

COGNITIVE OVERLOAD

Exposure to high levels of stimulation

Inability to reduce the level of stimulation

Ignorance of extra stimulus

Impact on behavior

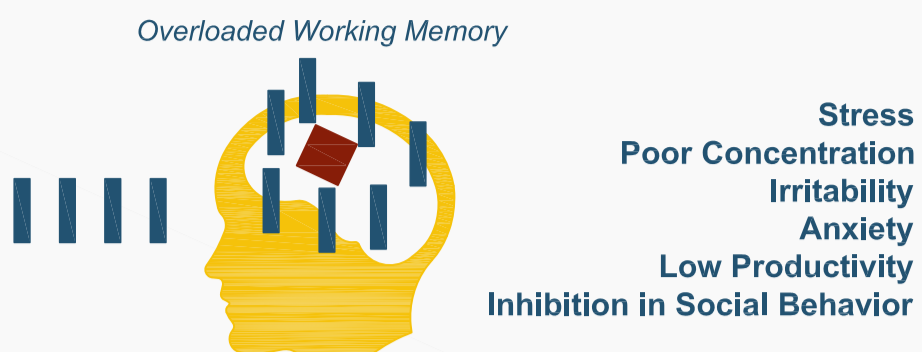
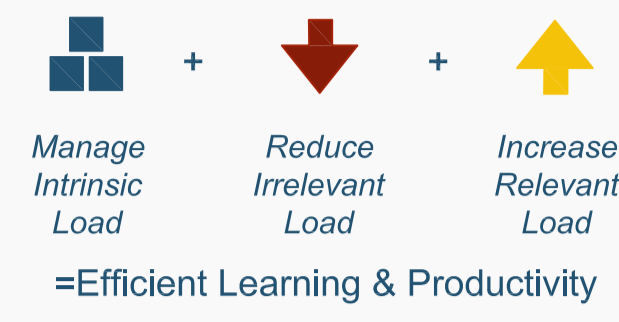
Larger amount of Visual Pollution can be one of the causes of the Cognitive Overload (CO)⁽⁹⁾.

CO occurs when the volume of information/stimuli supply exceeds the information processing capacity of the individual.

CO affects the **attention span** leading to increased **stress, anxiety and inhibition in social behavior** (Kaplan & Kaplan, 1980; Killingsworth & Gilbert, 2010).

On the other hand, **lack of stimulation of human attention results in boredom and numbness**⁽⁶⁾.

Cognitive Load Theory



The Magical Number 7 ± 2 (Georges A. Miller, 1956)

HABITUATION

Consequences of CO are:
1- Allocating less time to each input, and
2- Disregarding low priority inputs - Habituation.

Habituation is a form of non-associative learning in which an innate (non-reinforced) response to a stimulus decreases after repeated or prolonged presentations of that stimulus. The response-system learns to stop responding to a stimulus which is no longer biologically relevant⁽⁷⁾.

Sensitization is the opposite observation to habituation, i.e. an increase in the elicited behavior from repeated presentation of a stimulus.

Examples of Habituation in the Built Environment, where occupants of the residential area receive repetitive stimuli at specific hours of the day.



Grand Lycée Franco-Libanais (Beirut, Lebanon), in the middle of a residential area

