the best. Mercer releases an annual Quality of Living Survey, which European cities dominated in 2011. The winner that year was Vienna followed closely by Zurich, with none of the big international cities like London or Paris making the top ten. Note that Zurich is Google’s EMEA Engineering Hub. As the digital revolution changes the way we work, it might also change where

Understanding culture in the workplace will help with integrating it. The social scientist, Geert Hofstede identified Five Dimensions of Culture (Hofstede (2001)) that are useful in understanding culture in the workplace. They were a result of comparing cultural behaviours in IBM offices in different countries. The five dimensions he identified are:

1) **The power distance index** ie the nature of the distribution of power in a society

2) **Individualism** - The relationship between the individual and the group

3) **Masculinity** - The roles that are assigned between men and women

4) **Uncertainty Avoidance Index** - how society reacts to unstructured, ambiguous situations whether comfortable or not.

5) **Long Term Orientation -** A long term strategy is synonymous with values such as perseverance and saving. Whereas an attachment to tradition, social obligations and self image are linked to short termism.

Trends that have been identified include that the Western world is much more individualistic, with Anglo-Saxon countries leading the group. Scandinavian countries are at the forefront of promoting feminine cultures Gall (2009). Gall also noted that long term orientated cultures are predominantly East Asian countries like China and Japan which place future generations ahead of current generations. European and Anglo-Saxon countries are shown to be short term cultures. This reverses popular myths.

The question is how can you adapt the workplace to multiculturalism following this cultural understanding? An interview with Mathias Graf from Google's EMEA Engineering Hub revealed they have over 50 nationalities in their office (Gall (2009)). He said it works but requires an openness among staff and a capacity to adapt. The office space needs to consider the ramifications of cross cultural tendencies among staff.

An appropriate response to managing these cultural differences is through spaces such as Google's that avoid dominant cultural references that allows everyone to coexist. The question is still how the space can be optimised to accommodate cultural differences. Understanding the fundamental differences is a start to understand how best to design a healthy multicultural workplace.

One prominent example of cultural understanding was in the design of HSBC tower in Hong Kong by Sir Norman Foster. Originally the trusses were inverted until it was pointed out that in Chinese culture the symbol that created was bad luck so they were inverted.

The new workplace

The work place as we have now ascertained is changing. But what is driving this new workplace? Some would argue technology but this is generally only developed to fulfil needs. So what are the needs of the workforce themselves?

There are conflicting arguments of the future of working in the knowledge workplace. Evidence shows that the 'job for life'

Inspired knowledge workers

is disappearing in Western countries as job tenure figures show a downward trend in the US (Farber (2007)). So is there a move to globally competing free agents? Gen Y workers are characterized as unloyal moving from challenge to challenge.

As we discuss the rise of virtual social networks such as LinkedIn and Facebook, the job for life may take a more networked form. Loyalty becomes bound to the network rather than the organisation. Or more appropriately 'organisation' as per the meaning 'a group of people who work together in a structured way for a shared purpose' from the World Health Organisation .Therefore big business will have to reorganise themselves to have perforated boundaries where people come back and forth. Experience and information is shared among the network.

The principles of open source, where you are only as good as your last idea, will force organisations to continually innovate. Again this extended form of collaborative working will not apply to all, but among creatives it will keep them interested but also offer them job security. Loyalty will be gained by employment contracts but also through each companies ethos that appeals to the individual. This approach to working is more and more appropriate as company directors are asking their employees to look for ideas outside their organisation as a way of generating value.

The rise of coworking offices is potentially a more concrete response to this new approach to collaborative working. The origin of coworking, as we know it now, was in 2005/2006 in San Francisco at a place called The Hat Factory. It was a response by a group of three software engineers working in and around Palo Alto (Silicon Valley) to a need for a better space to work other than the cafes they were previously using. Being independent workers from the same sector they could not only help each other but also offer moral support that working alone often lacks. With a range of spaces from relaxation, concentration and meeting it fulfilled all the needs of independent workers with communal infrastructure such as wi-fi, printers etc. This trend followed with a number of other spaces in and around San Francisco, with coworking spaces now all round the world.

Conclusion

The digital revolution has had as big an impact on society as the industrial revolution a century before. Technology has significantly changed the way we live and work and forms part of the growing disparity in the knowledge economy.

Historical clues of human adaption are essential to predict future trends such as the link between social networks and collaborative working or how these networks are influencing the flow of knowledge migrants.

Nomadism and its increase in popularity is both helping drive and being sustained by the digital revolution. Facilitated initially by cheaper and easier air travel, long distance communication through VOIP is reducing the cost of staying in touch, making migration easier.

Although it is now cheaper to stay in touch with 'home', how can people feel closer to their new place of adoption? Cultural understanding is key to this, using tools such as Hofstedes five dimensions of culture to develop environments where everyone feels at home.

These more networked migratory knowledge workers need not only an overhaul of their work environment but more importantly the organisations themselves. More flexible contracts are required to motivate the most talented, with workplaces that cater for new ways of working. Coworking does not need to cater for just independent workers, but can extend to all.

All in the mind or not

Psychological health in the fast changing workplace is at stake. As psychological and physical health are so intertwined, they are difficult to separate. In order for people to not only cope but thrive with these new challenges to the workplace requires a comprehensive approach.

In this chapter I will try and show how our physical environment significantly impacts the mind in different ways enhancing and restoring psychological health. This can be achieved indirectly by addressing the physical health through indoor air quality, noise, natural light and ergonomics or directly by restoring mental vitality and creating place attachment with employees.

Workplace psychological health and productivity is often centred around psychosocial dimensions such as employee manager relationships, incentivisation, job advancement and employee support. These management elements have been shown by Judge et al (2002) to directly relate to job satisfaction. These thus form the basis of numerous management books with the physical environment often relegated by managers to being just a fixed cost to be minimised. Ellickson et Logson (2002) identified that these psychosocial elements accounted for 52% in variance of job satisfaction. But the physical environment becomes more important when the psychosocial effects are less pronounced. Donald et Siu (2001) showed positive links between job satisfaction, the physical environment and employee physical and mental health.

Sadly, the impact of the physical environment is often left to the architect, interior designer and engineer to manage with differing success. Few companies include the physical environment in their management strategy although that is changing. Highly creative companies such as Pixar, Google and Red Bull are setting examples with their offices around the world bringing together innovative physical environments with new approaches to working, enhancing their brand at the same time. There is also a growing body of scientific research that is demonstrating the impacts of the physical environment on workplace health following the existing wealth of research on psychosocial dimensions.

Creative work spaces

Physical health

The aesthetics and layout of the workplace may help to encourage employee loyalty and facilitate innovation. More invisible parameters have also been proven to help with employee health - both physical and mental. These include natural daylighting, indoor air quality and user control of the surroundings. Physical health has been indirectly linked to higher job satisfaction, lower job stress and better psychological wellbeing in a paper by Ganster (1995). This is explained by healthy individuals having a lower baseline level of arousal. When faced with a complex demand their level of arousal does not go as high as a less healthy individual and it also returns to the baseline faster.

The ‘sick building syndrome’ (SBS) was subject to significant concern in the 1980’s where employees suffered respiratory, eye and skin disorders caused by the deterioration of the indoor air quality. Poor design and maintenance of air conditioning systems with limited or no fresh air changes, off-gassing from all the new workplace materials and low ceiling heights were identified as key causes. The World Health Organisation after significant research into the symptoms released a report in 1984 saying that 30% of new or remodelled buildings had the potential of causing ‘sick building syndrome’ in its occupants owing to their indoor air quality. Following this there has been significant improvements following regulation on air changes and better design tools that have largely alleviated these problems.

A study by Newsham, Veitch, Arsenault et Duval (2004) demonstrated the psychological benefits of user control in the workplace. 118 office workers were placed in a mock-up work situation with different tasks to perform. They were later placed under 4 different lighting scenarios. They were later then offered individual lighting dimming control over their surroundings. After being given control there was an overall improvement in their mood, satisfaction and productivity. Although the immediate need is physical the psychological stress caused by not being able to control the physical problem is significant and is often defined as ‘learned helplessness’ or ‘coping’, Both physical and psychological then become difficult to separate in terms of impact.

There are many different sources of residual psychological stress in the workplace that causes ‘coping’ as described above. These include ergonomic stress (spatial layout and workstations), lighting (glare, level), air quality (temperature, fresh) noise and imposed social interaction. These elements in their effect are all subjective beyond broad tendencies and thus demonstrate the importance of greater individual user control over their environment both by immediate action or by input into the design process, as described by Vischer (2007) . The importance of control over the environment also links to the mind through territoriality and place identity that I will describe in more detail later in the chapter. Vischer importantly also links psychological comfort to physicality.

The impacts of daylighting, both positive and negative, are varied and not exclusive from the fact that its presence generally coincides with external contact and views, with the knock-on benefits that

brings. Natural daylighting helps regulate the human circadian system (body clock, sleeping patterns) by offering a variation in light during the day and season. As the full spectrum of daylight can be recreated artificially, companies like Phillips are also responding to this by producing dynamic lighting that changes during the day and seasons working with daylight or recreating it where necessary.

The impact of daylight levels on individuals are subjective whether with respect to physical acceptance eg glare or psychologically through mood as described by Boyce, Hunter et Howlett (2003). Physical acceptance and mood cannot be separated as demonstrated by Tuaycharoen et Tregenza (2007) where students were tested with different views including extensive wide-ranging natural views and more closed views. Those with more wide ranging views of nature could accept more glare than those without.

