Interior Design Research Dissertation

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The ill effects of subliminal stimulation on humans within interior spaces

“Everything that deceives may be said to enchant.”

Plato, (427 BC - 347 BC)

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Abstract

This dissertation discusses the ill effects of subliminal stimulation on humans within interior spaces. It looks at the way in which the human psyche functions, and how subliminal stimulation can surpass human sensory perception. It uses some examples of subliminal stimuli to illustrate the ill effects they can have on humans, and discusses the implications they have for interior designers, the interior design industry, and users of space. It highlights the notion that what humans do not perceive, does indeed have an ability to negatively affect them, and that greater consideration of this area is necessary in order to create healthier interior environments.

Introduction

This dissertation aims to bring insight into the ill effects that can be caused on the human body and mind due to *subliminal** stimulation within interior spaces, and the implications that this has for interior design.

The topic has been thoughtfully approached as it occurred that issues relating to the *subliminal* tend to be less discussed in interior design when compared to *conscious* issues such as aesthetics and function. Most interior designers focus on satisfying their client by meeting their client's needs; however, the exploration into the *subconscious* and ill effects that can occur within it, help to explain that there may be more to a human's needs than simply meeting what they consciously desire.

The first chapter provides an introduction to the general human psyche, with particular emphasis on the *subliminal* realm. It first defines the different levels of consciousness and explains their role in the functioning of a human being. This is a necessary component in order to understand the second chapter which discusses specific examples of how stimulation can occur below the threshold of human perception. The first chapter also attempts to display the extent to which human perception can reach. It explains to what degree human sensory perception reaches, and at what point a human can be stimulated beyond their sensory perception. Additionally, it illustrates a brief history and testing of deliberate *subliminal* stimulation. This information has been strategically placed at the conclusion of the first chapter, as it leads into the second chapter which discusses some current practices of unintentional *subliminal* stimulation.

*Key words and phrases appear in italics and have a clear definition under the Glossary section (pp.43-44).

The second chapter discusses the ill effects of *subliminal* stimulants on the human body and mind within interior spaces. It requires the understanding of the general human psyche, as outlined in chapter one, as it builds on this understanding to explain how humans can be negatively stimulated within interior spaces. It uses examples to demonstrate the ill effects of three *subliminal* stimulants that are regularly used or are in contact with human beings. Furthermore, is discusses the far reaching implications that these *subliminal* stimuli have for the design industry, the designers and the users of interior spaces.

The exploration into this topic aims to challenge the way designers think in terms of approaching and designing in a world that they perceive as fixed and true. Human beings trust their senses to provide them with information that is relevant to them regarding the environment that they are in. Yet what they do not perceive, can negatively affect them. This does not demonstrate a failure on the behalf of human sensory perception, but rather demonstrates a failure of thoughtfulness and awareness in the minds of designers and inventors who design or implement *subliminal* stimuli into environments. Consequently, this dissertation looks to provoke its readers into thinking about what else shares their environment that they do not perceive, as human sensory perception can only reach so far.

Chapter One

In 1977 Karl Popper wrote that; “All experience is already interpreted by the nervous system a hundredfold – or a thousand fold; before it becomes *conscious* experience” (Dixon 1981, p.ii). Popper’s statement has enticed exploration into the workings of the *subconscious* and the way in which humans are able to be stimulated beyond their awareness, and thus, this statement has formed the basis of the first chapter within this dissertation. Popper’s statement recognises that humans do not process their experiences on simply one level. There are other levels of processing (that are not initially evident to humans) which influence their experiences. This is an extremely important notion to consider in interior design, as interior design is about directing and creating experience for humans. In order to successfully influence and create experience, an interior designer must first understand the way in which perception and processing occurs within humans.

Chapter one aims to first identify the various definitions of consciousness and the varying degrees of it. It then illustrates why these different degrees of consciousness are necessary and looks at how they work to the benefit (or otherwise) of the human being. The chapter describes the threshold point between the *conscious* and *subconscious* realms, and lastly provides a brief historical background regarding the testing of deliberate *subliminal* stimulation. This historical background has been strategically placed at the conclusion of the chapter. It has been placed here as the information prior to it helps to make it more comprehensible. It also allows for logical transition into chapter two, which discusses further examples of *subliminal* stimulation.

The various definitions and varying degrees of consciousness

Humans possess what is known as a consciousness, which (to a wide degree) allows them to experience their environment. However, human experience does not occur within, and is not processed by, one realm of consciousness alone. The human mind has varying degrees of consciousness and has beautifully evolved to perceive its environment often without a human's full awareness. To better understand the different degrees of consciousness it is necessary to define them. This will aid in distinguishing between, and identifying the different characteristics of, the varying degrees of consciousness. In understanding consciousness it is possible to see how human experience in space is able to be manipulated and affected through the *subconscious* realm.

Consciousness is a topic that has been studied by philosophers for hundreds of years. It was defined by William James (1842 – 1910), an American philosopher and psychologist, as the tool that enables individuals to select their own courses of action. It is the function of knowing, the idea that an individual lies in a particular state of awareness with regard to themselves and their environment. Consciousness can be further defined in seven ways. Firstly, it can be defined as "joint or mutual knowledge", secondly as "internal knowledge or conviction", i.e. being aware of one's behaviour, and thirdly as "a state of awareness" through internal and external sensory confirmation. The fourth definition of consciousness is "direct awareness" or "what passes in a man's mind" as Thomas Natsoulas stated; the fifth being awareness without sensory confirmation, and the sixth as a "state of wakefulness and attentiveness to stimuli or to events in one's environment". The seventh and last

definition of consciousness, with reference to Thomas Natsoulas again, is the processing of information at various levels of awareness or having a "double-consciousness" (Fisher & Wallace, 1999). These definitions agree that consciousness is a condition of the human body and mind at an attentive state to one's internal self and external environment. The definitions have been summarised in Figure 1.0 below.

1. Joint or mutual knowledge.
2. Internal knowledge or conviction.
3. A state of awareness through internal and external sensory confirmation.
4. Direct awareness. What passes in a man's mind.
5. Awareness without sensory confirmation.
6. State of wakefulness and attentiveness to stimuli or to events in one's environment.
7. Processing of information at various levels of awareness. Having a double-consciousness.