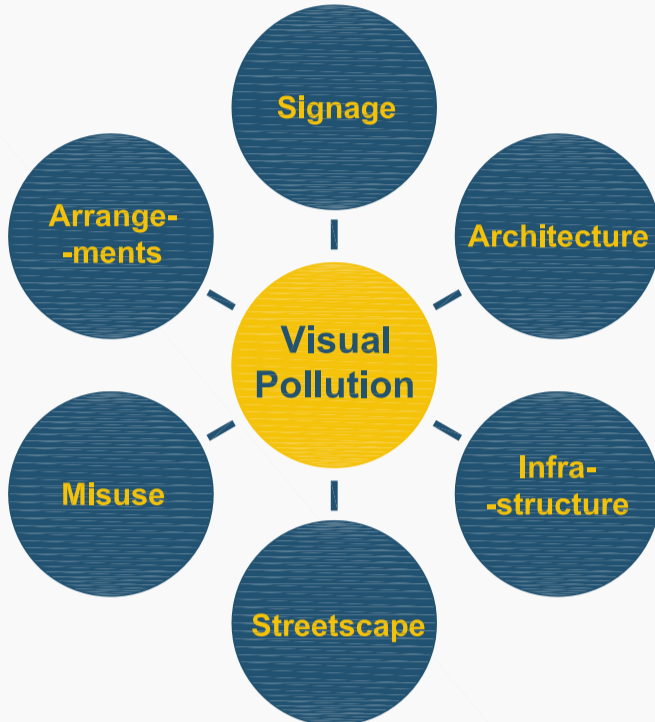


Down Town Beirut, Lebanon, residential areas next to religious buildings

VISUAL POLLUTION

Visual pollution disturbs the visual areas of people by creating harmful changes in the natural environment.

Billboards, open storage of trash, antennas, electric wires, buildings, and automobiles are often considered visual pollution. An overcrowding of an area causes visual pollution.



Effects of exposure to visual pollution include:
Distraction, Eye fatigue, Decrease in opinion diversity, and Loss of Identity⁽⁹⁾.



New York's Time Square - Credit: Oto Godfrey (CC BY-SA 3.0)



Shinjuku, Tokyo - Credit: Paul Tichonczuk (CC BY-NC-ND 2.0)

ATTENTION!

The link between aesthetic features of the Built Environment and its restorative properties

Several studies have already proven the impact of physical activity on both health and psychological well-being⁽¹⁾. Physical activity performed outside is also linked with the quantity of social interaction, therefore social cohesion, considered number one factor leading to a healthier happier city⁽²⁾.

Other studies showed that features of the built environment influence behavior & tendency for physical activity (e.g. distance, safety). The fact that BE influence physical health is evident but what about mental health? A question that concerns the research on restorative environments, i.e. environments that can facilitate recovery from stress and/or mental fatigue, improve mood and cognition⁽³⁾.

