



# The Emergence of the Term Biophilic Design

An Interdisciplinary Approach

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**Architectural History Thesis**

AR2A011

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MSc Architecture

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*April 17, 2025*

**“ Your exposure at an early age predisposes you to understanding the value and importance of natural contact. ”**

(Beatley, 2013, as cited in Söderlund, 2019, p.43)

# Abstract

Nowadays, Biophilic Design (BD) has become more well-known in architecture, without a good understanding of the term's conceptual foundations and, therefore, its true meaning. Existing literature predominantly focuses on the characteristics and features of BD, while the historical context of its emergence is underexamined, leading to conceptual misunderstanding and a gap in the literature. This study explores the development of the term BD, primarily in the United States, from the mid-twentieth century to its formal definition in 2008 by positioning it in a broader historical and interdisciplinary context. Based on the analysis of primary and secondary literature sources, this research identifies four significant moments of collaboration between experts from different disciplines that led to BD's formulation. Moreover, it highlights multiple influential figures throughout the emergence, most notably Stephen Kellert, who first mentioned the term BD at the beginning of the 21st century. The study shows that BD is a broad term shaped by theories in an interdisciplinary context and is, therefore, not confined to the single discipline of architecture.

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# 01 Prologue

Growing up near the sea and dunes shaped my connection with nature and influenced me as a person. I experience tranquillity and a sense of freedom while being in these landscapes, which positively impact my well-being. I feel connected with nature. However, I believe people nowadays increasingly lose their connection with nature despite their inherent tendency to connect with it.

As an architecture student, I often ask myself what role I could play in enhancing this connection through the built environment. This is the reason why Biophilic Design fascinates me, as it provides an architectural framework for the reconnection of humans and nature. When I first heard of the term, I thought of it as incorporating nature into architecture by adding some extra plants into buildings. But through this research, I began to understand that Biophilic Design is an interdisciplinary deep approach that aims to restore the evolutionary human need to be in contact with nature, which is essential for holistic human health.

My interest in Biophilic Design comes from the belief that it is a step to harmonious architecture, where people and nature live together in balance. I think it is important to learn how I can contribute to architecture that goes beyond aesthetics and has a deeper understanding of ecology and psychology. Through integral architectural design, we can restore our bonds with the natural world.

Architecture is not just a profession but a powerful tool to stimulate the needed change.

**“ Biophilic design is the deliberate attempt to translate an understanding of the inherent human affinity to affiliate with natural systems and processes, known as biophilia, into the design of the built environment. ”**

(Kellert et al., 2008, p.3)

# 02 Introduction

Nowadays, Biophilic Design (BD) is popular in the field of architecture with many designers identifying their designs as biophilic, but without understanding its original meaning. This term misuse illustrates the need for research on the theoretical foundations under which BD emerged. Because the current literature focuses mainly on the principles and applications, BD's emergence and contextualization are underexamined or incomplete. Moreover, a deeper examination of the literature shows critical gaps in the total emergence, which leads to an incomplete understanding of the tendency.

This thesis aims to address these gaps by examining the emergence of the term Biophilic Design, primarily in the United States, in the context of a psychological, biological, scientific, and cultural tendency in a chronological and complete way. Through historical research, this study will strengthen awareness of the origin of BD by answering the following research question:

**How did the term Biophilic Design emerge within the context of psychological, biological, cultural, and scientific influences from the mid-20th century to its formal and popularized development in 2008?**

This thesis positions BD in a broader historical development, emphasizing the role of interdisciplinary collaboration in shaping the concept. Through a chronological structure, it explores how the term BD developed from biophilia theories into a design concept and illustrates not only the connection between nature and humans but also between architecture and other disciplines. The first chapter will outline biophilia's biological and psychological roots starting in 1964 when the term biophilia was introduced. The second chapter will focus on the transition to a design concept from the 1990s until 2001 by introducing key pioneers in the field and key projects. The third chapter will outline the formal birth of Biophilic Design as a term between 2001 and 2008, highlighting different moments in the literature identified as its official formulation by emphasizing on key figure Stephen Kellert. The conclusion will focus on the interdisciplinary nature of BD throughout its total emergence.

This thesis will analyze primary and secondary sources to provide a detailed overview of the development of BD. Primary sources include books and publications by key thinkers and will be used to understand the meaning and evolution of both biophilia and BD, as well as to gain insight into the psychological and scientific trends that underlie them. Secondary sources will be used to provide a historical overview and analysis of the emergence of BD. The sources will be examined to gain insight into the existing knowledge about the development and identify the literature gaps. Primary and secondary sources will be compared in order to reconstruct the chronological development. In addition, conducted interviews by researcher Jana Söderlund in 2013 will be analyzed to clarify the pioneers' narrative further.

This thesis is not a handbook on the principles of BD but an analysis of the discursive and contextual frameworks that shaped the term by using historiography. It will emphasize the interdisciplinary foundation instead of reducing it to a contemporary mainstream title.