Identity and place attachment

Identity and place attachment refers to how physical environments are much more to people than the physical elements that construct them. They are a place of memories, habits and cognitive maps. This past, brings a sense of place that make people feel positively or negatively attached to their surroundings. It can give people a sense of belonging and meaning.

Place attachment or belonging is often linked to loyalty and commitment to an organisation. It has been regarded as a better measure of the quality or success of the physical environment than productivity and job satisfaction. (Sundstrom et Sundstrom (1986)). This attachment significantly impacts staff retention and thus directly impacting company performance and costs (Vischer (2008)).

To understand why people feel attachment to certain places one must understand how humans shape their own identity. The physical environment is a large factor in this as well as the social context they are in. People often describe themselves through a series of places whether actual or preferential eg I'm a sea person or I've lived most my life in London. These comments often help with understanding what type of places people will belong to (Lappegard (2005)). The ultimate place people identify themselves is "home". Again this word is ambiguous physically but generally refers to a place where they feel comfortable or protected.

Place Identity is a field of environmental psychology that has moved away from the principle of "physical determinism" suggests that there is a direct relationship between environment and behaviour (Franck, (1984)) towards a people-environment relationship that is more dynamic and interactive.

This is exemplified by what I described as the impact of physical control over their environment on place attachment. People will feel greater attachment to their environment if they have been part of its development, because they feel ownership. This appropriation is part of the attachment to place and is often linked to territoriality in the workplace. This is why change management is so important when existing workplaces are altered. People can alter their mental and physical maps during the process making changes easier to accept. Thus the appropriation of the physical relates to the way it is received as much as what it is.

The importance of social identity in how people perceive themselves is also important to place attachment and its interactivity. Feeling belonging to social groups brings with it positive values and emotions. These social groups are numerous and include religious, national, cultural, social status, family etc.(Tajfel (1982)). The perceptions of place and that of the social groups we identify ourselves within will also have significant sway. At its simplest, the places your family hold of value will have an impact on your attachment to them. This is because places represent both personal and shared memories that are contained in the sociohistorical relationships that make up groups (Lappegard (2005)).

In the context of the changing workplace, as described in Chapter 2, is the importance of physical place diminishing in an increasingly global, interconnected workplace? Place identity and migration has thus become a significant focus of attention for social scientists. Castells (1996) suggested that it is not really the importance of place that is disappearing but more how they are identified. It is the way that places position themselves in global networks. Therefore place is reflected in terms of inter-connectedness and process that take precedence over its individual characteristics.

Others argue that it is an interplay between the local and the global place that is defining them, often referred to as "glocalisation" (Robertson (1992)). This acknowledges that everything comes from somewhere but are often destined to more diverse locations. But place does not refer to only geographical locations but identity in furniture, spaces and communities as described previously.

Feelings of insecurity and loss of control brought by the changing workplace has also given rise to people searching for psychological comfort, whether that is in "home", roots or groups (Cohen (1997)) and therefore place is becoming even more important. Gustafson (2001) noticed Swedish seasonal migrants to Spain noticed that they had difficulty with identifying home but also had difficulty in how they identified themselves socially both in Sweden and Spain. This lead to behavioural traits of social distinction to identify themselves.

There is also a debate among social theorists who say that the poorer less influential demographic seek greater consolation in place attachment and territoriality where as the global rich has become more mobile and independent of specific places (Castells (1996)). The difference between these two demographics is often described as the differences between 'locals' and 'cosmopolitans' as named by Merton (1957).

I would argue that the global rich still find attachment in place. Origins such as nationality or 'home' are particularly important. Comfort is also found in familiar experiences, that of communities such as social groups with shared histories, sports clubs or as simple as integrating familiar habits. Many of these manifest themselves as a form of social distinction as described

Migration, place identity

by Gustafson (2002). This combination between integrating both the new local identity as well as existing individual identity is called “transnationalism”.

Attention, Contemplation and Restoration

Mental effectiveness in terms of creative problem solving has many different schools of thought. There is a school of thought that say’s that mental effectiveness is a question of having a diverse knowledge base helped by engaging in cross disciplinary discussions and reading widely (De Young (2010)). Others say it is how you process the information already there that matters (De Bono (1973)).

Nevertheless, confronted by the changing face of the workplace with all its challenges plus that of having to remain creative requires significant effort. Mental vitality has to be achieved in order that effective contemplation can occur and this requires constant restoration from daily stresses and therefore both are interconnected.

In psychology contemplative effort is described as attention. Kaplan (1995) defines two different forms: involuntary attention and direct attention. Involuntary attention or fascination requires little effort and is involuntary. William James a renowned American psychologist (1892/1985) provides a list of these fascination elements as “strange things, moving things, wild animals, bright things, pretty things, metallic things, words, blows, blood, etc. etc. etc”. Like trees, flowing water and animals even after repeated encounters they still attract and engage our attention without effort.

Fascination can act more as an unwanted distraction as EE Cummings (1894-1962) the famous poet observed “it is with roses and locomotives, not to mention acrobats, spring, electricity, Coney Island, the 4th of July, the eyes of mice and Niagara Falls, that my ‘poems’ are competing”

Direct attention requires significant effort and is that required for work without fascination. One has to inhibit all the surrounding sources of fascination to concentrate on a specific task. It is critical to separating ourselves from the demands of the surroundings without, which it would be difficult to achieve more complex tasks. It is required for abstraction enabling us to plan and behave in a coherent way exclusive of surroundings.

Directed attention fatigue (DAF) is a condition that occurs after your direct attention has suffered too many demands. The variety of these demands are as numerous as the complexity of our lives. It is often a multiplicity of direct attention tasks running simultaneously that results in fatigue. It makes ‘coping’ more difficult to accept. Particularly challenging mental tasks then become difficult to manage often leading to a form of mental fog (De Young (2010)). Towards the end of long tiring projects this manifests itself in irritation, impatience and sometimes snap conclusions. This results in an incapacity to self-manage thinking and action. This is identified by managers as ‘occupational stress’ in individuals.

What are the solutions? Kaplan et Kaplan (1989) wrote about the restorative aspects of ‘contact with nature’ on direct attention. They did a study on the impact of nature on work stress and satisfaction by observing 168 public sector workers. They noted that not all types of natural settings contain the full range of restorative elements but many do.

They identified four essential qualities of these restorative aspects of nature *fascination, being away, extent, and compatibility*. *Fascination* refers to watching things such as trees moving in the wind, requiring involuntary attention, as previously described, allowing the brain used in directed attention to rest. *Being away* is the importance of escaping their normal environment and all the stress and the obligations it brings. *Extent* refers to connectedness and scope of the view. Does the view have enough appeal in terms of connectedness and scope to encourage the person to build a mental map? *Compatibility* refers to whether the environment provides spaces or activities that are compatible with individuals preferences. It specifies spaces that increase rather than limit ones desires in the environment.

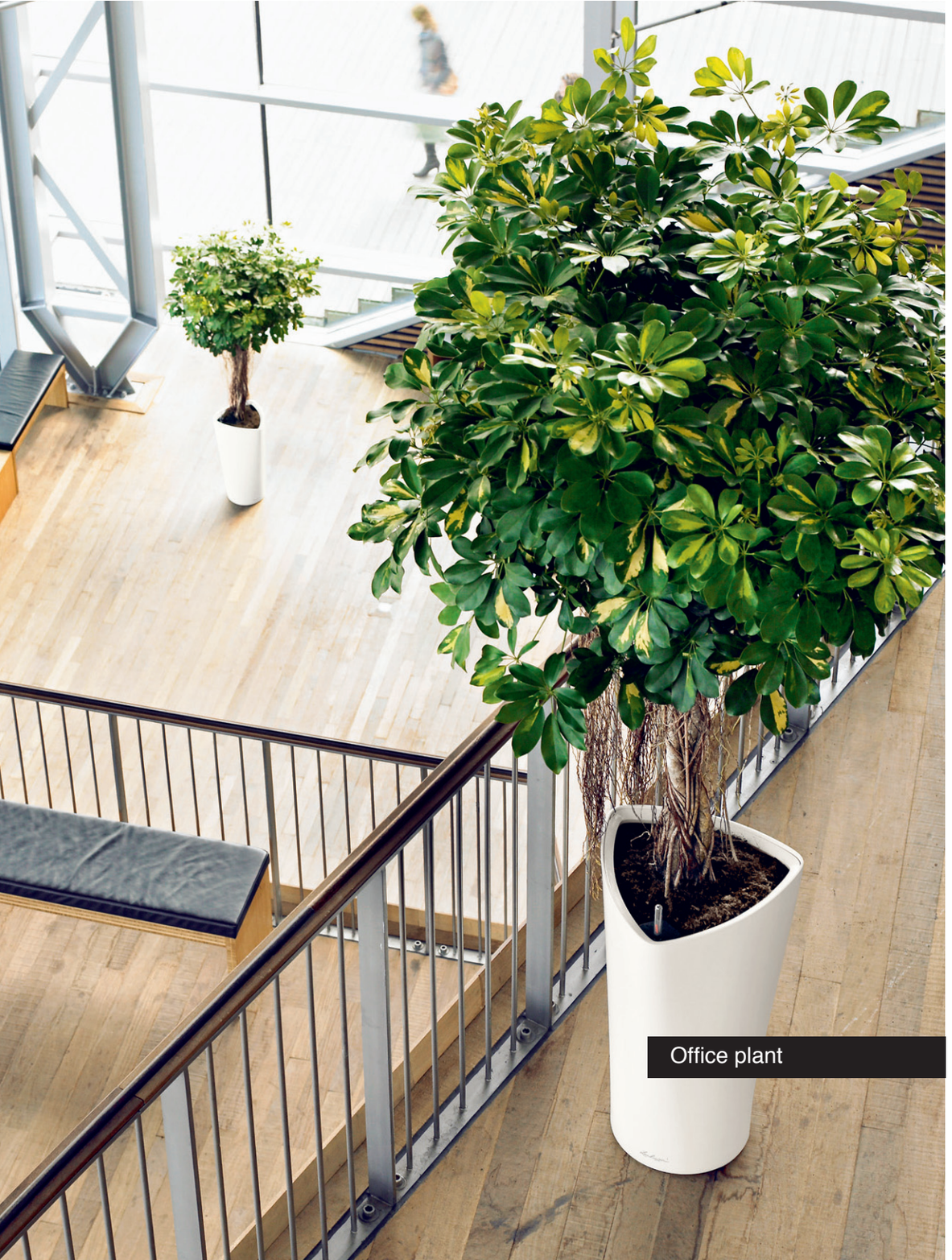
Cimprich et Tenneson (1995) demonstrated the benefits of natural views after studying 72 undergraduate students. He categorized the views of nature into 4 categories depending on how varied and expansive they were. After interviewing the participants and looking at feedback from tests he concluded that those with more complete and varied views of nature performed better in attentional tasks. This demonstrates that just views of nature can have significant impact on restoration and contemplation as well as full immersion described by Kaplan et Kaplan.