Restorative Built Environment

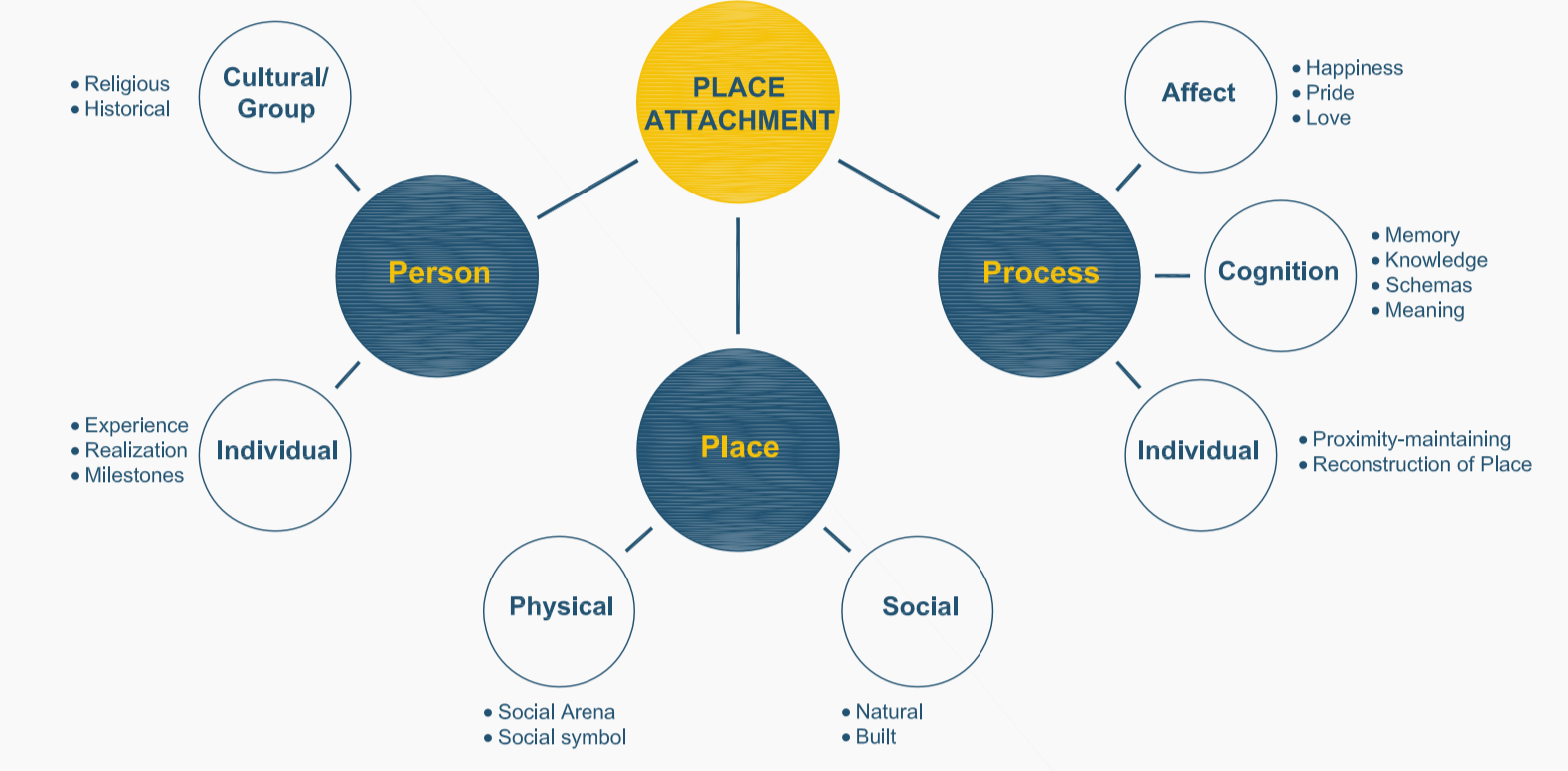
- Facilitates recovery from stress & mental fatigue
- Improves Mood
- Improves Cognition

PLACE ATTACHMENT

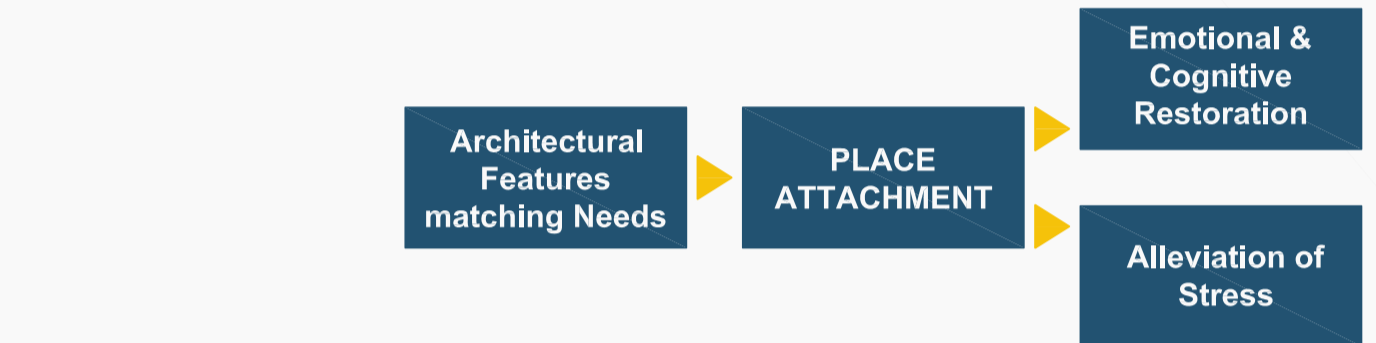
Place Attachment (PA) is the emotional bond between a person and a place⁽⁸⁾.

Many factors play a role in creating the PA⁽⁹⁾:

- Cognitive
- Behavioral
- Social



Place attachment and related dimensions (Scannell, 2009)



When under CO, a person cannot successfully form an attachment to a place and interact with it and others⁽¹⁰⁾.