# Chapter 1

# 03 The Biological and Psychological Roots of Biophilia (1964 -1993)

In order to understand the total emergence of the term Biophilic Design, it is essential to begin with the roots of the conceptualization, starting with the term biophilia. The term is derived from the combination of the ancient Greek words bio (life) and philia (love), which literally translates to 'love of life'. In this context 'life' means both living creatures and the natural environment, framing biophilia as love for living creatures and love for nature (Barbiero et al., 2021).

**bio (life) + philia (love) = biophilia**  
**(life) + (love) = love of life**

## Psychological Biophilia

Thus, the term biophilia is a combination of two ancient Greek words but was not used as a combined term until 1964. Erich Fromm was the first to mention the combined term biophilia in his book *The Heart of Man: Its Genius for Good and Evil* (1964). Fromm (1900-1980) was born into an orthodox Jewish family in Germany during the First World War and opposed bourgeois society and capitalism, which led him toward socialism (Funk, 2003). In 1933 he started working in the United States during a time of social unrest, due to the World Wars and the Cold War, as a professor at the National University of Mexico and the William Alanson White Institute of Psychoanalysis and Psychiatry and at Michigan State University (Fromm, 1958). He wrote about the problems of modern society that stood in the way of the realization of true human freedom, and saw love and attachment to others and socialism as essential solutions for these problems (Elkind, 1981; Alexander, 2021). As a German Marxist psychoanalyst, socialist humanist, and philosopher, Fromm focused on the social and cultural influences on the individual (Fuchs, 2020; Benton, 2011).

In *The Heart of Man: Its Genius for Good and Evil* (1964), Fromm described the term biophilia from a psychological perspective as 'love of life', by which he meant the connection and love with everything that is alive. "The person who fully loves life is attracted by the process of life and growth in all spheres." (Fromm, 1964, p.47). According to Fromm, it is a positive and innate urge to have love with all living things. Fromm's use of the terms 'love' and 'life' is rooted in his broader psychological framework. In his most popular book, *The Art of Loving* (1956), he described love as an active power and an art that people could learn and develop (Fromm, 1956, p.20). "Love is the active concern for the life and the growth of that which we love" (Fromm, 1956, p.26). He linked love and life because of the active power (love) in engagement with existence (life): "Without love, humanity could not exist for a day." (Fromm, 1956, p.18). Fromm's ideas were relatively new in social psychology and psychoanalysis, in contrast to other psychoanalysts who saw love as a passive feeling or just an occurrence (Fromm, 1956). The period in which *The Art of Loving* (1956) was published was characterized by a new awareness of freedom, connection, and love. Moreover, America was discovering both social science research on sexuality and self-help books (Hausdorf, 1972).

In 1973, Fromm further elaborated on the term biophilia in his book *The Anatomy Of Human Destructiveness*, in which he stated: "Biophilia is the passionate love of life and of all that is alive; it is the wish to further growth, whether in a person, a plant, an idea, or a social group." (Fromm, 1973, p.365). The ideas and publications of Fromm emerged in the middle of the 20th century when alienation was caused by modern capitalism, industrialization, and urbanization (Miyamoto,1987). Furthermore, the 1970s were also characterized by ecological movements, such as Earth Day (1970) and the Club of Rome: Limits to Growth (1972). His Jewish background and interpretation of the Bible and the Talmud also influenced Fromm's ideas. He stated that humans were destroying the environment because they were not living in harmony with nature. Instead, he advocated that humans should build a new, non-destructive relationship with nature. He saw the Messianic era as a utopia where people lived harmoniously with nature. According to Fromm, developing human capacities, such as love and reason, would be the solution to restoring the destructive relationship between people and nature (Gunderson, 2014).

**"Man, in the name of progress, is transforming the world into a stinking and poisonous place (and this is not symbolic). He pollutes the air, the water, the soil, the animals-and himself. He is doing this to a degree that has made it doubtful whether the earth will still be livable within a hundred years from now."** (Fromm, 1973, p.350)

## Biological Biophilia

In 1984, the term biophilia was mentioned again, by American biologist Edward O. Wilson, who studied the taxonomy of animals, sociobiology, biodiversity, and the human-nature relationship. He was a professor of science and curator of entomology at Harvard University and twice winning author of the Pulitzer Prize (Kellert & Wilson, 1993). In 1975, Wilson published *Sociobiology: The New Synthesis*, in which he introduced a groundbreaking approach to the social behavior of humans and animals. He stated that research in human genetics and neuroscience had led to a biological understanding of human nature, in contrast to the leading psychological emphasis on cultural and social influences (Harvard University Press, 2000). In 1978, Wilson further explored human biology in his publication *On Human Nature*, in which he examined how biological evolutionary processes influence human behavior and drew connections between biology and the social sciences. With his publications, Wilson shifted the emphasis to biological foundations and sociobiology.