The impact of nature was further demonstrated in a study by Bringslimark et al (2007) from observing 385 office workers in Norway. They looked at many factors of the office environment from lighting, temperature, gender and office plants. They controlled the other variables and looked at how the proximity of plants to workers’ desks changed their productivity and the amount of sick leave they took. They noted there was a statistically demonstrable albeit small effect of proximity to office plants on productivity and sick leave.

In a further study Bringslimark et al (2011) demonstrated that people positioned without windows were five times more likely to bring a picture of nature into their office space and 3 times more likely to bring in an office plant to their desk than those with windows. This demonstrates that individuals find some sort of pleasure or solace by having views of nature whether real or not. This might be further complicated by cultural preferences, Norwegians have perhaps a greater affinity to nature than more urbanised nations.

Ulrich et al (1991) contradicts slightly Kaplan et Kaplan’s theory of the universal restorative impact of natural environments. Ulrich suggests the first reaction to the natural environment is an unconscious emotional reaction rather than a controlled cognitive response as described by Kaplan et Kaplan. This is explained by the fact that some natural settings create fascination and capture involuntary attention, such as ones including spiders and snakes, but are threatening so create other physiological effects. This reflection is potentially reflected in what Kaplan et Kaplan describe as compatibility, which is a response based on ones preferences and desires of nature.

Despite the debate there is a general con-



Office plant

sensus of the importance of nature in its unthreatening state on contemplation and restoration. Defining nature itself is difficult but potentially unnecessary as nature in all its variety can contain the essential qualities of restoration defined by Kaplan et Kaplan (1989).

One of the most famous English landscape architects, Capability Brown, was noted for his meticulous reconstruction of nature in grounds such as Blenheim Palace and Warwick Castle. Sir William Chambers, another garden authority of the time, criticised him saying his works “differ very little from common fields, so closely is nature copied in most of them” (Chambers)1772)).

Conclusion

The links between our psychological health and our physical health in the workplace are as diverse and wide ranging as the people that form it. Whether knowing that you have control over something improves your mood or a more wide ranging view increases your physical acceptance, this reciprocity is evident.

The physical environment also has an enormous effect on our ability to ‘cope’. Introducing psychological and physical stresses from the work environment impacts our capacity for direct attention eventually causing fatigue thus impairing our ability to concentrate on more complex tasks.

Creating place identity and attachment in employees is a form of psychological comfort that helps alleviate workplace stress. This greater loyalty and commitment they feel, thus eliminates some of the residual stresses felt by employees reducing additional demands on their direct attention.

‘Home’, the ultimate place for attachment in people, is starting to creep into our work environments, bringing with it more individuality. Less uniform lighting, desk arrangements and casual sit down areas are creeping into the open plan office. Future evolution in design will include the “transnational” aspect of place in the workplace catering for nomads. Bringing these “homely” aspects into the workplace helps with creating greater place attachment as well as catering for workers that are less desk bound compared to the past.

Nature in its way to fascinate, occupies our indirect attention, thus revitalising the direct attention demonstrates one approach to improving psychological health. Well designed gardens in hospitals and clever landscaping in schools have been shown to speed up healing and aid concentration respectively. The workplace and the importance of nature within have been widely neglected in terms of scientific research, although this is changing.

Access to natural elements whether office plants, images or views improves both physical and psychological health. The important question is how much can the restorative qualities of nature be recreated and how its effects can be made culturally universal to also impact nomadic workers?

Art, perception and light

Art and nature have always been linked together for better or for worse. The Ancient Greeks identified the cosmic elements of the world we live in as Earth, Water, Air and Fire. These key elements of nature have fascinated artists through the ages. Whether it is through precise representations as per the grand masters or other-worldly experiences such as Anthony Gormley's Blind Light.

Art can reproduce feelings very similar to nature. It can shock as much as it can delight and calm. What is of particular interest is the way art produces restorative contemplative experiences similar to nature but with a technological approach. These experiences from art have similar qualities to those highlighted by Kaplan et Kaplan (1989) for restoration in nature. Artists often get spectators to challenge their own thinking or feelings regarding the physical environment they are in.

Blind Light, A. Gormley

Light & Space Movement

Light or the lack of it has played a strong part in the approach by different artists. As a fundamental criterion for perception, it impacts all that we do. Without it, there would be no life or nature as we know it.

When art moved beyond the literal reproduction of nature it started having a greater impact on its spectators. Artists such as Turner in his late works in the 1830's and 1840's abandoned the *camera obscura* approach in favour of capturing the temporality of experiences. Gone were the fixed light sources, the strong rays and the distance between the observer and the event itself. Turner among others like Goethe and Rushkin recognised the greater importance of perception in vision rather than the 'true or the right' (Crary (1994)). Turner was particularly interested in how nature by its diversity distorted light in many ways simultaneously through reflections, distortions and transmissions.

Science and art have often challenged similar subjects, one prefers written laws as representations and the other offers physical experiences. The nineteenth century brought with it many attempts both scientific and artistic to understand the perceptions of nature, in particular the sun. When Turner painted T*he Angel Standing in the Sun* it was his representation of nature. This painting was a whirl of golden light with the symbolic inclusion of an angel. His personal experience of the sun transcends any need for literal representation. Perception goes beyond materiality.

Gustav Fechner a scientist during the same period of Turner approached the representation of physical stimuli such as those provided by nature from a different point of view, psychophysics. He proposed to rationalise sensation by measuring external stimulus. He thus created Fechners/ Webers Law that describes a logarithmic relationship between sensation and stimulus. This was demonstrated when he noted that the intensity of sensation of light does not increase as fast as the intensity of the physical stimulus. This law helps us understand how psychological stimulus impact physical acceptance as highlighted in the example of glare acceptance and views in chapter 3 (Tuaycharoen et Tregenza (2007)).

The Bauhaus movement was a reaction to the horrors of World War I and placed art more centrally as a device for social healing. The Bauhaus movement was very closely linked to industry helping improve life for workers by redesigning factories to include more natural light. Industry helped drive the movement and ultimately led to its destruction through disenchantment among its protagonists.

Laszlo Moholy-Nagy, a Hungarian artist and Bauhaus instructor, spent his career exploring the spiritual, technical and social implications of Light and Space art. He was the first artist to combine moving sculpture and light projections. These two elements, combined, light and physical movement are some of the fundamental aspects of nature.

The core aspects of Light and Space art included in Moholy-Nagy's work and then in subsequent artists' work such as Otto Piene and James Turrell are *Space and movement*, *Perception and Activating the viewer* (Lutgens (2004)). These elements form the basis of Kaplan's essential qualities of nature for restoration. *Space and movement* means that the art opens up into the space of visitors with moving objects like standing in nature. Fascination caused by *movement*, changing views and shapes such as grass moving in nature occupies your indirect attention. *Activating the viewer* is the artists intention to engage the spectator through a mix of recognition and understanding that challenges his feelings and thoughts. Like when you feel the wind in your face when looking out to sea.

Otto Piene, who was initially part of the Light and Space art collective Zero, before that dissolved in 1966, also worked at the Massachusetts Institute of Technology. His art bridged both artistic and scientific boundaries. His real ideology was summarised by him "I'm interested in the forces of nature and what happens when they meet technical and technological forces - how they support each other, how they might possibly be reconciled, and how to use technical means to evoke natural powers that would not otherwise be visible." (Lutgens (2004))

His work was characterized by moving sculptures that either project light, which intersects or is reflected without obvious sources. The spaces and objects within seem to disintegrate because of their relationship with the light. Only the power of gravity and balance for the viewer remain undisturbed. He went on to develop Sky Art, a collection of large inflatable sculptures, whilst working at MIT.