The seven definitions of consciousness

(Fisher & Wallace, 1999)

Figure 1.0

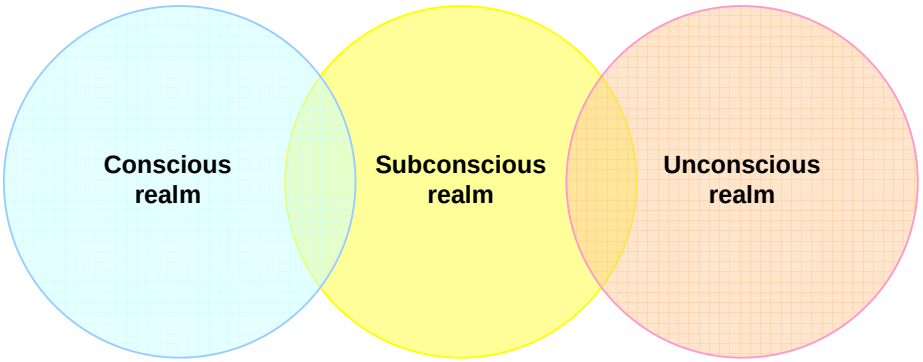
The fifth and seventh definitions – "awareness without sensory confirmation" and "the processing of information at various levels of awareness or having a double consciousness" – support a hazy, yet justifiable, distinction between what is thought

to be strictly *conscious* and *subconscious* or *subliminal*. These two definitions seem to fit more closely to the definition of *subconscious*. *Subconscious*, as defined by the Merriam Webster dictionary, means "existing in the mind but not immediately available to consciousness", indicating that the brain's *subconscious* level functions within both the *conscious* and (in some cases) the *unconscious* realm.

The term *subconscious* very closely relates to the term *subliminal*, which literally means below threshold (Stark, 1999). In this case, the threshold is the point at which stimuli are acknowledged in *conscious* thought. The word *subliminal* (which is technically archaic due to the introduction of signal detection theory in psychology in 1967 by Green & Swets) (Stark, 1999), when coupled with the word stimulation, refers to any stimulus that affects the human body, mind and/or senses from outside one's awareness.

This therefore highlights that there is also a difference between the states of *subconscious*ness and *unconscious*ness. *Unconscious*ness, as defined by the Merriam-Webster Dictionary, means; "not knowing or perceiving: not aware".

*Unconscious*ness is thus the opposite of *conscious*ness. Humans cannot function within the realms of *conscious*ness and *unconscious*ness at the same time. However, they are able to function in either the *conscious or unconscious* realm as well as functioning within the *subconscious* realm simultaneously. This is illustrated diagrammatically in Figure 2.0 below.



Human consciousness: the diagram illustrates how the subconscious realm works in the background to the conscious and unconscious realm. However, a human cannot function in both the conscious and unconscious realm simultaneously. The subconscious will only work within one other realm, depending on whether the human is conscious or unconscious.

Figure 2.0

In fact, as will next be discussed in this chapter, the ability of humans to function in this way is imperative to their survival. It is fair to state then, that the term *subconscious* is a term used to describe a position in the mind where processing can occur during both the contrasting stages of *conscious*ness and *unconscious*ness. The term *subliminal* refers to the effect that certain stimuli can have on the human mind that is recognized in the *subconscious* realm, after passing through the *unconscious* or *conscious* spheres without being perceived.

The different stages of consciousness and their function

It is intriguing that the human mind works in this manner; that while experiences are taking place in the *conscious* realm, the *subconscious* realm is actively working in the background, without the awareness of the human. This allows for the questioning of the purpose of this *subconscious* function. The reality that the brain is subconsciously processing stimuli from its environment (and using it to develop an understanding of its current experience) without acknowledgment in the *conscious* state seems phenomenal. On the surface this functioning appears meaningless - for what good is this processing if humans are not aware of it? However, when considered more closely the function of the *subconscious* realm is extremely valuable. Simply because humans are unaware of their *subconscious* processing does not mean that the processing has no purpose.

The stages of *conscious*, *unconscious*, and *subconscious* processing each have specific purposes for the functioning of a human being. The human brain and sensory system has evolved to accept and respond to many stimuli, particularly due to the desire for survival, and the brain (usually instinctively) is phenomenally able to determine which stimuli are suited to which stage of awareness.

The *conscious* state allows for humans to make sense of themselves and their environment. Humans use their senses to perceive their environment and themselves, to comprehend, and to make sense of the world that they are in. The *unconscious* state comes about when the body is required to “shut down” in order to aid survival. For example, sleeping is a required state of unconsciousness that assists the proper functioning of the individual, when *conscious*, thus increasing the chances of

survival. Another example might be an individual passing out of consciousness into unconsciousness as a result of bodily trauma. This is a survival mechanism that allows the body's energy to be used more efficiently in healing the body by shutting down consciousness. The *subconscious* state is an exceptional realm that allows an individual to be processing its self-thoughts and environment without full awareness in the *conscious* realm. The purpose of this state of awareness is that it aids in survival by alerting the individual's *conscious* state (and sometimes *unconscious* state) to any changes in its self or environment, if the *conscious* or *unconscious* self is "busy" performing its usual function (Dixon, 1981). This means that the *subconscious* will interrupt the functioning of the *conscious*, and some states of unconsciousness, if it detects a threat to survival.

The function and workings of the different stages of consciousness are thus invaluable to the survival of the human being and it is necessary to explore just how the brain filters and directs stimuli through to each level of consciousness.

As mentioned, the brain has developed as a tool to aid survival. The way in which it assists survival is by its processing techniques. The brain will accept stimuli and measure them against our learned experiences, expectations, needs, and values. It will also make predictions continuously, make assumptions, judge expectancy, and create perceptual hypothesises and *schemata* in order to process stimuli quickly and efficiently. These processes, which are occurring mainly within the *subconscious*, help to efficiently service the *conscious* realm by providing information that is based partially on the actual stimulus and partially based on what the individual expects or predicts (Dixon, 1981). This is an effective way to assess one's self and environment

as a human would not be able to deal with complex problems and situations if the brain did not have this processing technique.

This processing technique lends to what is called “habituation” – this is where the human is relaxed due to the familiarities of an environment fading out of awareness (Fisher & Wallace, 1999). Habituation occurs when the brain recognizes the aspects of an environment as stable, allowing them to ‘drop away’ from consciousness in order to make processing space available for new information of higher priority. Within the *subconscious* realm, the brain is still processing any new information and making sense of it, determining if it is a threat to the individual’s survival.

