

## INTERIOR PLANTSCAPING AND THE HEALTH AND WELLBEING OF BUILDING OCCUPANTS.

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### **Introduction**

People living in cities spend about 80% of their lifetime indoors (McNall 1986). Many studies have shown that buildings are complex, dynamic entities which constantly respond to their occupants and occupant activities (Gilbert 1993). A combination of chemicals, micro-organisms, heat and humidity are major factors contributing to air pollution and discomfort levels in a large number of modern energy efficient indoor environments (B.O.M.A. 1991). The internal environment is being increasingly regarded as an important determinant of the health and well being of building occupants (Gilbert 1993).

The term "building ecology" has been used to describe a comprehensive systems approach to understanding building environment occupant interactions (Gilbert 1993). There are many factors to consider in the provision of optimum conditions for the occupants of a building and its equipment and services.

People react to the indoor environment in markedly different ways. The modern office environment is complex and produces in people reactions of a psychological (perception) and physiological (biological conditions) nature, as well as the physical impact of various environmental conditions. The reasons why one environment is better than another are complex and involve the psychological and social aspects of the workplace activities as well as the physical environment. This has traditionally been the field of the management analyst, however it is becoming clearer that the physical and psychological work environments are not separate entities but rather parts of the one integrated experience.

Most of the people responsible for buildings and their interior design and management probably agree that plants contribute to environmental quality. However there has been relatively little scientific research about people/ plant interactions, creating the impression among decision makers that there is an absence of tangible, credible

evidence regarding the benefits that plants make possible (Ulrich and Parsons 1990). Without this other evidence, apart from the “clean air” information, decisions are based only on aesthetics and cost comparisons.

In recent years, researchers from several disciplines, including clinical psychology, environmental psychology, sociology and behavioural medicine, have been investigating the benefits of contacts with plants. People derive benefits from plants in a wide range of situations, and through active contacts or involvement such as gardening or more physically passive experiences such as looking at plants through a window. This review focuses on the influences of visual contacts with plants on psychological and physiological well-being, and on health related indicators. Particular emphasis is given to stress-reducing benefits of viewing plants (Ulrich and Parsons 1990).

Throughout human history plants have provided a source of healing and a direct link with nature. All aspects of human culture are rich with references and meanings regarding plants.

### Contemporary Theories

A number of quite different theoretical perspectives from both the social and natural sciences have been advanced to explain why people may derive enhanced well-being from passive contact with plants. *Overload* is used to describe characteristics of the environment such as high levels of visual complexity, noise, intensity and movement which can, overwhelm and fatigue human perceptual systems, or lead to detrimentally high levels of psychological and physiological excitement. People may become insensitive and distrustful, constantly on guard and withdraw from the offending environment whenever possible (Kaplan and Kaplan 1982). This theory implies that restoration from stress or perceptual fatigue should result from settings with stimuli, such as plants, that are low in intensity and incongruity, and have patterning that reduces arousal and processing effort. Another important category of theories emphasises *learning* as the key mechanism for acquiring positive responses to plants and other nature. *Cultural* explanations emphasise learning as the basis for an individual being conditioned or taught by society to prefer certain environmental elements and dislike others (Ulrich and Parsons 1990). Cultural and other learning-based perspectives can suggest at least explanations for a given society's positive disposition to plants generally, and for greater liking for one particular plant variety over another.

More recently several *evolutionary* theoretical perspectives have been advanced, however Ulrich (1983) has developed a “psychoevolutionary” perspective with the objective of explaining a broad range of emotional and physiological influences of natural configurations and content, including vegetation. Ulrich postulates that quick-onset affective or emotional reactions--not cognitive responses--constitute the first level of response to nature, and are central to subsequent thoughts, memory and meaning, and behavior with respect to environments. This position is consistent with a large body of contemporary research on emotions and cognition, and with recent advances in understanding neurophysiology.