Artists such as James Turrell and Douglas Wheeler who were part of the Californian Light & Space movement used light as a way of playing with perception. This importance of recognising perception as a viewer was fundamental to their work. The aim, according to Turrell was "that you see your own seeing and this act of self-reflection, seeing yourself seeing, says more about the way the viewer sees"(Lutgens (2004)). Wheeler in his piece 'Light Encasements' exhibited in 1970 played with the perception of a room by obliterating the boundaries, making the room seem endless. He removed all bearings of size from the room.

Olafur Eliasson

Eliasson throughout his career has used weather and its constituent elements water, light, temperature and pressure for his pieces of art. His particular focus has been on aspects of nature that are ephemeral such as mist and rainbows (May (2003)).

He positions his installations politically against the materialistic nature of society and the loss of morals. He seems to confront and combine the ideals of Romanticism with the science of the modern ecological movement. (Steinle et Weibel (2001)). It is the rescuing of nature from mankind with poetic natural phenomena and embracing the scientific knowledge and its apparatus that allow him to do it. The romantic poet John Keats, in 1817, said that scientists were robbing the natural phenomena of his poetry by explaining the science behind rainbows (Dawkins (1999)). In comparison, Eliasson combines both the poetry whilst confronting the viewer with the science involved.

The Weather Project, Eliasson

Eliasson's work and his success is partly in the way it resonates with the dynamics of globalisation. Everything has sped up from financial transactions, communication, politics, migration of people and growth of cities. Today and yesterday occur without difference, time passes without punctuation, faster and faster. The subjects of his work are not limited by cultural understanding but engage everyone in their own way thus catering to this disenfranchised globalised migrant society.

Eliasson, who is against the market economy, questions us with this interplay of time and space. Time is slowed down by the recreation of temporal events that do not then disappear. Sunsets, rainbows or shadows last indefinitely. By doing so, he gets us to observe our surroundings and finally look at ourselves seeing. (Ursprung (2008))

'Eliasson's stated goal is to integrate art into society, so that it will once more have the function of helping sensual orientation in a world where technology and nature have forced nature into the background.'(Lutgens (2004))

As with the Californian Light & Space movement Eliasson is particularly interested in perception. He does this by ensuring the elements from which his pieces are constructed are as obvious as the effects he creates. The viewer has to separate the psychological impact of the ephemeral with the reality of its construction therefore being confronted with his own perception.

Eliassons approach ties closely with the teachings of French philosopher Merleau-Ponty, who said to understand the nature of perception, one needs to stand back from it so we no longer view the world from the lens of perception but make perception become the object viewed. Psychologists call this the 'experience error' (Merleau-Ponty (1945)).

Eliasson's particular interest in light is in the effects of dematerialisation it creates. It removes the boundary between the space occupied by the viewer and the installation itself. This dematerialisation of object refocuses the attention on the viewing itself and the viewer. The viewer becomes part the installation. This interest in the socialization of the viewer and viewers (Lutgens (2004)) is clearly experienced when entering into the Turbine Hall for his Weather Project installation at the Tate Modern in 2003. Personally as a visitor, there was a sense of sharing something with all the viewers, a slowing down of time and a wish to just stop and stare, almost as if everyone was in a trance. People were just staring, at each other, in the reflection on the ceiling or at the round light, as if time had slowed. This socialization between the viewers is another element that Eliasson encourages in his work. It is his disenchantment with today's individualism.

Eliasson's spaces in their composition are comparable to other Light Space movement artists. There is a similar attention to atmosphere through perception. Michael Glasmeier in his book 'Atmosphere machen' said "atmosphere is precisely the imprecise" but nevertheless that is their pursuit (ibid). This notion of atmosphere is closely linked to our memories and our shared history and very little to the reality we actually see.

This interest between reality and perception started whilst at art school where he was very much inspired by the teachings of the Gestalt psychologists. He was fascinated by the aspect that individuals expectations considerably changed how they looked at things, even relatively simple scenes (Gaskins (2008)).

There is a beauty in Eliasson's recreation of natural phenomena despite its visible construction. He goes on to say that our perception of nature is mediated by our prior understanding of its representation. Nature and its incarnation is almost all manmade from the fields that make up our countryside to the rivers that flow through our cities (Coulter Smith (2006)). The criticism by Chambers (1772) of Capability Brown's work that 'differ's very little from common fields', mentioned in Chapter 3, is appropriate to our understanding of nature and its continuing attraction.

This modulation of how we view nature is repeated in many of Eliasson's works. Whether in the 'Green River' installation when he poured non-toxic bright green dye into the main river in Stockholm or his work 'The blind pavilion" at the 2003 Venice Biennale.

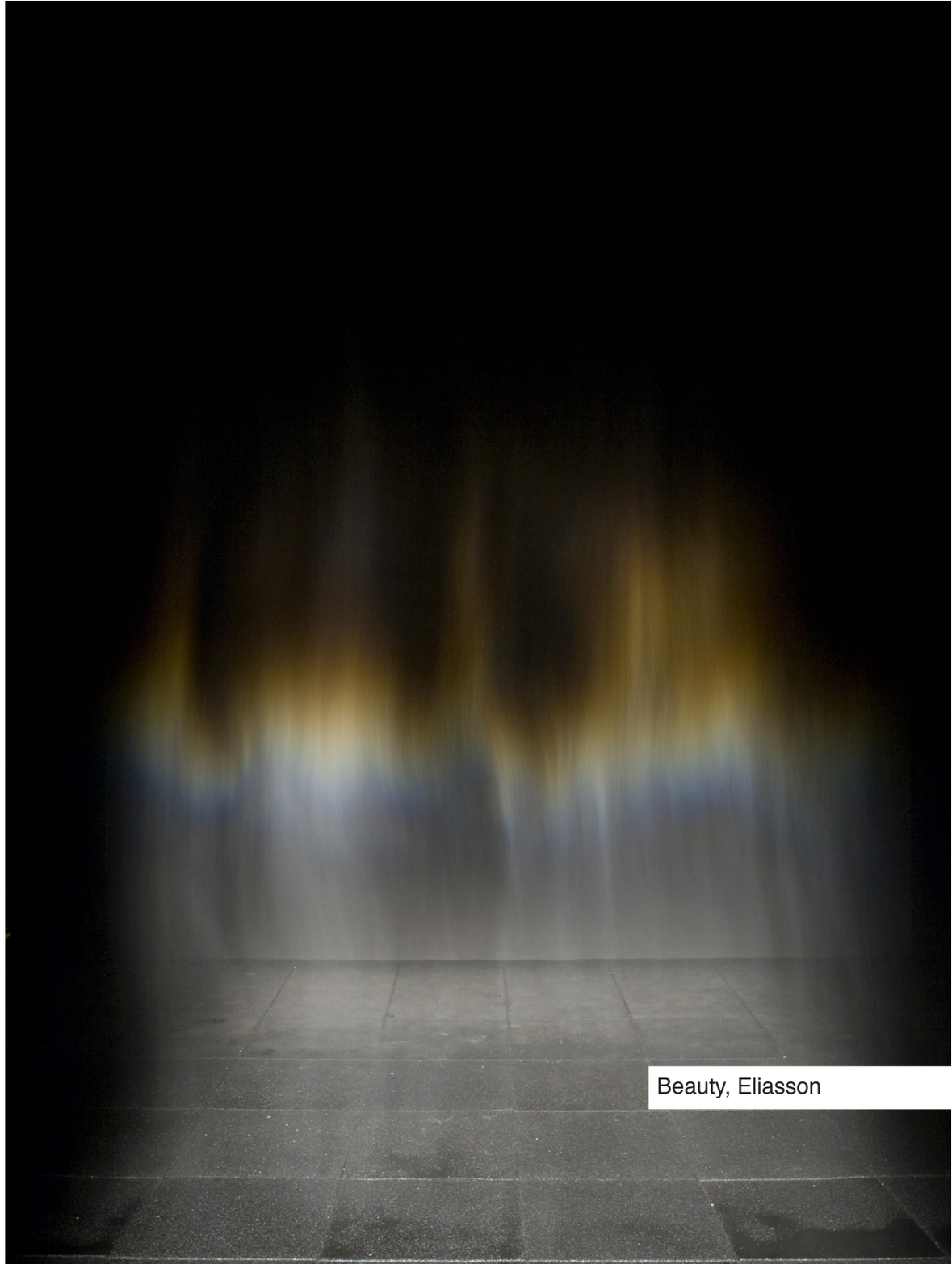
The thought behind the 'Green River' installation was to get people to reinterrogate the nature that surrounds them. He clandestinely poured harmless green die into the river and watched how a sort of green cloud illuminated the surface, passerby's just stopped and stared and traffic slowed down. Eliasson slightly resents this disenfranchisement with nature saying "The way we experience public spaces is more to do with the way representation and iconography influence our senses and our habits of seeing. A lot of people see urban space as an external image they have no connection with, not even physically." (Jacquet (2002)). He therefore was pleased how people reengaged with the river, which is a central element to Stockholm.

His attempts to reconnect people with themselves and their surrounding landscape was also demonstrated in ' The Blind Pavilion'. The pavilion apart from being an installation itself contained a series of 'viewing installations' that modified how we looked at both ourselves and our surroundings. The pavilion included mirrors and kaleidoscopes through which the viewer himself or the surrounding garden was viewed thus questioning the reality. The intention is to show us how our perception constantly interrogates what is natural and how that we constantly change what we feel is natural (Ursprung (2008)).

Conclusion

The representations of temporal events like that of Turner, Turrell and Eliasson help us question the importance of our perception over the reality we see. The success of their work owes greatly to their universally emotive subjects such as water, mist, sunsets and rainbows.