It is these techniques of comparison, prediction, and habituation that lead humans to respond to changes in their environment, rather than responding to the situations that they expect. While humans have different states of readiness which determine what they notice and what they do not, it is acceptable to say that the *subconscious* will interrupt the *conscious* and some stages of *unconscious*ness in the event of changes in the environment. So as the *conscious* state is comfortably habituated, the *subconscious* state is ready to interrupt habituation should change in the environment occur (Dixon, 1981).

The understanding of the varying degrees of consciousness and their functions are thus useful tools for interior designers who intend to create experience for users. If interior designers are able to understand why these differing degrees of consciousness are needed and how they work, they are better equipped with knowledge that they can use to design successful spaces for human experience.

The path of subconscious processing

To better understand the functioning and techniques of the human mind, it is necessary to briefly explore how the *subconscious* processing occurs.

All *conscious* representation (i.e. what humans perceive in their *conscious* realm) requires *subconscious* processing. This means that the *subconscious* sphere must process the stages of structural analysis as well as *semantic* analysis, and access stored sensory information in order to make the comparisons and predictions outlined previously (Dixon, 1981). Yet, the monitoring capacity of the senses is far more sophisticated than the *conscious* state has capacity for, which subsequently means that a large amount of sensory information that has undergone processing (up to a *semantic* level) will never achieve *conscious* representation. To take this one step further and, interestingly enough, the residue that lies unrepresented in *conscious*ness may have profound effects upon the processes of perception, memory and emotional responses, as well as consciousness itself (Dixon, 1981). This point will be discussed in more depth in Chapter two.

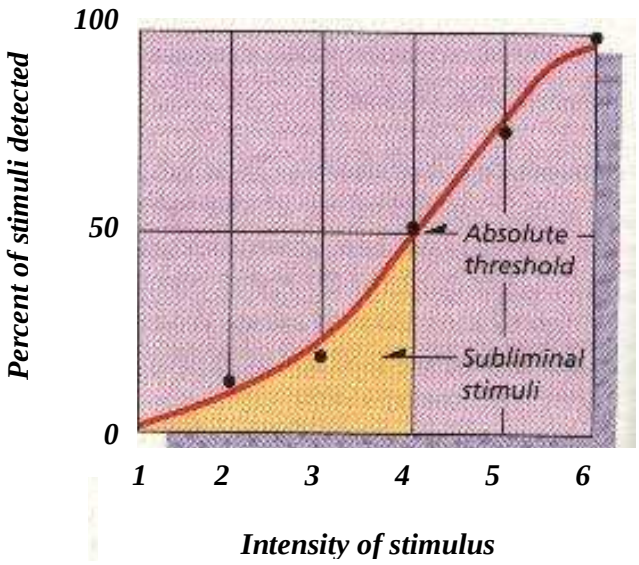
There is proof that *subconscious* processing occurs in this way, especially with regard to the habituation of an individual and the sudden awareness of an environmental aspect once a change occurs within it. Binocular rivalry (where one eye assumes dominance over another) is a good example of this. In situations where one eye is better suited to accept a certain stimulus, this (one) eye assumes dominance and the visual information from this eye only is accepted in *conscious* representation. However, as soon as change occurs in the field of the subservient eye, the subservient eye immediately assumes dominance and the visual information from the subservient eye takes priority in *conscious* representation. It is paradoxical that

the ‘un-sensing’ organ should provide the most important information, but binocular rivalry is a clear example of how *subconscious* processing works, and of how suppressed sensory channels do continue to register and process information up to a high level.

Subconscious processing and the suppressed sensory channels that it receives stimulation from, are thus not dysfunctional, but given high priority for future access to consciousness due to the nature of their perception as a survival technique. As demonstrated by binocular rivalry, changes will be initiated by a stimulus from a suppressed channel rather than a stimulus on the previously dominant channel. Additionally, even when no change occurs on suppressed channels, these are periodically assessed by the *subconscious* (Dixon, 1981). The workings of the *subconscious* realm are thus an invaluable mechanism for assessing and understanding one’s environment.

The threshold point that defines conscious and subconscious stimulation

The discoveries into the workings of the *subconscious* realm have made it evident that almost all stimuli must filter through the *subconscious* realm. However, it is also evident that most of what is subconsciously processed does not reach *conscious* representation (Dixon, 1981). As Figure 3.0 demonstrates, approximately fifty-percent of stimuli go unrepresented in consciousness. (The Absolute Threshold is arbitrarily measured as the point at which we perceive stimulus) (Stark, 1999).



Human perception of stimuli

(2005, <http://www.talkaboutonline.org/musicprg/Docs/dgm_psyc.html>)

Figure 3.0

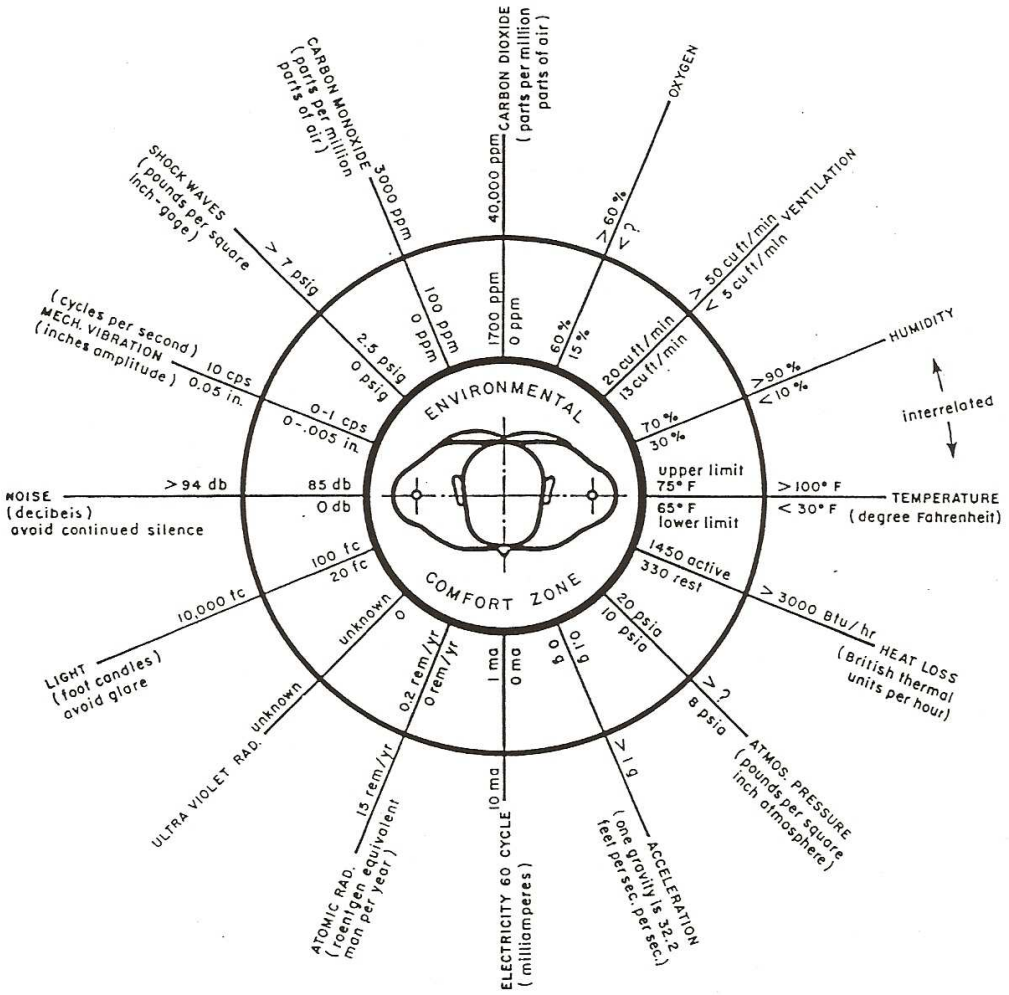
Additionally, human senses only consciously perceive stimuli to a certain extent. Figure 4.0 poetically illustrates the degree to which the standard human senses can consciously perceive stimulation.