Without PA, the restorativeness of a place decreases⁽¹¹⁾.

MINDFULNESS

The psychological process of bringing one's attention to experiences occurring in the present moment.

Mindfulness practice has been employed to reduce symptoms of depression, to reduce stress, anxiety, and in the treatment of drug addiction. Programs have been adopted in schools, prisons, hospitals, veterans' centers, and other environments, and mindfulness programs have been applied for additional outcomes such as for healthy aging, weight management, athletic performance, helping children with special needs, and as an intervention during the perinatal period⁽¹⁷⁾⁽¹⁸⁾⁽¹⁹⁾⁽²⁰⁾.



A meditation room at WeWork's Chinatown in D.C. - Source: WeWork.com.



UCSF Benioff Children's Hospital San Francisco on Sept. 17. - Credit: Elisabeth Fall (Hospital website)



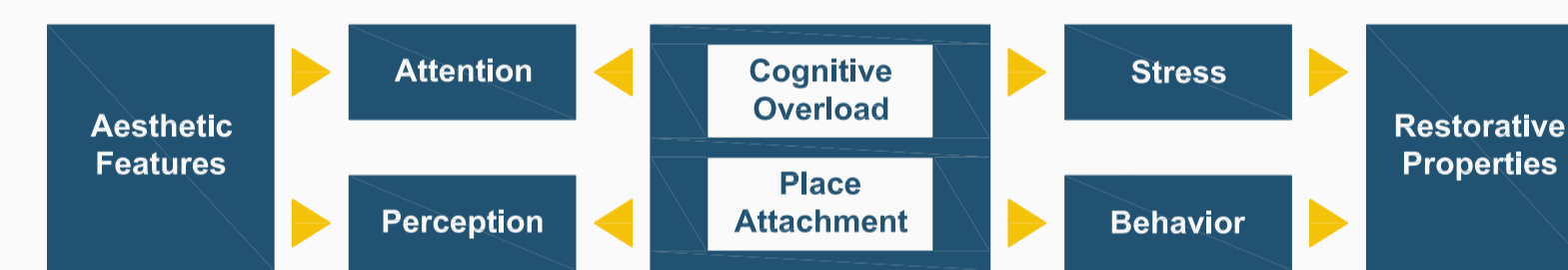
Second Home co-working space in Lisbon by Selgascano features 1,000 plants - Source: yellowtrace.com.au

CONCLUSIONS

Psychological/neuroscientific studies explain the positive effects of nature on our well-being.

These can be adapted and replicated in architectural design.

The built environment can in turn rather decrease our stress and anxiety, help in social interaction, and in forming Place Attachment, therefore preventing a large amount of related diseases.



In this framework, we extend the healthcare scope into the city level, where the built environment's aesthetic features can benefit from these concepts, in an attempt to promote wellness across the "happier and healthier" city.

AUTHORS

Richard Jedon. Masters of 'Psychology' at Masaryk University, Brno, Czech Republic (2017) & Masters of 'Neuroscience applied to Architectural Design' at Universita di Venezia, Venice, Italy (2018). R.Jedon@seznam.cz

Nour Tawil. Bachelor in 'Architectural Engineering' at Beirut Arab University, Beirut, Lebanon (2003) & Masters of 'Neuroscience applied to Architectural Design' at Universita di Venezia, Venice, Italy (2018). Nourtawil@hotmail.com

ATTENTION RESTORATION THEORY (Effortless Attention)