These subject matters form some of the most fascinating elements of nature that, no matter how often they are seen, still stop people and make them look. Eliasson with his 'Green River" installation wanted to get people to question again the importance of the main river in Stockholm by causing outrage by its seeming 'pollution'. The importance of our surround-



Beauty, Eliasson

ings is being lost by our focus on the fast moving everyday, only when it is at risk do we notice that it is always there and thus emotionally active in us. Nature, as shown by Eliasson, is a constantly changing word.

The Light and Space movement engaged the viewer, creating fascination, taking them away and also getting them to question what they saw. Very similar to Kaplan and Kaplan and his essential restorative qualities of nature these effects are regularly encountered when we interact with nature.

Eliasson's slowing down the perception of time through behaviour similar to that explained by Webers law, where stimulation and reaction is non linear, is a way that we can seek refuge from the pressures of life in this post-modern society. By getting us to question what we think and see, through different types of clearly artificial fascination, helps us lose ourselves in our surroundings.

How better to explain the importance of the interaction of the viewer with his surroundings than with the Zen riddle 'A tree falls in the forest, there are no ears to hear it. Does it make a sound?'.

The Japanese Garden

For the Japanese, harmony shapes many aspects of their life from individual behaviour to nature itself.

The role of harmony in Japan, *wa* in Japanese, has its origins in Confucianist teaching that holds it as one of the five core virtues. 'Wa' is self-evident in many aspects of traditional Japanese culture from poetry, art and rituals such as the tea ceremony. Its presence in the design of Japanese gardens is no exception.

The Japanese garden is not a singular, there is no one type, it doesn't sit alone but is the harmony between where man lives and nature. The Japanese garden is an inseparable piece of the main residence.

Nature and its importance to the Japanese is the product of both the 'beauty' aesthetic and religious beliefs. Its reproduction in Japanese gardens is a 'way of mediating between the fearful aspects of 'outside', of nature in the raw, and the safety and security of the 'inside' world. (Asquith et Kalland (1997)). It is nature in its idealized state.

In this chapter I will explain how both the Japanese relationship between nature and religion influences the perception of their gardens, the fundamentals of Japanese garden design and the design effects behind Japanese dry rock gardens and its visual perception.

Nature, Hokusai

Nature, religion and Aesthetics

Nature and its human relationship in Japan differ significantly from Western society where it is more mechanical. In Japan it is understood moreholistically and spiritually with an interconnectedness between nature, aesthetics and religion (ibid).

This spiritual aspect is important to the perception of nature for Japanese people. They understand spirits, *kami*, as belonging to nature. This linking of spirits to nature builds a greater link between humans and nature. As in ancient Chinese culture there is a worshipping of nature where mountains, rivers, forests and plains are deified (Kong (1989)).

This communication between humans and gods is facilitated by *yorishiro* or landing places. These landing places for gods traditionally took the form of shrines that were real natural phenomena such as rocks, mountains or lakes that had been 'demarked' by ropes, steps, paths etc.

Hayakawa (1973) claims that the origins of the Japanese garden, *niwa*, was in these real *yorishiro,* starting as cleared spaces, bounded by a rope or fence with pebbles and moss as a place purified for worshipping gods. Thus these shrines and their spiritual significance fed their way into traditional garden design through representation with an idealized / purified form of nature.

This spiritual view of nature is key to how Japanese gardens are viewed and constructed. As with Gestalt psychology these embedded cultural meanings help change our perceptions of spaces. But the question remains how these gardens still impact foreign visitors with their calming nature when they might not have this cultural/ spiritual connection? As with Eliasson, potentially the universal impact of the natural phenomena recreated has an effect but it is also likely that there is a visual perspective impact from the precise techniques employed in their design. The latter i will now explain in more detail.

Japanese Gardens

The style of traditional Japanese gardens changed through history as the perception of nature of its creators changed as well. Early examples had a greater emphasis on supernatural elements than later examples. The Japanese garden was seen as a mediator between culture and nature (Asquith et Kalland (1997)). Framed in views, differing representations of nature contained therein help instil a divine nature to them.

Asquith and Kalland (ibid) argue that Japanese gardens are 'cooked' versions of the wild in a manageable cultural context. Hendry (1989) differs, saying it is more a wrapping of space as a way of stressing the Japanese importance of aesthetics. However you look at it though, there is a mediation process between 'outside' (*uchi*) and 'inside' (*soto*). This dichotomy between outside and inside is accentuated by the enclosed and concealed aspect of Japanese gardens as if moving from one world to another (Asquith et Kalland (1997)). A grand entrance also helps to accentuate this otherworldly experience on entering, with the leaving of shoes at the entrance.

Ito Teiji identified four essential elements that a Japanese garden shares (Ito (1973)). The first two being the garden and

the view, the third is *mikiri* where the view is trimmed capturing only the parts wanted and the fourth is linking the view to distant scenery whether a mountain or even the sky.

The importance of framed views similar to that of Japanese print paintings was central to the design of all complexes until the seventeenth century when the tea garden and the stroll garden was created (Slawson (1987)). Although the stroll garden to an extent is also about framed views but in sequence. Before the seventeenth century gardens, the key views of the garden were intended to be enjoyed from the comfort of the buildings that people occupied. This suited the gentry and clergy who occupied them. The access to these key views was afforded according to stature with important guests being given the best viewing spots. Although access to the gardens was also allowed through use of boats on ponds and strolling around, the importance was placed on the activity that accompanied it like discussing poetry or literature.

The importance of the buildings themselves in framing the views is seen clearly in their design. They did not have solid walls but were fabricated from shutters (*shitomido*). The shutters were made of two parts the upper and lower part. These could be folded away to produce a continuum between interior and exterior. This signified the harmony between humans and nature. Internal views are often augmented with additional framed external views of mountains in the background such as the hedge and tree trunks in the Entsuji temple in Kyoto that borrow the landscape of Mt Hiei in the distance (Slawson (1987)).

Nature and its aesthetic beauty are represented through six elements according to Sakutei-ki, the first manual for designing gardens from the Heian period (794-1192) (Goto (2003)). These are ponds, islands, streams, waterfalls, plants and stones, each has its own specific meaning.

Ponds with islands in gardens represent the sea from which gods originated. These islands with sometimes rocky surroundings were intended to represent the sea shore as a place for the gods to descend: a ‘landing place’ (Maki (1979)). Stones, by far the most complex in representation have different sensory qualities depending on their arrangement and shape. As stones were seen as elements that could not be changed over time unlike plants, particular attention is given to the explaining of these in the Sakutei-ki garden manual (Goto (2003)). The arrangements and types of stones chosen are in function to the needs of the two masters, the client and the site (Slawson (1987)).

Dry landscapes of stones were built to represent natural phenomena such as waterfalls and mountains. This representation of natural features with rocks went deeper than pure representation and referenced the spiritual, linked to both Buddhist and Taoist ideas (Slawson (1987)). White gravel representing water on which rocks were placed signified life that flowed round the islands representing changing moods. Rock clusters according to their shape and arrangement represent different moods.

Visual perception in dry rock gardens

Much has been discussed about the spiritual, supernatural elements of Japanese gardens and their influence on our visual perception. I will now discuss how the application of design principles, with intentional visual effects also impact our visual perception (Tonder et Lyons (2005)).

Tonder et Lyons (ibid) used the Gestalt psychological principles of perceptual grouping to interpret how traditional Japanese gardens create aesthetic qualities such as asymmetry, tranquillity, simplicity and naturalness by the controlled use of different design elements. This follows their work shadowing Japanese garden designers at work.

It is important first to identify the principle intentional design effects of Japanese dry rock gardens before further analysis. These techniques are centred on a fixed viewing point as in other types of Japanese garden, facilitating the understanding of how they will be read by the viewer.

The list below is a summary of the techniques used in Japanese dry rock gardens from the two most important garden manuals. The first being the medieval Sakutei-ki garden manual already mentioned and the other an illustrated text by Shingen (1466) that had a greater focus on dry landscape gardens. These techniques highlighted are (ibid):

Triangular rocks and clusters - express earth, man and the divine through horizontal, diagonal and vertical lines.

Odd number of groupings of rocks are preferred

Largest rock is set first - Smaller rocks then set afterwards for ‘good agreement’.

Base Stones - are set at the foot of dominant stones in a group to extend the base to make it look more triangular.

Sute ishi - ‘thrown away stones’ are randomly placed stones to engender naturalness and increase grouping.

Folding screen technique - scaling of stones like fish scales create a sense of depth like in mountainous landscapes.

Winding Streams - Never straight to create a seemingly infinite curving form.