Sense	Absolute threshold
Vision	A candle flame can be seen from 30 miles away on a clear, dark night.
Hearing	A watch can be heard ticking from 20 feet away in a quiet room.
Taste	A teaspoon of sugar can be tasted in 2 gallons of water.
Smell	A drop of perfume can be smelled when circulated into 6 large rooms.
Touch	A fly's wing can be felt falling onto one's cheek from a height of 1 centimetre.

Absolute thresholds (Darley et. al., 1991)

Figure 4.0

Furthermore, Figure 5.0 below illustrates the limitations and tolerance levels of other stimuli that are perceived consciously through both standard and non-standard human senses (e.g. balance).



THE BAND BETWEEN THE CIRCLES INDICATES THE ZONE FROM COMFORT TO THE TOLERANCE LIMIT. OUTSIDE THIS LIMIT GREAT DISCOMFORT OR PHYSIOLOGICAL HARM IS ENCOUNTERED. OTHER FACTORS NOT SHOWN AND TO BE CONSIDERED ARE: INFRA-RED RADIATION, ULTRA-SONIC VIBRATIONS, NOXIOUS GASES, DUST, POLLEN, CHEMICALS & FUNGI.

Comfort and tolerance levels of perceived stimuli

(Dreyfuss, 1966)

Figure 5.0

Beyond these limitations, humans are able to perceive stimuli on a *subconscious* or *subliminal* level. As previously mentioned, the *subconscious* realm generally is continually assessing the self and environment to locate any changes to alert the *conscious* state to. However, it is also possible to deliberately stimulate the *subconscious* process with *subliminal* stimulants. These include stimuli of low intensity or short duration (Stark, 1999), and require at least five factors (that are the same as those required in unintentional *subconscious* stimulation) to progress into the state of *conscious*ness. These are: the strength of the signal, external noise level, internal noise level, meaning of the signal, and the subject's direction of attention (Dixon, 1981). These factors govern whether the *subliminal* stimulant will achieve *conscious* representation. If the stimuli are not intended to affect the *conscious* state then, as Dixon (1981) states; "there must be a level of stimulus energy sufficiently great to activate peripheral receptors and cortical reception areas but insufficiently intense to produce an effect in consciousness".

Deliberate subliminal stimulation: a history of background and testing

Indeed, the deliberate influencing and effects of *subliminal* stimulation have been widely tested over the past one hundred years. Interest in the *subliminal* can be traced back to the early 1900's when Otto Poetzl studied the effect of rapidly flashed images on dreams (Stark, 1999). By the 1950's an invention named the 'Tachistoscope' spurred public controversy and pushed concern into research. Invented as a device to rapidly flash images in attempts to train fighter pilots to quickly identify an enemy (Stephens, 2005), it became a sensory curiosity that promptly attracted the advertising industry. Around 1956, advertisers were using

subliminal techniques in their marketing campaigns (‘drink Coca-Cola’, ‘eat popcorn’) during the preview periods prior to movies. Visual messages were said be encoded into various mediums such as the word ‘sex’ written imperceptibly on cracker packets, erotic images in liquor advertising, and hidden sexual symbols in children’s movies. Understandably, controversy arose as James Vicary (a market research consultant claiming to influence the buying behaviour of movie patrons) was challenged by people such as Vance Packard, who created social fear about *subliminal* influencing (Stark, 1999).

However, this period of controversy led the way to research and discovery within the field of *subliminal* stimulation. Five different types of deliberate *subliminal* stimulation have been noted.

The first is what is known as the Mere Exposure Effect, or *Subliminal* Perceptual Priming. This is where subjects are exposed to an image, without *conscious* awareness, that leads them to favour that image over others. An example of the Mere Exposure Effect can be noted in the test conducted by Kunst-Wilson & Zajonc, 1980. Subjects were repeatedly shown a series of geometric figures, each for less than 0.01 second. They were only able to recognize a flash of light in the *conscious* state, but subconsciously could process the image beyond their awareness. The subjects were then shown a range of figures including those that had been flashed, and others that had not. The subjects picked out the images that had been flashed as desirable, despite having no idea as to which had or had not been flashed. Variations of the Mere Exposure Effect have been demonstrated and documented by Whalen et al, 1998, to activate emotional centres of the brain, particularly the *amygdala*, without awareness (Stark, 1999). Another example is the test conducted by Rollman and Nachmias,1972. They first presented *subliminal* stimuli to subjects, then later

asked them to pick from a range which stimuli were present or absent. Even when the subject responded 'absent', the experiment conductor would ask them to guess the colour that the stimulus may have been. The subjects 'guessed' correctly, proving the effect of the *subliminal* stimulation (Dixon, 1981).