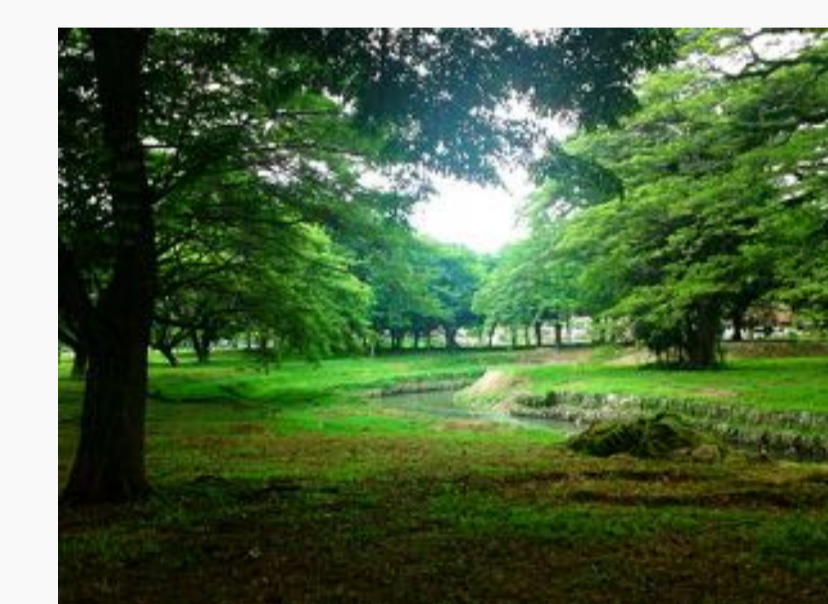
ART is the idea that restorative or natural environments can improve attention, concentration and focus (Kaplan, 1995; Berto, 2005).

ART is based on past research showing the separation of attention into two components:

- Involuntary attention, where attention is captured by inherently intriguing or important stimuli, and
- Voluntary or directed attention, where attention is directed by cognitive control processes⁽¹²⁾.

When voluntary attention is depleted, we are prone to negative behavior, stress and anxiety⁽¹³⁾.

Nature stimulates involuntary attention, this leads to recharge of the voluntary one (that's why the nature is so relaxing)⁽¹⁴⁾.



Linear Park (or Taman Jajar), Penang, Malaysia - Source: travel2penang.org



Mombacho Volcano, Nicaragua - Source: sandyfeet.com

Why nature has this effect?

Most probably because of its fractal structure.

FRACTALS

Fractals exhibit similar patterns at increasingly small scales called self similarity, also known as expanding symmetry or unfolding symmetry.

Fractals are encountered ubiquitously in nature.



Romanesco Broccoli or Roman Cauliflower - Credit: cyclonebill/Wikipedia (CC BY-SA 2.0)



Angelica Flowerhead - Credit: Chiswick Chap/Wikipedia (CC BY-SA 3.0)

Humans appear to be especially well-adapted to processing fractal patterns with D values between 1.3 and 1.5. When humans view fractal patterns with D values between 1.3 and 1.5, this tends to reduce physiological stress⁽¹⁵⁾.

The fractal structure can be measured and it was found that famous and quality pieces of art share the similar structure as nature.

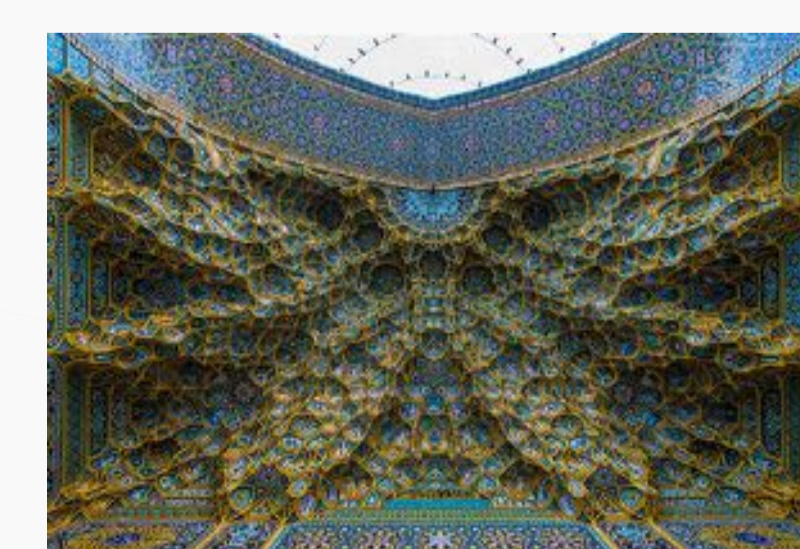


Jackson Pollock, Number 34 1949. Courtesy of The Pollock-Krasner Foundation ARS, NY and DACS, London 2015/Munson Williams Proctor Arts Institute/Art Resource, NY/Scala, Florence