Intentional Asymmetry

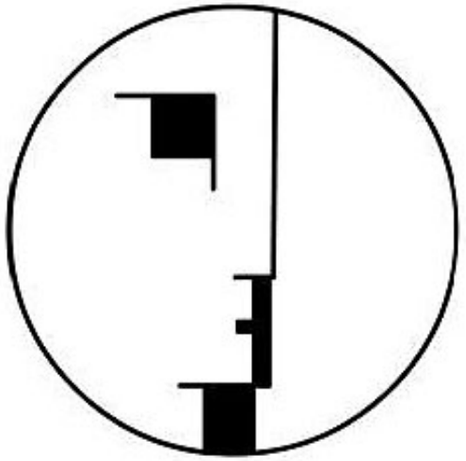
Uniform textures - rocks, moss and gravel should not have overtly textural patterns

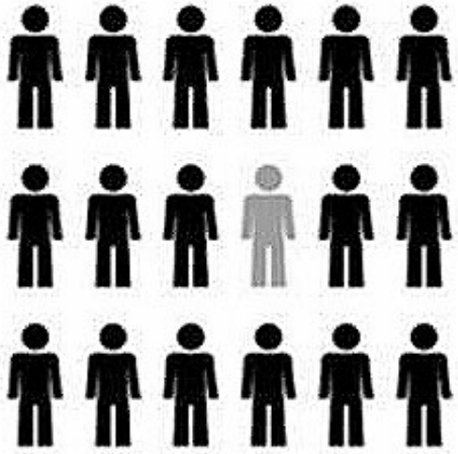
The visual psychology of perceptual groupings according to Gestalt psychologists is the process that the human brain groups various visual clues to create an understandable perceptual whole (Koffka (1935)). The interpretation of these visual groups is through ‘visual segmentation’ breaking down the whole grouping into potentially meaningful parts. The segmentation process is like describing the scene, often contextualised in terms of surface regions and bounding contours of objects (Tonder et Lyons (2005)).

Although visual segmentation is key to understanding human vision, it is still not completely understood. The Gestalt psychologists produced some intuitive guidelines called the Gestalt laws that are still deemed relevant in perception research today. These are (ibid):

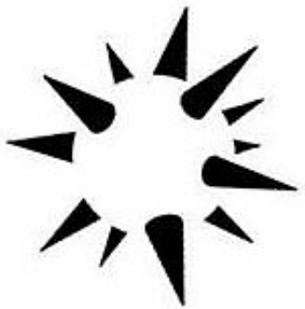
Proximity - more closely spaced elements seem to belong together.

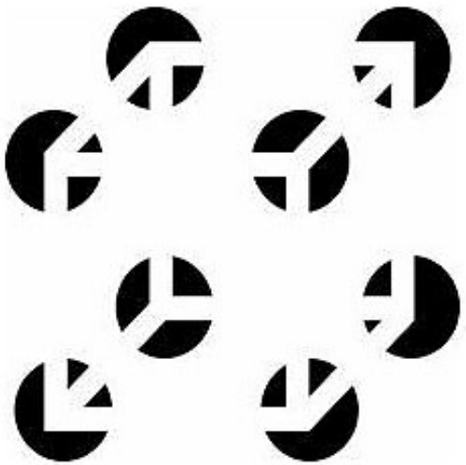
Similarity - similarly looking elements are visually grouped together

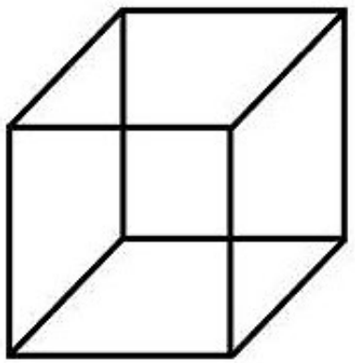




Gestalt Laws







Smoothness - If elements spatial alignment follows a smooth path they are visually grouped together.

Enclosedness - If elements are disposed in a closed path they are visually grouped together

Simplicity - Perceptions of grouped objects is as per the ecologically simplest configuration of individual objects.

These Gestalt qualities should not be considered individually but in superposition, as the results are not linearly additive but complex. For example Zucker et Davis (1988) noticed a major difference in contour perception when the *cue size:empty space ratio* was more than 1:5. The perception of classical illusions from the reconstruction of incomplete boundary contours was not possible beyond this ratio. Note that one of the famous dry rock landscape gardens, at Ryoanji temple in Kyoto, has an average *cue size:empty space ratio* of rock clusters and spaces of 1:2. well below the 1:5 mentioned above (ibid).

Textures are chosen not to dominate visual attention. They are not pure colours but are natural thus containing visual complexity. The coarse gravel used is a combination of light and dark elements to give a mottled effect that significantly reduces the contrast between the rocks, moss and the visual ground, with the rocks and moss of similar hues.

The spacing of rocks as described by Shingen (1466) should be a function of their size and that of the garden as a whole. The perception of the spatial dimensions of the whole garden will depend on how rocks visually fill them. Changing the size of rock clusters compared to their spacings changes their visual relationship as highlighted by Zucker et Davis (1988). If clusters appear too large, they are broken down rather than viewed in relationship with others; if too small the visual relationship between clusters is lost.

Junctions between surface textures and boundary contours of rocks should be so that an odd number of contours meets. This follows the Gestalt law of good continuation. An even junction visually jumps out at the viewer compared to an odd one. Gardeners use both odd and even junctions to control the importance of contours and thus visual segmentation (Tonder et Lyons (2005)) Where there are many even junctions in patterns, segmentation is ambiguous and the viewer is not directed across the image. The role of patterns with overlaps, similar to fish scales, create odd junctions. In visual psychophysics these occlusion junctions from this type of pattern have been identified to act as vivid monocular depth clues (ibid).

Small low-lying rocks seemingly naturally scattered close to more dominant rock clusters act as a way of extending the spatial range of groupings. Base stones as already mentioned enhance them.

Bilateral asymmetry has a significant impact on figure-ground perception. When segmenting a view, the objects with the most obvious bilaterally symmetrical form sit in front of the rest. This effect is independent of local visual clues such as proximity, similarity and smoothness. The principle is the same for rock clusters: those that are bilaterally symmetrical

Japanese, dry rock garden

jump out at the viewer, compromising the ensemble. (ibid)

The fractal or self-similarity aspect of raw nature is fundamental to Japanese dry rock landscapes. The triangular groupings are repeated in ever larger scale from the texture of the rocks and moss, to the dominant clusters up to the groupings of clusters in gardens. The use of base stones and low-lying stones help accentuate this triangular effect, by reinforcing the groupings between clusters and reducing the visual salience. It should be noted that although the shapes repeat at different scales, the shapes are irregular and thus keep the asymmetrical, natural appearance of the garden. A good example of this fractal composition is in the Dokuzatei garden at Diatokuji in Kyoto.

Much has been discussed about the importance of the rocks themselves but what about the importance of the background in which they sit in. Kovacs et Julesz (1994) discovered that 'human luminance contrast sensitivity is enhanced along loci that correspond exactly to the medial axes of the given stimulus figure'. These medial axis are invisible lines that sit exactly half way between two visible cues and potentially act as description vectors of shape when unconsciously processed by the visual part of the brain. When the medial axes are analysed in the famous Ryoanji dry rock garden they form a branching tree structure with the trunk converging on the viewing area. The asymmetric branching structure formed from these invisible lines is reminiscent of organic and inorganic patterns of nature (Tonder et Lyons (2005)).

Visual segmentation and perception is a constantly developing field. The Gestalt laws help us to understanding how we see by breaking frames down. Designers with a strong sense of aesthetics probably do this intuitively or unconsciously.

Conclusion

The Japanese garden is the product of a culture that has strong relationships between nature, religion and aesthetics. This approach is obvious in many areas of their life from human interaction, food through to art.

The universal impact and thus global fascination around Japanese gardens comes from the multifaceted nature of them. They impact the viewer on a spiritual, representational and aesthetic level. Whilst those who are not aware of the multitude of connections at a spiritual level can be attracted by representation and the strong attention to visual aesthetic.

Those who also have the spiritual connection with the gardens must really feel this otherworldly connection as they move from outside in. This nature in its distilled, idealized form is heavily studied in its recreation, further enhancing its impact. By this attention to detail, made possible by framing of views, this is nature designed for human consumption.

This recreation of nature is interesting especially when discussing Budhist Zen Gardens, which are designed for contemplation. All the essential elements of restorative environments by Kaplan et Kaplan (1989) are present, *fascination* in their fractal nature*, being away* in the inside and outside approach*, extent* with the many levels of representation and *compatibility* from individuals love of nature.

In Zen Buddhist gardens these representations of nature and the importance of bringing the attention from outside inwards is an attempt to understand the inner self (ibid). Understanding one's inner self in Buddhist tradition is part of the 'path to Enlightenment. Parallels can be made between the obvious construction and representation in Oliafur Eliassons art to that in Japanese gardens and the intention in both to see ourselves seeing as a way of self-comprehension. Our visual perception is thus questioned.