The second method of deliberate *subliminal* stimulation is known as the Poetzl Effect, named after Otto Poetzl and his contribution to this field. This is where words or images, subliminally perceived, appear in altered form in imagery or dreams a short time later (Stark, 1999).

The third method is called Affective Priming, where the *subconscious* exposure to an emotionally compelling image causes a subject to respond emotionally without knowing why (Stark, 1999).

The fourth method is known as *Semantic* Priming and has been thought to yield the best evidence for proving the process of *subliminal* perception. *Semantic* priming is where *subliminal* exposure to a word, lasting only around one hundred milliseconds, tends to bias the subject's perception of subsequent words for a fraction of a second. For example subjects, unaware of "seeing" the word, can be asked to distinguish whether the word was real or nonsensical. This is slightly different from the Mere Exposure Effect as it directly relates to *semantics* and not pictorial information (Stark, 1999).

The fifth and final type of deliberate *subliminal* stimulation is called Psychodynamic Activation. Here, exposure to certain kinds of fantasy images or *subliminal* suggestion can influence the mental state or *psychosocial* adaptation in a meaningful and persistent way. This is one of the oldest and most intriguing methods of *subliminal* stimulation as it can enter dreams and waking imagery in an altered way as documented by Shevrin, 1986. It has the ability to influence later recall and

perception and, most remarkably, even influence our social functioning (Stark, 1999). This method is, however, the most difficult to prove due to both the individual differences and psychological state of the subject, together with the vagaries of subjective interpretation of results.

This chapter has explored the various definitions and varying degrees of consciousness, the functions of the different stages of consciousness and the purpose and workings of the *subconscious* realm. It has attempted to display the extent to which human perception can reach, whether *conscious*ly or subconsciously, and has illustrated a brief history and testing of deliberate *subliminal* stimulation. This chapter, together with the second chapter, aims to discuss the effects that negative *subliminal* stimulation can have on humans and the implications for interior design.

Chapter Two

Chapter one defined and discussed consciousness, and the way in which the human psyche functions and experiences its environment in relation to it. It described how humans are able to perceive stimuli without their own *conscious* awareness. This second chapter further elaborates on the topic of *subliminal* stimulation within humans, especially its ill effects. The chapter has not been structured to describe which senses accept which *subliminal* stimulation, as it has been found that humans do not have senses for some *subliminal* stimuli. For example, it is impossible to link the sensation of Electromagnetic Frequencies (EMF) to any human sense, despite the evidence that EMFs are felt and affect the human body. This is the case for numerous *subliminal* stimuli, for if stimulation is occurring subconsciously then through what medium is it entering? Infrasound is not consciously heard, so how can it be classed as a sound that is perceived through the ears? For this reason, the chapter has been structured to first discuss what is meant by "ill effects" relating to the human body and mind. Next, the chapter gives examples of *subliminal* stimuli that cause ill effects, and argues the implications that *subliminal* stimuli causing ill effects have for the design industry, designers, and users of interior space.

The definition of "ill effects" relating to the human body and mind

It is necessary to define what is meant by "ill effects" on the human body and mind when discussing the effects of *subliminal* stimulation on human beings.

The majority of texts discuss how a medium can subliminally stimulate a human being's body and/or mind, yet few discuss the implications and effects this type of

stimulation can have; the negative of which is the topic for the second chapter of this dissertation. Only a few articles (Sarimov, R. et al. 2004, Kangmin, Z. et al. 2003, Huynh, M.C. & Stutzman, W. 2004, Bedard Jr, A. J. & Georges, T.M., 2000) engage the subject of *subliminal* stimulation and provide evidence of ill or negative effects that have occurred within the human body and/or mind as a result.

Ill or negative effects on the human body and mind mean any unhealthy change that occurs within the mind or body, particularly related to the effects of *subliminal* stimulation. When discussing the human body, ill or negative effects relates to any negative disruption in the normal, healthy, functioning of a human body where the body will become disadvantaged in some way after its exposure to the *subliminal* stimulation. An example, as will be illustrated further into this chapter, would be the disruption of a biological cell function or structure resulting in cell mutation or in increased risks of diseases such as cancer. Ill or negative effects on the human mind relates to any disturbances in the normal, healthy, functioning of a human mind where the workings and processes of a mind will become inhibited in some way after exposure to *subliminal* stimulation. An example, as will be illustrated further into this chapter, would be the condition of psychosis brought about by aggravation of the mind through *subliminal* peripheral vision irritation. Examples of *subliminal* stimulants that have had ill effects on the human body and mind will be presented to acknowledge that *subliminal* stimulation not only can occur, but also can have negative effects on humans.

Examples of subliminal stimulation that cause ill effects

This chapter will discuss three examples that illustrate ill effects on the human body or mind due to *subliminal* stimulation. Ill effects have been associated with certain frequencies, infrasound, and rear-approaching objects and the peripheral vision reflex.

Certain frequencies are a type of *subliminal* stimuli that produces negative effects on the human body. Electromagnetic and micro waves are two frequencies that can negatively affect the human body. They are produced by appliances that require electricity to operate. This means they are widespread in interior environments. Their use worldwide has especially increased over the past two decades due to the increasing desires for personal communication and the consequent demand for the necessary appliances and technologies to foster this desire (Huynh & Stutzman, 2004). Electromagnetic and micro waves are distinguished by their frequency range in *hertz* (Hz); electromagnetic waves range between 3 kHz to 300 GHz, and microwaves range between several hundred MHz to several GHz. Furthermore, electromagnetic waves can be classed as *ionizing* or non-*ionizing*, depending on the magnitude of the wave. (*Ionizing* is a process that requires a high level of electromagnetic energy in order to strip electrons from atoms and molecules). Additionally, they can be broken down into *thermal* and non-*thermal* classifications depending on their heating effect on biological material. (Huynh & Stutzman, 2004 pg.2).

These frequencies, like the majority of frequencies, are undetectable to the human senses. They are below the threshold of human sensory perception in that they cannot be seen, heard, touched, tasted or smelled with the normal human senses. They are not, however, beyond the conceptual perception of humans who have the ability to learn of their existence, just not through their own information receivers (i.e. their senses). Human thus rely on technology to measure the existence of Electromagnetic Frequencies/waves (EMFs) and Microwaves (MWs), yet their bodies are subliminally stimulated beyond their sensory perception and, unfortunately, these unperceivable EMFs and MWs can have negative effects on the human body.

EMFs and MWs have the ability to subliminally stimulate the human body negatively. The two studies involving EMFs and MWs which will be discussed have reported to have found negative impacts on the human body.