### Psychological Well-Being

A comparatively narrow but important category of psychological benefits of plants, and which has received the most attention from researchers, is the aesthetic. If viewing a setting with plants elicits a response of aesthetic liking or preference, then presumably an individual's feeling state may be more positively toned (Ulrich and Parsons 1990). Consistent with the various theoretical perspectives predicting aesthetic preference, many studies conducted in different countries have shown that people usually express higher liking of nature scenes dominated by vegetation than to urban scenes lacking

vegetation (e.g. Kaplan and Kaplan 1982, Ulrich and Parsons 1990). While preference or aesthetic liking is an important emotional response, it is only one component of the broad range of feelings (e. g. interest, anger, sadness, fear) that are central to the psychological dimension of stress and restoration (Ulrich 1983).

**Stress-reducing effects of plants.** A stress reaction is the process of responding psychologically, physiologically, and often with behaviours, to a situation that is taxing or threatens well-being (Evans and Cohen 1987). Although certain short-term stressful situations can improve human performance and cognitive functioning, stress is considered to be a negative condition that should be mitigated over time to prevent deleterious effects on human performance, well-being, and health (Ulrich and Parsons 1990). A large body of research has shown that activities in nature settings with vegetation are important for helping people cope with stress as well as in meeting other non-stress related needs. (Kaplan and Kaplan 1989). More recently, research has focused on the indoor environment with restoration from stress emerging as a key perceived benefit (Berge and Lohr 1994). Another line of research, on window views and windowless settings, has provided additional evidence suggesting that visual contact with nature and plants can be preferred and restorative. Compared to settings with windows, windowless rooms tend to be disliked and can be stressful, especially in workplaces and health care settings (Heerwagen 1990). Heerwagen and Orians (1986) found that office workers with little or no visual access to the outside were more likely to decorate their work spaces with posters and other depictions of outdoor nature scenes than were workers with windows. The windowless workers may have displayed nature pictures to compensate for stressful influences of windowlessness (Heerwagen 1990). In interiors with windows, views having depth, vegetation, or other nature are preferred over low-depth and visually impoverished window views (Verderber 1986).

People interact with the total indoor environment. It either supports them in their tasks and gives satisfaction, or it hinders and frustrates. The office is the place where the majority of waking hours are spent and so should be seen as a 'second' home. To do this we need to be able to personalise it by adjusting it to our own requirements just as we may adjust lighting, ventilation or layout in our own home. We also need to feel a sense of connection with events beyond our desk, a need to be connected to other workers, to the organisation and to the outside world. Isolation can be negative and felt as a form of sensory deprivation. The landscaped atrium concept provides a good working environment, combining daylight with nature. A view of a natural setting or interior plantscaping has been found to be relaxing and provide visual relief for workers spending long periods at a desk, visual display unit or drawing board.

### **Physiological Evidence of Benefits of Plants**

In addition to psychological effects, stress and restoration have very important physiological dimensions. The physiological component is reflected in responses or levels of activity in numerous bodily systems, such as the cardiovascular. Data obtained by recording physiological responses are widely recognised to have scientific credibility as indicators of stress and restoration. Also, physiological methods can identify influences on well-being that may be outside the conscious awareness of individuals (Ulrich and Parsons 1990).

In a current study in progress at the University of Technology Sydney, brain electrical activity was recorded from unstressed individuals while they viewed either a whiteboard, or an abstract painting, or an indoor foliage plant. The major preliminary finding was that alpha wave activity was higher when subjects viewed the plant. Apart from indicating that the whiteboard/abstract painting had different effects on electrocortical activity, the alpha wave results strongly suggest that the foliage plant was more effective in eliciting a wakeful, relaxed state. The right hemisphere of the brain was the site for this higher alpha wave activity, suggesting a creative, as well as a wakeful, relaxed state (Ashley Craig, pers. comm. 1994). These results appear to

confirm similar findings from overseas research (Ulrich 1981), which also found that vegetation settings sustained attention and interest at higher levels than did urban scenes, and produced more positively toned emotional states.

Physiological measures have been used to study stress reducing effects of visual experiences with nature. Owen (1994) monitored the systolic blood pressure of visitors to a botanic garden. Results indicated, that after spending time in the garden, systolic blood pressure decreased significantly. Other researchers have begun to use physiological measures to investigate stress -reducing effects of nature scenes in health-care and workplace settings (Heerwagen 1990).