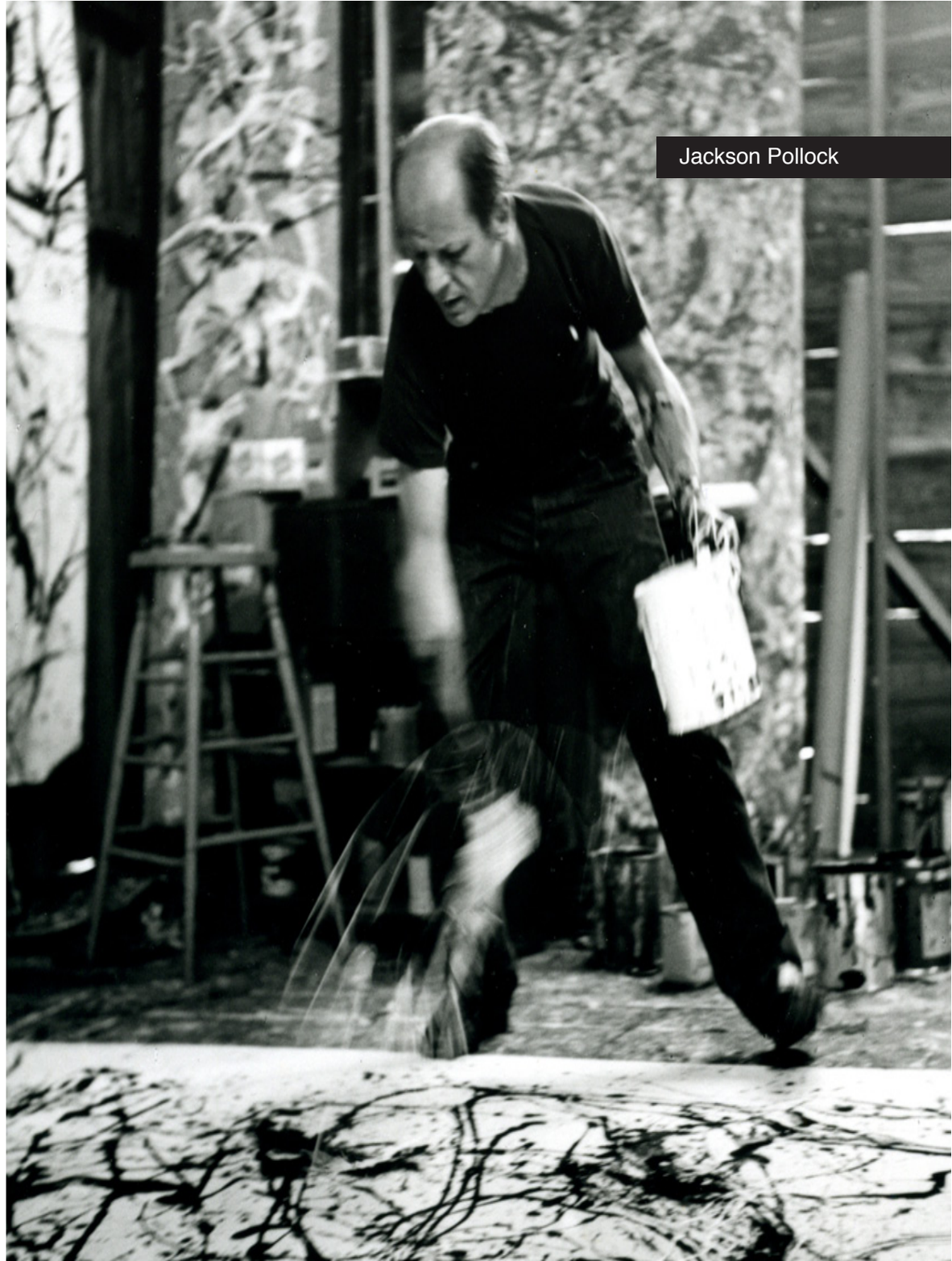
Fractals, Pollock & Aesthetics

Fractal patterns have grabbed the interest of artists and scientists in the way that they capture the visual complexity of nature and thus the interest of the viewer. Recent studies have shown their aesthetic appeal and their impact on our physiology.

Fascination as described by Kaplan et Kaplan (1989) in their essential relaxing qualities of nature, the Light and Space Movement recreates with light and reflections and the Japanese Garden with triangular groupings, these differing forms of fractal patterns are key to recreating nature.

Jackson Pollock's drip paintings were his interpretation of nature albeit an unorthodox approach in its time. His work has subsequently been subject to much attention and debate with regards to their representation. Taylor et al (2005) have analysed the visual perception of Pollock's paintings to demonstrate their fractal aspect thus potentially unlocking the secret of their success. With one of his drip paintings selling for $140m in 2006, one of the most expensive paintings sold in history, their continuing appeal is clear.

Taylor et al (ibid) also looked at the paintings of Mondrian, who was a contemporary of Pollock, which have a differing interpretation of nature. Mondrian's paintings have been similarly successful in the world of art but are there any similar aesthetic reasons in their recreation of nature?



Jackson Pollock

Nature and Visual Complexity

For art lovers, Jackson Pollock moving out from Manhattan to rural Springs on Long Island in 1945 was an influential moment in the history of art. His friends said that he used to sit on his porch staring at the natural shapes that surrounded him (Potter (1985)).

He set up studio in his barn and started painting but not in the ordinary sense. He didn't touch the canvas physically but dipped his brush into a paint can and dripped paint with differing directions and motions on to his canvas. This seemingly simple approach incited controversy, creating fans and critics alike.

Pollock's drip paintings are classified as 'abstract expressionist" art. The patterns he creates are very similar to the fractals demonstrated in nature (Mandelbrot (1977)). Fractals, as previously described in the Chapter 'The Japanese Garden', are patterns that repeat at smaller and smaller scales creating what is known as visual complexity. The branching nature of tree's is a common example of a fractal pattern.

The extent of visual complexity in a fractal pattern is quantified by parameter D, which stands for the fractal dimension. The value of the fractal dimension varies between 1, represented by a smooth line with no fractals, and 2, represented by a completely filled area, containing again no fractals. The closer the D value to two the more intricate and finer the structure is repeated (ibid).

The fractal dimension of several natural fractal patterns are shown below for comparison (Taylor et al (2005)):

Natural pattern	D
Coastline Norway	1.52
Woody plants and trees	1.28 - 1.90
Waves	1.3
Clouds	1.3 - 1.33
Mineral patterns	1.78
Geothermal rock patterns	1.25 - 1.55

Pollock and Aesthetics

The ability of Pollock to create such complexity in his drip paintings was studied by Taylor et al, (2002) in their analysis of a video of Pollock painting taken at his peak in 1950. The sequence he used for his paintings as described by Taylor et al (2005) was 'localized islands of trajectories distributed across the canvas, followed by longer extended trajectories that joined the islands gradually submerging them in a dense fractal web of paint'. Pollock worked at great speed covering the canvas very quickly before returning over a period of several days for the final details.

This analysis of the evolution of Pollock's painting showed that the fractal dimension after 20 seconds of painting was already 1.52 and this increased to 1.89 after 47 seconds. When returning to the canvas during the following days he increased the fractal dimension by less than 0.05. Pollock's drip technique demonstrated a steady increase in fractal dimension over the 10 year period of his paintings appearing. In the early days his completed works had a fractal dimension of 1.3 increasing up to 1.9 in his last drip painting works.

Drip painting, Pollock 1950

Despite this, does the fractal dimension have an impact over preference of different fractal patterns ie aesthetics. A study by Pickover (1995) using mathematically generated fractals showed that people preferred patterns with high fractal values of 1.8 whereas Aks et Sprott (Aks et Sprott (1996), Sprott (1993)), with a different mathematical process of generating fractals, showed a preference of values around 1.3. This 1.3 corresponds with that of many natural patterns such as clouds and waves. This poses the question whether the preference was determined by a familiarity in seeing images with that fractal dimension or even an unconscious emotional connection with images of nature, and thus images with similar fractal dimensions.

Taylor et al (2005) decided therefore to take this further and compare individuals preferences to artificial mathematical fractal patterns, Pollock's fractal patterns and those from nature. The question they posed was if there is a universal preference to the aesthetic qualities of fractals. They used computer generated simulated coastlines, cropped images of Pollocks paintings and images of natural scenes with varying fractal dimensions for their study. There was also a control image with no fractal patterns included. This study demonstrated a general aesthetic preference to patterns with an index between 1.3 and 1.5. This is similar to that of common scenes of nature such as coastlines, clouds and trees.

Physiological responses

The question was then posed, beyond aesthetic preferences does the exposure to fractal patterns have any restorative effects as demonstrated by the benefits of nature by others.

Taylor et al (2005) conducted a study on 24 people, measuring their skin conductance as a measure of stress following mentally taxing tasks. Ulrich et al (1986) showed that skin conductance is a reliable test for mental performance stress where higher stress is demonstrated by higher conductance. The subjects were given mentally stressful tasks intermitted with rest periods during which they were shown different fractal images.

They were shown several images but those that stood out were a natural forest image and an artificial savannah image with fractal dimensions of 1.6 and 1.4 respectively. Despite the expectation that the natural forest image would have the greatest impact on reducing stress it was actually the artificial savannah that had the biggest impact. Not surprisingly, its fractal dimension fits better in the range of aesthetic preference identified previously.

Taylor et al stress the preliminary nature of the physiological tests but suggest that preferential fractal dimensions have an impact on restorative effects. I would suggest Ulrich et al's (1991) and Kaplan et Kaplan (1989) work of the importance of the emotional connection might also have had an impact. It would have been interesting if two similar images of Savannahs were used but with different fractal dimensions. Potentially, the emotional unconscious connections with a forest are less appealing than that of an idyllic savannah?

Mondrian vs Pollock and nature

Mondrians paintings are very different than Pollocks but have still been very successful. Art experts say that Mondrians ability emanates from how he arranges pattern elements in a way that creates a 'profound aesthetic order' (Taylor (2004)). His paintings are composed in a clean, linear fashion very much in contrast with those of Pollock.

Despite their different styles Mondrian said he was looking for the underlying structure of nature (Mondrian (1957)). The simplicity of his work is significantly different to that of the visual complexity found in nature and in particular Pollock's interpretation. Mondrian felt that natures complexity was detrimental to people. He said behind this complexity was an unconscious order that contained the real harmony of nature. It was this he was trying to capture.

His paintings and the patterns within were assembled using a precise set of rules, which formed a grid upon, which everything was based. His obsession with using only vertical or horizontal lines went to the extent that he threatened to end the 'De Styl' art movement that originated from his work because of their increasing use of the diagonal.