The first study, reported in the *IEEE Transactions on Plasma Science* (Sarimov, R. et al., 2004) illustrated that the use of the non-*thermal* Global System for Mobile Communication (GSM) "…under specific conditions of exposure, affected human *lymphocytes* similar to stress response. The data suggested that the MW effects differ at various GSM frequencies and vary between donors" (Sarimov et al., 2004, pg 1600). This means that the use of the GSM (by mobile phone) can affect humans by altering *chromatin conformation* in the human *lymphocytes* and possibly contributes to a relationship between *neuronal* damage and damage to human deoxyribonucleic acid (DNA – the building blocks of life and individual characteristics), the latter of which was found by testing rats (Sarimov et al., 2004). While Huynh & Stutzman (2004) stated that "Non *thermal* effects are not very well understood and …Evidence of harmful biological effects is ambiguous." (Huynh &

Stutzman, 2004, p. 25), the study reported by Sarimov, R. et al. (2004) clearly found evidence of a negative effect on the human body.

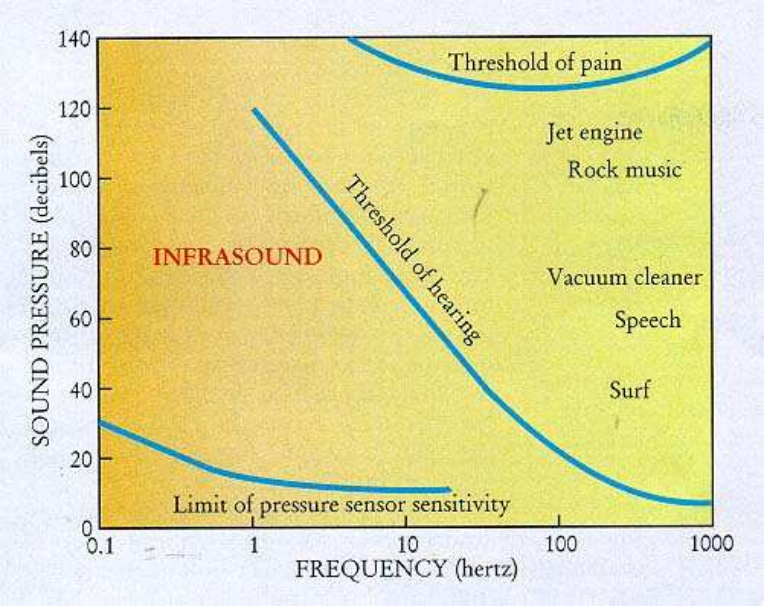
The second study, reported by the *American Journal of Epidemiology* (Kangmin, Z. et al., 2003) showed how the use of electrical bed-warming appliances (such as the electric blanket) were linked to a risk in breast cancer in African-American women. This study made reference to similar studies conducted on Caucasian women and agreed that the link between electrical bed-warming devices and risk of breast cancer in Caucasian women was also evident, however, it did notice a stronger risk association in the African-American women. The study stated that:

> EMFs can suppress production of *melatonin*…*Melatonin* can suppress production of oestrogen, directly inhibit breast cancer cell growth, and boost immune function. As a result of suppression of *melatonin* production, oestrogen levels may rise, breast cancer cells may grow faster, and the immune function that controls cell transformation may be depressed, increasing the risk of breast cancer.
> (Kangmin, Z. et al., 2003, p. 798).

Additionally, the article suggested that EMFs may have a negative effect on calcium *homeostasis* which can increase the risk of breast cancer. Thus, the effect of electric bedding devices on the health of a human can be noted as negative, and especially frightening considering these appliances may be the highest contributors of electromagnetic exposure to humans from residential appliances due to their EMF density, prolonged exposure, and intimate contact (Kangmin, Z. et al., 2003).

Infrasound is another method of *subliminal* stimulation that has had reported negative effects on the human body. Infrasound is a low frequency noise that is inaudible to humans. It can be generated by both humans (by creating a device to output infrasound) and by natural phenomena (e.g. storms, seasonal winds, weather patterns, some types of earthquakes). (*Debunking guide Spooky infrasound Alternative medicine lg Nobel prizes,* 2003)

Figure 6.0 (below) illustrates the pressure and frequency of infrasound.



" THRESHOLD OF HUMAN HEARING at low frequencies. The low-frequency domain of infrasound lies to the left of the nominal threshold of human hearing and feeling on this pressure-versus-frequency diagram. The regions occupied by familiar sounds are at the right. Frequencies below about 1 Hz can travel relatively undiminished for hundreds or thousands of kilometres through the atmosphere. The curve at the lower left roughly indicates the present limit of detectability imposed by atmospheric winds and turbulence".

(Bedard & Georges, 2000)

Figure 6.0

Infrasound can be considered as *subliminal* as it occurs below the sensory awareness threshold of human beings. Humans are unable to perceive infrasound with their basic five senses, yet are somehow aware of infrasound via other information receivers. As will be discussed, some humans do produce a bodily response to infrasound yet are unable to directly attribute the reactions they have from infrasound to infrasound, due to their inability to perceive it with their standard senses. It can therefore be said that infrasound is *subliminal* in human perception.

Infrasound has an amazing ability to create ill effects on the human body through its *subliminal* stimulation. As Walburn (2003) discussed, victims complained of illness "with everything from diarrhoea to a diminished ability to read and write" (Walburn 2003, p1). Once made aware of infrasound, they attributed their illnesses to the infrasound that had been unintentionally created by large fans at two local industries nearby. Infrasound was, however, intentionally created and studied as reported in 2003. Listeners at a musical concert had their musical performance "laced with infrasound", without their knowledge, and later reported that they suffered "…shivering on my wrist…odd feeling in my stomach…increased heart rate…feeling very anxious…sudden memory and emotional loss…feelings of unease or sorrow, chills down the spine, nervous feelings of revulsion or fear…" (*Debunking guide Spooky infrasound Alternative medicine lg Nobel prizes* 2003, p.1). Thus, these ill effects are a result of the *subliminal* stimulant of infrasound.