Results from these investigations justify the speculation that people may not have to be consciously aware of the presence of plants in offices, workplaces, homes or other settings for the plants to have positive influences on emotional states and physiological indicators. Another implication of these physiological studies is that research approaches based on verbal ratings or evaluations of physical settings having plants may sometimes not reveal effects of plants on well-being.

### **Health-Related Benefits**

Unprecedented opportunities have been created with recent major advances in the development of equipment and techniques for performing sound, quality research on beneficial influences of contact with plants. Rapid advances in electronics miniaturisation and computers make it possible for the recording of important physiological indicators such as blood pressure, heart rate, muscle contraction and electrical activity of the brain. Eye-tracking equipment makes it possible to study the extent to which people notice and give attention to plants and vegetation. These advances are enabling researchers to apply physiological and health related procedures in a broad range of real-world situations, such as offices ,workplaces, health-care facilities and other places.

Restorative or stress reducing responses to natural scenes have a number of features that has been exceedingly adaptive during human evolution, including the quickness of recovery influences effective reduction of negatively toned affects such as fear and aggression, reduction of taxing and deleterious sympathetic nervous system mobilisation (such as blood pressure ), and the possibility of pronounced parasympathetic nervous system involvement, associated with the maintenance or recharging of energy (Ulrich 1993).

Positive emotional states, elicited by natural settings, may significantly increase people's scores on tests of creativity and high order functioning.

### **Conclusion**

Natural settings provided the context of everyday experience throughout human evolution. The need to expand our understanding of positive human responsiveness to nature represents a major new direction for scientific research. One that can help us learn more about ourselves as humans and discover the benefits that people derive from natural environments. By contributing tangible, convincing evidence of the importance of plants for human well-being and health, research in the fields of health psychology, clinical psychology and behavioral medicine will assist decision makers to give higher priority for plants.

## References

- Berge Barbara and Lohr Virginia I. (1994) Landscape Preferences and Stress Responses of Ethnically Diverse Adolescents . *Proceedings of The Healing Dimensions of People-Plant Relations*. University of California, Davis.
- Building Owners and Managers Association of Australia (1991) *Managing Indoor Air Quality -Interim Guidelines*
- Evans, G.W. and Cohen S. (1987). Environmental Stress, 571-610. In: Stokols D. and Altman I.(eds.). *Handbook of Environmental Psychology*. John Wiley, New York.
- Heerwagen J. H. and Orians G. H.(1986). Adaptions to Windowlessness:: A Study of the Use of Visual Decor in Windowed and Windowless Offices. *Environment and Behavior* 18:623-639.
- Heerwagen J. H. and Orians G.H. (1993) Humans, Habitats, and Aesthetics. In: Kellert S.R. and Wilson E.O.(eds.). *The Biophilia Hypothesis*. Island Press Covelo CA.
- Kaplan R. and Kaplan S. (1982) *Humanscape-Environments for People* Ulrich's Books Inc. Ann Arbor Michigan.
- McNall Preston E. Jr. (1986) Indoor Air Quality: A Status Report *ASHRAE Journal* June, 39-48.
- Owen P.J. (1994) Translating the Healing Dimensions of Plants Into Scientific Terminology. *Proceedings of The Healing Dimensions of People-Plant Relations*. University of California Davis.
- Ulrich R.S. (1983) Aesthetic and affective response to natural environment, 85-125. In:Altman I. and Wohlwill J.F. (eds.). *Human behaviour and environment*. Vol. Plenum, New York.
- Ulrich R.S. and Parsons R. (1992) Influences of Passive Experiences With Plants on Individual Well-being and Health. In:*The Role of Horticulture in Human Well-Being and Social Development*. Timber Press Portland Oregon.
- Ulrich R.S. (1993) Biophilia, Biophobia and Natural Landscapes . In: Kellert S.R. and Wilson E.O. (eds.).*The Biophilia Hypothesis* Island Press Covelo CA.
- Verderber S. (1986). Dimensions of person-window transactions in the hospital environment. *Environment and Behavior* 18:450-466.