Scientists are questioning whether the 'visual simplicity' rather than complexity in Mondrian's paintings has a particular impact on aesthetics. His use of only vertical or horizontal lines with exclusion of diagonals is a dominant part of his composition. In neurobiology it has been identified that different parts of the brain are used to process the visual signals of horizontal and vertical lines (Zeki (1999)), although there is no scientific proof yet that this impacts aesthetics (ibid). Spehar (2001) in a study of 20 people twisted Mondrians paintings in 4 orientations. Two orientations were oblique but the outcome showed there was no preference amongst viewers to oblique or orthogonal orientations.

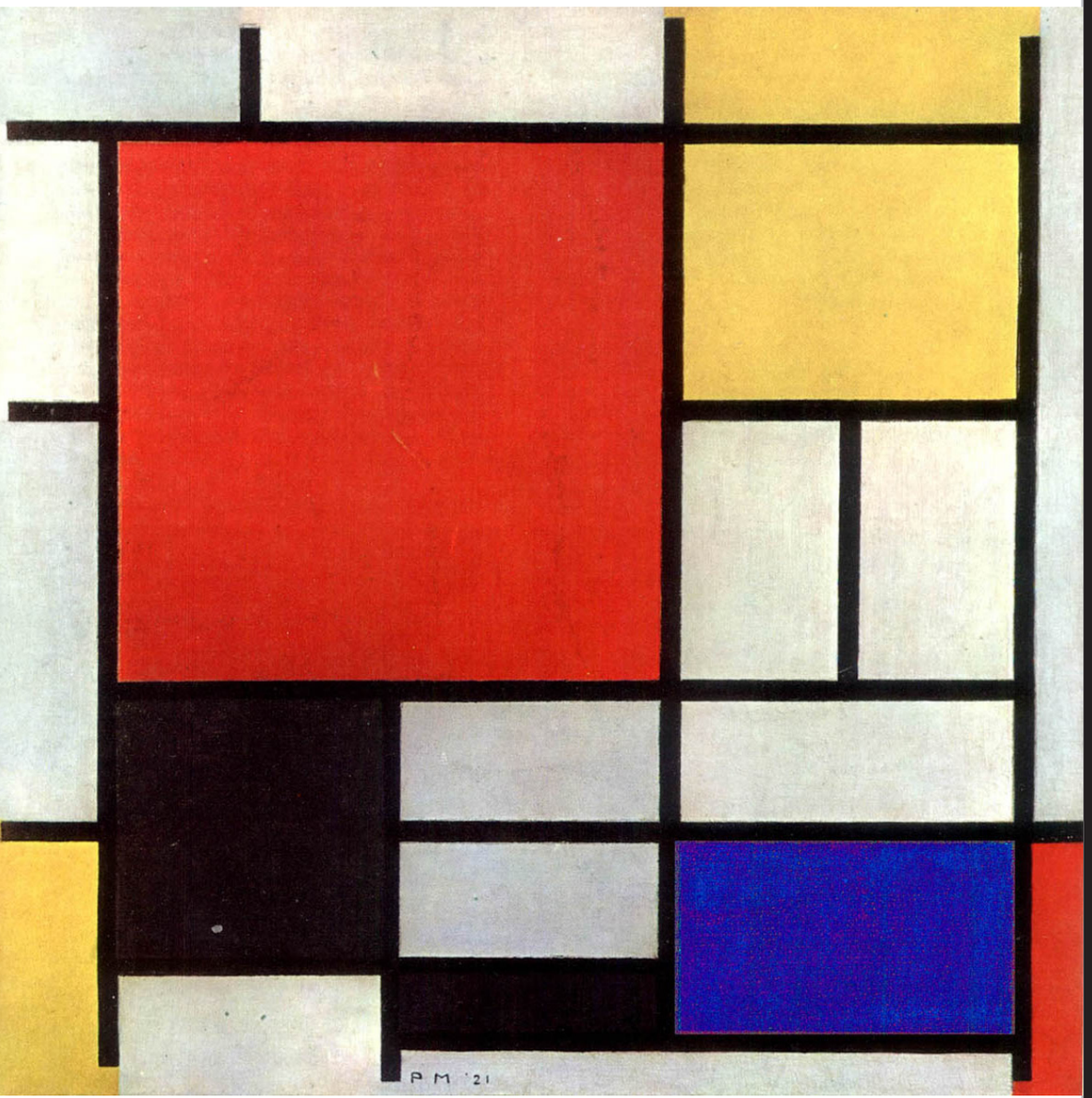
Mondrian was also obsessive with the exact placement of lines moving them back and forth with minute adjustments of a few millimetres. This was his attempt at creating an aesthetic that is "free of tension" (Deicher (1995)). Lee (2001) put this attention to detail of Mondrians lines to test. Recreating additional paintings with randomly placed lines, he asked experts and non-experts to distinguish the new paintings from the originals. Both the experts and non-experts could not distinguish between the two types.

Further tests of Mondrians work on the randomness of the placing of Mondrians lines were inconclusive. Taylor et al (2005) demonstrated that his lines were not random and were predictable.

Thus Mondrian's paintings, despite being recreations of nature like Pollock's, do not seem to have an aesthetic that follows any particular visual rules. Maybe there is something yet to be revealed.

Conclusion

Nature has captured the attention and interest of artists since the beginning of existence. Pollock and Mondrian no exception. Interpretations of nature have varied widely from obvious representations, Pollock's fractals and Mondrians lines to Eliassons installations and Japanese gardens.



Mondrian painting

Pollock with his meticulous observation of nature, inspired whilst sitting on his porch, captured this fascinating aspect of nature. He captured the complex temporality that is afforded the viewer each time he looks at even the same scene. Never does the same scene in nature appear in the same way, hence its fascination. His way was through the speed that he painted bringing a visual complexity that is difficult to repeat.

The sequence described from the video taken of Pollock in 1950 has similarities to the nature of the disposition of rock clusters in Japanese garden. As he starts painting individual islands and then paths between islands before covering the canvas, this process might give his paintings an unconscious visual structure similar to the medial axis and rock clusters in Japanese gardens. This presupposes that despite the additional layering of paint to fill the canvas that the visual clues of the islands and paths still exist.

The high fractal dimensions of Pollocks works are higher than those that were proven by Taylor et al (2005) to be commonly preferred but maybe their added visual complexity captivates the viewers attention more. Mondrian with his interpretation of nature is much more abstract and potentially his simplicity attracts us in a different way to nature.

Conclusion

The workplace has changed a lot over the last ten to fifteen years mainly driven by the advances in communication technology and the speed of computers. Before one had to wait for a letter or a fax, now everything happens in seconds. No time to think, we are in information overload.

Mobility among employees is also a growing trend and actively encouraged by employers grooming the next chief executive. Numerous livability indices are thus sprouting up, helping guide the discerning nomad to the next ‘must be’ destination. These indices may start to challenge the large metropolises like New York, London and Shanghai who are never included?

Part of the impact of nomadism and the digital revolution is a disconnect between people, their surroundings and themselves. Traditional territoriality has been lost! We are moving so fast with tunnel vision that we do not perceive life in all its complexity. This creates a sense of temporality in our existence. As James Turrell puts it ‘seeing ourselves seeing’ might help us to reengage.

So apart from all moving to Zurich or Stockholm, how can we manage these conflicting stresses caused by the changing workplace? It starts by reconnecting with our surroundings and all the diversity and interest it will bring. We can’t and shouldn’t reverse the recent changes in the workplace but we need to know how to live with them better. It will be this balance between this fast moving work-life tempered by moments of reconnect and slowing down

The universal relaxing impact of nature in the Japanese sense, an idealized unthreatening form combined with the otherwordly experience created can start to offer this reconnect. Nature in its fascinating way can create universal place attachment appealing to nomads of all backgrounds. It transports people through their shared histories and memories to other worlds as well as creating attachment to the immediate.

The form of this re-engagement will differ depending on the state of the individual. Sometimes it will follow the need to reconnect with ourselves and sometimes it will be more of a reconnect with our surroundings and society at large. Both will offer stress relief but in differing forms and thus suit needs at different times.

Re-connecting with ourselves in a more solitary experience will aid with contemplation and immediate relaxation. This can be created by individual otherworldly experiences similar to that of Japanese gardens where people are lost in their own visual perceptions. Harmony in aesthetics, with fascination both real and perceived are essential in capturing involuntary attention thus rejuvenating our ability to concentrate. Spectacular events of nature like sunsets, rainbows, snow falling, bird noise and trees moving can help create this never ending fascination. Bringing these experiences into the workplace will also allow us to further identify ourselves with it.

The experience of re-connecting with society and our surroundings is about stepping out of our tunnel vision and looking around. Offering collective experiences, where we can share unique events with others, brings us closer to them and gives us attachment to them and the environment in which it is shared. Eliasson with his Weather Project installation showed that certain experiences are multicultural in bringing everyone together.

The recreations of nature in the diverse examples discussed have many similarities. All these examples demonstrate an understanding of the fundamental importance of the aspects of nature to our

psychological health and wellbeing through perception. Our memories and shared histories all help how we view things and they are what give us a sense of place. Nature's essential qualities have a universal cultural appeal despite repeated confrontations. This aspect can potentially be harnessed to help create place and restoration in the workplace in the 'digital age', reconnecting us with our surroundings, ourself and our coworkers. The benefits if this can be achieved will be numerous both economic, social and environmental.

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