The third and final example of *subliminal* stimulation that causes ill effects is any object that approaches a human from the rear and enters into the human's peripheral

vision. Rear-approaching objects refers to anything that moves and advances into the peripheral vision of a stationary human, for example, other people. (Tucker, 2005)

Rear –approaching objects that enter into the human's field of peripheral vision can be considered *subliminal* due to the way the mind functions and lends to survival and habituation, as explained in chapter one of this dissertation. Once a rear-approaching object enters into the peripheral vision field of a human the object will come into the *conscious* mind. Humans have an instinctive reflex, due to their inherent desire for survival, to turn their head and look directly at the moving object that has approached into their peripheral vision. They do this in order to identify if it is a threat. Once identified as a threat, the human can spring into action, or if not identified as a threat, can return to the task that they were performing. In certain interior environments, such as cubicle spaces within offices described by Tucker (2005), rear-approaching objects will be consistently entering and departing from peripheral vision and humans will habituate; meaning that they learn to ignore them as they have already identified the type of movement as not posing a threat. This does not mean humans cease from seeing them; humans are simply able to allow the recurring process of identifying the object as a threat to occur in the *subconscious* rather than the *conscious* mind-frame, allowing them to continue uninterrupted on the task that they are performing. Rear-approaching objects into the peripheral vision field are therefore able to be considered as *subliminal* (Tucker, 2005).

Rear-approaching objects that enter into the peripheral vision field of humans can have a detrimentally ill effect on the human mind. This occurrence can lead to what is know as *Subliminal* Peripheral Vision Psychosis (SPVS), where a human develops "unexplained periods of psychotic behaviour that may include hearing voices, which

has a sudden onset with no reasonable explanation or cause" (Tucker, 2005) as a result of habitation and of the *subconscious* mind attempting to manage the continual stimulation in the peripheral vision field. SPVS will apparently only occur after very long periods of rear-approaching objects entering into the peripheral vision field. Tucker's website states;

> If you have several hours exposure from human traffic at the library, while reading at an open table or seated in a reading room chair, followed by long hours watching TV with a critically misplaced ceiling fan sweeping detectable shadows around the room, the combination of those two behaviours might cause the problem. The suggestion is that either activity alone would not consume enough exposure time even if the critical movement is present (Tucker, 2005).

The author of this website acknowledges that knowledge of this condition is not widespread and information on this topic is not readily available. Nevertheless, the concept of SPVS, its causes, and ill effects, are worthwhile to consider.

The implications of negative subliminal stimulation for interior design

The ill effects caused by *subliminal* stimulation such as frequencies, infrasound, and rear-approaching objects into a human's field of peripheral vision, have implications for the interior design industry, and the designers and users of interior spaces. As more information is uncovered and the knowledge of the negative effects of *subliminal* stimulation becomes more widespread, designers and users of interior spaces (i.e. society) will demand new design standards (to be implemented by

government or other official bodies). In the future they will demand *subliminal*-safe spaces and alternative spaces that can provide the same functions as regular spaces with the difference that they do so by alternative means (for example, by using minimal electricity). Additionally and most obviously, it could mean an increased design consciousness could develop in designers towards an understanding of the ill effects caused by *subliminal* stimulation which they could use in the design of new spaces. They may also implement this knowledge into making their design practice a healthy space to work within which could potentially lead to a less stressful environment and more efficient and effective design solutions.

With increased research and dispersion of knowledge related to the ill effects caused by *subliminal* stimulation such as EMF's, infrasound, and rear-approaching objects which enter a human's peripheral vision field, society will demand new design standards be put into place to ensure their safety and wellbeing. This is a fair prediction to make as the majority of studies researched for this dissertation were not only few, but very current. This indicates that this topic is in its stages of preliminary research and development and can be expected to grow. Even the study reported by Huynh & Stutzman (2004) indicated that "Non *thermal* effects are not very well understood and …Evidence of harmful biological effects is ambiguous." (Huynh & Stutzman 2004, p. 25). While this is only an example relating to frequencies, it illustrates the preliminary nature and how little is known of this, and potentially other *subliminal* related, topic(s). Once further research has been undertaken, the dispersion of the results and the accompanying knowledge could take place, educating society and allowing them to understand the *subliminal* occurrences that can negatively effect them within the interior environments that they frequent. This is

a justified statement as society is becoming increasingly more health and safety *conscious* as a result of increased information. An example is the research conducted into cigarette smoking, the presentation to Australian society of the findings, and the subsequent increased awareness and decline in cigarette smoking in Australia (Yong, H. et al., 2005). This education then, could lead to society demanding that the government or other official bodies implement new design standards for those designing interior spaces to abide by. New design standards relating to the design of electrical equipment or visual fields in corporate workspaces for example, would benefit the health of society in a similar way to the standards that have been implemented for sustainable design.

Another implication that the ill effects of *subliminal* stimulation could have on the design industry, designers and the users of interiors spaces, could be the desire for *subliminal*-safe spaces. *Subliminal*-safe spaces refers to interior spaces where the ill effects of *subliminal* stimulation are first targeted and then tended to by design, so that they no longer affect the health of the users of the interior space. These *subliminal*-safe spaces would need to be publicized in some way to the users, in order to invite them to use the space and re-assure them that this space would pose less of a risk to their health than other spaces that were not designed to combat the ill effects of *subliminal* stimulation. The use of these spaces can be justified using the example of the purchasing of expensive organic food products. While similar food products are available, some people choose to purchase organic food products as they place value on their health and believe organic food products are a healthier alternative to regular food products. They will even spend more money purchasing organic food products than they would regular food products (Hill, 2004). This is

illustrated by the trend in society that where health-*conscious* alternatives are being provided, an increasing portion of society is responding and accepting the alternative that will benefit their health (Hill, 2004). So the implication is that interior spaces, whose design and publicity can demonstrate, for example, that it has reduced EMFs (which negatively affects health as discussed) in contrast to other spaces of identical function, could potentially be successful and in demand.

The social desire that leads to the creation of alternative designed spaces is another implication brought about through the understanding of the ill effects caused by *subliminal* stimulation. Alternative spaces refers to interior spaces that provide the same service or function as other spaces, with the difference that these alternative spaces provide the service or function by a completely different method. Examples of such alternative spaces are a café that will service the needs of its users without much use of electricity (as responding to the negative effects of EMFs); or an alternative method of ventilation to fans that produce infrasound as they operate. The design of these alternative spaces would challenge designers, their creativity, their skills, and their perception of society's desires. The design of alternative spaces would also entail that designers collaborate with professionals in other areas to broaden their knowledge and increase innovation. If designers were to be successful in collaborating and creating these alternative spaces, they could potentially further differentiate themselves within their industry as alternative space designing could become an area of specialty. Furthermore, designers may discover that the users of interior spaces require innovative spaces to perform new functions that have been brought about by the knowledge of ill effects caused by *subliminal* stimulation.