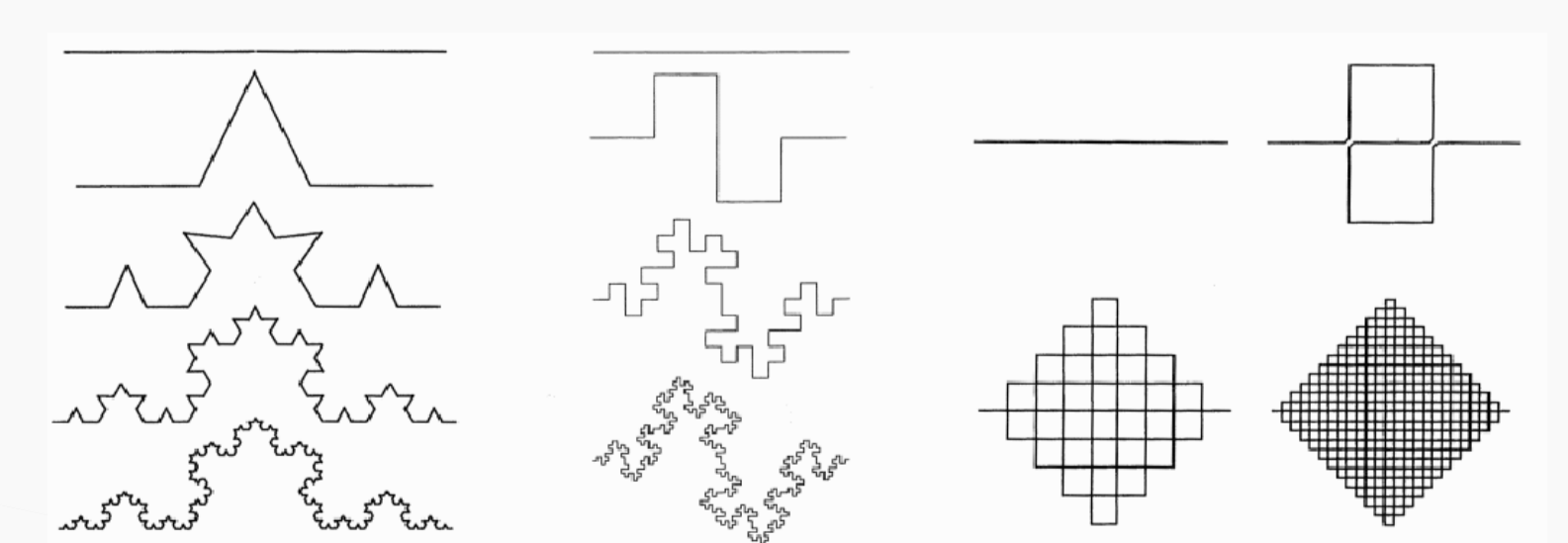
Fractal structure can be replicated.

Architectural design, e.g. facades in the city, could be created in accordance with the natural fractal structure.

With the application of fractal structure to architectural design, the urban environment would not exhaust voluntary attention, rather could charge the involuntary one⁽¹⁶⁾.



Islamic geometric patterns are reminiscent of fractal art, as Fatime Meusumeh Shirine, Gom, Iran - Credit: Wikimedia Commons (CC BY 4.0)



1. Koch curve, 2. Minkowski curve, 3. Peano curve Bovill, Carl (1996) Fractal geometry in architecture and design. Boston: Birkhäuser

Consequently, fractals could work as a form of mindfulness training.

REFERENCES

- (1) Sallis JF, Cerreto RB, Ascher W, Henderson KA, Kraft MK, Kerr J (2006). "An ecological approach to creating active living communities". *Annu Rev Public Health*. 2006a;27:297-322. DOI: 10.1146/annurev.publhealth.27.021405.102100.
- (2) Montgomery C (2013). "Happy City: Transforming Our Lives Through Urban Design". First edition. New York: Farrar, Straus and Giroux.
- (3) Rucifelle E, Korpeka K (2016). "Memory and Place Attachment as Predictors of Imagined Restorative Perceptions of Favourite Places". *Journal of Environmental Psychology* 48:120-130. DOI: 10.1016/j.jenvp.2016.09.005.
- (4) Yilmaz D (2011). "In the Context of Visual Pollution: Effects of Trabzon City Center Silhouette". *The Asian Social Science Journal*. 7 (5): 99. DOI:10.5539/ass.7.v05p99.
- (5) Milgram S (1970). "The Experience of Living in Cities". *Science*, 167(3924) 1461-1468. Retrieved from: <http://www.jstor.org/stable/1728966>.
- (6) Ellard C (2015). "Places of the Heart: The Psychogeography of Everyday Life". New York: Bellevue Literary Press.
- (7) Ramlakhan HA, Abrams T, Barry RJ, Bhattacharya S, Clayton DF, Colombo J, ... Thompson RF (2009). "Habituation Revisited: An Updated & Revised Description of the Behavioral Characteristics of Habituation". *Neurobiology of Learning and Memory*, 92 (2): 135-138. DOI:10.1016/j.nlm.2008.09.012.
- (8) Lewicka M (2011). "Place Attachment: How Far Have We Come in the Last 40 Years?". *Journal of Environmental Psychology*, 31 (3): 207-230. DOI:10.1016/j.jenvp.2010.10.001.
- (9) Marcus CC (1992). "Place Attachment". New York: Plenum Press. pp. 87-112. ISBN 978-1468487558.
- (10) Scannell L, Gifford R (2010). "Defining Place Attachment: A Tripartite Organizing Framework". *Journal of Environmental Psychology*, 30: 1-10. DOI:10.1016/j.jenvp.2009.09.006.
- (11) Scannell L, Gifford R (2017). "The Experienced Psychological Benefits of Place Attachment". *Journal of Environmental Psychology*, 51: 256-269. DOI:10.1016/j.jenvp.2017.04.001.
- (12) Kaplan R, Kaplan S (1989). "The Experience of Nature: A Psychological Perspective". Cambridge University Press. ISBN 978-0-521-34139-4.
- (13) Kaplan S, Berman MG (2017-05-05). "Directed Attention as a Common Resource for Executive Functioning and Self-Regulation". *Perspectives on Psychological Science*, 5 (1): 43-57. DOI:10.1177/1745691605367874.
- (14) Ulrich RS, Simons RF, Losito BD, Fiorillo E, Miles MA, Zeleni M (1991). "Stress Recovery During Exposure to Natural and Urban Environments". *J. Environ. Psychol.* 1991, 11, 201-230.
- (15) Ostwald MJ, Vaughan J (2016). "The Fractal Dimension of Architecture". *Birkhäuser*, Basel. DOI:10.1007/978-3-319-32426-5.
- (16) Taylor RP (2006). "Reduction of Physiological Stress Using Fractal Art and Architecture". *Leonardo*, 39 (3): 245-251. DOI:10.1162/leon.2006.39.3.245.
- (17) Kaba-Zeni J (2013). "Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illnesses". New York: Bantam Dell. ISBN 978-0-34539724.
- (18) Nihei M (2017). "The Mindfulness Movement: How a Buddhist Practice Evolved into a Scientific Approach to Life". *Skeptical Inquirer*, 41 (3): 24-26.
- (19) Rodrigues MF et al. (2017). "Mindfulness in Mood and Anxiety Disorders: A Review of the Literature". *Trends in Psychiatry and Psychotherapy*, 39 (3): 207-15. DOI:10.1590/2237-4089-2016-0051.
- (20) Killingsworth MA, Gilbert DT (2010). "A Wandering Mind is an Unhappy Mind". *Science*, 330 (6006): 932. DOI: 10.1126/science.1192439.