The final implication for the design industry, designers and the users of interior space, is that ill effects caused by *subliminal* stimulation could result in a greater awareness and design consciousness by designers when they create new spaces. As research and knowledge in the field could develop, so too could a consciousness and conscience develop in designers. This means that as designers become aware of *subliminal* stimuli that cause negative effects on the human body and mind, they will design interior spaces by taking this into consideration and by prioritizing it during the design development along with issues such as sustainability. Thus by possessing knowledge and understanding in this field, they will be able to design interior spaces that are health-beneficial or health-neutral, and develop their own conscience in how they design for users.

This chapter, with the use of three examples, has demonstrated that some forms of *subliminal* stimuli are indeed harmful to the wellbeing of humans. The ill effects that are caused by these *subliminal* stimuli have significant implications for the design industry, the designers, and the users of interior spaces. The implications are that the increasingly health-conscious society will demand new design standards, *subliminal*-safe spaces, alternative spaces, and a consciousness and conscience of the issue in the minds of designers. Furthermore, this topic has illustrated that opportunities for innovation, design advancement, creativity, and new methods of approaching design problems, are available as a result of questioning the surrounding environment that is so often perceived as fixed and true.

Conclusion

This dissertation has aimed to bring insight into the ill effects that can be caused on the human body and mind due to *subliminal* stimulation within interior spaces, and the implications that this has for interior design.

Human beings are an integral part of interior design. It is imperative that interior designers understand the significance of humans in their industry. Their needs and desires are what interior designers aspire to meet, not only for business or financial profit, but also for personal and social satisfaction. To understand the complexity of a human being, the workings of their body synergized with the workings of their mind, is to truly understand their needs.

For this reason, the first chapter of this dissertation aimed to give background into the complexity of the human mind, which the workings of, indeed, are still not completely understood by science. The initial chapter discussed the levels of consciousness, why they are needed, and the way in which the human mind works to aid survival. This chapter attempted to bring attention to the often forgotten, yet essential, *subconscious* realm of the human mind, a realm that is rarely discussed in interior design.

This disregard for the *subconscious* realm by interior designers is an unintentional one, yet the *subconscious* realm has been proven to be a very important one in the workings of a human being. Interior design currently seems to disregard or 'forget' about this realm, and tends to favour and design for the *conscious* realm of human

beings. Interior design is a discipline that is very much oriented towards combining aesthetics and function. Yet aesthetics and function are considerations of the *conscious* mind. Of course there has been much research to support aspects of human comfort that are not constantly at the forefront of human minds (such as ergonomics – one does not think about the placement of one's body every time one sits in a chair). However, there has been much more information regarding *subconscious* or *subliminal* human comfort considered and incorporated into interior design, rather than information regarding *subliminal* discomfort.

In following on from the first chapter, the second chapter of this dissertation discussed how human beings can be negatively stimulated beyond their senses, i.e. through their *subconscious* realm, within interior environments. The chapter illustrated some of the ill effects that certain *subliminal* stimulants can have on human beings. The ideas presented were both fascinating and frightening as, just as the *subconscious* functions and responds without intense reflection, so too do some of the creators of technologies in this world. It seems that the good intentions of the creators of some technologies, in attempting to understand human needs, do not entirely succeed. While they meet the *conscious* realm with striking aesthetics and a desirable function, their creations possess an element of superficiality when compared to the negative *subliminal* effects they provide. However, this may be a subjective opinion in the sense that human values are completely individual and diverse. Where one human may value a technology that meets their *conscious* functional desires, another may prioritise their health and sacrifice the use of the technology that affects it.

Furthermore, with human values and trends toward health and sustainability being seriously considered by a growing number in today's society, the dissertation also discussed the implications that these ill effects could have for the future of interior design, the industry, its designers, and its users. The implications are far reaching and, as already mentioned, research into the ill effects caused by *subliminal* stimulation in interior environments seems in its preliminary stages. It is ironic to think that the technology that will better assist human beings to understand their *subconscious*, and the effects from their environment, might have *subliminal* negative effects itself. Yet, as Sigmund Freud once said; "From error to error, one discovers the entire truth" (Quoteworld.org, 2005).

So, development in this area has great potential for interior design in understanding and educating those within the industry (and hopefully those on a wider base) that the things that humans do not perceive consciously have equal, if not more, value to them.

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List of illustrations

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Glossary

Merriam-Webster Online (dictionary) - (ref: http://www.m-w.com/)

Amygdala	the one of the four basal ganglia in each cerebral hemisphere that is part of the limbic system and consists of an almond-shaped mass of grey matter in the anterior extremity of the temporal lobe -- called also *amygdaloid nucleus.*
Conformation	any of the spatial arrangements of a molecule that can be obtained by rotation of the atoms about a single bond.
Conscious	perceiving, apprehending, or noticing with a degree of controlled thought or observation.
Chromatin	a complex of nucleic acid and basic proteins (as histone) in eukaryotic cells that is usually dispersed in the interphase nucleus and condensed into chromosomes in mitosis and meiosis
Hertz (Hz)	a unit of frequency equal to one cycle per second.
Homeostasis	a relatively stable state of equilibrium or a tendency toward such a state between the different but interdependent elements or groups of elements of an organism, population, or group
Ionizing	to convert wholly or partly into ions.
Lymphocytes	any of the colourless weakly motile cells originating from stem cells and differentiating in lymphoid tissue (as of the thymus or bone marrow) that are the typical cellular elements of lymph , include the cellular mediators of immunity, and constitute 20 to 30 percent of the white blood cells of normal human blood.
Melatonin	a vertebrate hormone derived from serotonin and secreted by the pineal gland especially in response to darkness.
Neuron	a greyish or reddish granular cell with specialized processes that is the fundamental functional unit of nervous tissue.
Psychosocial	involving both psychological and social aspects.
Schemata	a mental codification of experience that includes a particular organized way of perceiving cognitively and responding to a complex situation or set of stimuli
Semantic	of or relating to meaning in language/of or relating to semantics.

Subconscious	existing in the mind but not immediately available to consciousness.
Subliminal	inadequate to produce a sensation or a perception/ existing or functioning below the threshold of consciousness.
Thermal	of, relating to, or caused by heat.
Unconscious	not knowing or perceiving: not aware.

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