**"Sociobiology is a scientific discipline, the systematic study of the biological basis of all forms of social behavior in organisms, including humans."** (Wilson, 1978, p.xvi)

In his book *Biophilia* (1984), Wilson approached the term biophilia from this biological and evolutionary angle to indicate that humans have deep bonds with nature rooted in humans evolutionary biology. He described biophilia as "the innate tendency to focus on life and lifelike processes" (Wilson, 1984, p.1) and "... the urge to affiliate with other forms of life..." (Wilson, 1984, p.85). Wilson's ideas emerged in the 1980s when sociobiology emerged as its own field and when environmental and ecological concerns were increasingly rising: "In the interpretation of E.O Wilson's biophilia concepts we can see direct references to the environmental movement thinkers- Henry D. Thoreau or Aldo Leopold." (Krčmářová, 2009, p.14).

With Wilson's biological approach, a disciplinary shift occurred in the focus from psychological to biological. In contrast to Fromm, the biological explanation of Wilson did not use the word 'love' anymore. Wilson suggested that the connection with nature was not just a cultural or psychological preference but a deeply

rooted feature that helps people survive in their environment. Throughout history, humans have relied on the natural environment in order to survive. According to Wilson, if humans had the choice, they would choose several landscape features similar to the evolutionary environment: the savanna, lookout points, and water bodies. "It seems that whenever people are given a free choice, they move to open tree-studded land on prominences overlooking water." (Wilson, 1984, p.110). Wilson based his biological perspective on scientific studies from researchers such as Gordon Orians with the Savanna Hypothesis (1980), Yi-Fu Tuan with *Topophilia* (1974), and Rene Dubos with *Wooing of the Earth* (1980) (Wilson, 1984). To conclude, academia shifted from a social and psychological perspective toward a more biological and sociobiological model.

Both Fromm and Wilson described biophilia as inherent to humans and a sign of mental and physical health (Orr, 1993). However, Fromm defined biophilia psychologically, while Wilson described it from a biological perspective (Barbiero et al., 2021). Furthermore, both Wilson and Fromm argued that a deeper understanding and development of biophilia contributed to a better coexistence of humans and nature, which could help address environmental problems (Gunderson, 2014). Ultimately, the two perspectives were complementary and together provided a theoretical framework for the term biophilia.

## An Interdisciplinary Biophilia

Wilson's book *Biophilia* gave rise to discussions and more research: "The concept of biophilia inspired discussions of ethics, art, culture, politics and religion." (Millar, 2006, p.9). American social ecologist Stephen R. Kellert was one of those thinkers who began exploring the concept of biophilia after Wilson's publication. Kellert first studied and researched in the field of sociology and published about environmental and biology conservation. In 1977, he joined Yale University School of Forestry and Environmental Studies as a researcher and lecturer and became an associate professor in 1980. His work focused on understanding the connection between nature and humans (Dennehy, 2017). Kellert and Wilson met in 1982 before Wilson published *Biophilia*. Although both were professors at different universities in the United States, Harvard and Yale, they collaborated intellectually. Wilson focused on sociobiology and evolutionary theories, while Kellert focused on the human-nature connection. Wilson's theories inspired Kellert, who has been thinking about biophilia ever since they met (Söderlund, 2019).

Wilson's biological ideas about human behavior and nature were not fundamentally a part of academia and practice until the 1990s (Söderlund & Newman, 2022). In 1992, Kellert and Wilson wanted to gather a group of thinkers and researchers to discuss biophilia and reach beyond the current explanation of it. They aimed to popularize the biophilia concept and to broaden the theoretical and empirical evidence supporting it (Joye & De Block, 2011). Together with Kellert's colleague Scott McVay, a naturalist, a philanthropist, and a poet, who was head of the Geraldine R. Dodge Foundation\* (US), they brought together a diverse group of twenty thinkers. "With McVay, they were able to secure some funding and brought together an exceptional group of "very bright, high powered people." (Kellert, 2013 as cited in Söderlund, 2019, p.48). "This meeting occurred because the editors (Kellert & Wilson) believed that scientific inquiry of such a new and difficult subject (biophilia) required an initial opportunity for productive discussion and feedback. A highly attractive, retreat-like setting was chosen in the hope of stimulating deep and lively discussion." (Kellert & Wilson, 1993, p.24). These discussions led

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\* Geraldine R. Dodge Foundation is a philanthropic foundation that supports arts, education, environment, informed communities, and poetry to connect communities and influence social change. Under McVay's leadership, the organization also supported environmental conservation, education, and animal welfare (Chautauqua, n.d; Geraldine R. Dodge Foundation, 2025)

a year later, in 1993, to the publication of the book *The Biophilia Hypothesis*, written by Kellert and Wilson. The book was a collection of publications by twenty experts from different disciplines, all connected with nature in a psychological, biological, cultural, symbolic, or aesthetic way. Their shared idea that the natural world is critical to humans at both the individual and the societal level connected these actors (Kellert, 1993). “The editors believe that the contributors are distinguished by the relevance of their prior work relating to the biophilia hypothesis, the outstanding quality of their scholarship, and the breadth of their disciplinary perspectives. We have proceeded with the conviction that the richness of the topic requires no less than a multidisciplinary consideration.” (Kellert & Wilson, 1993, p.22).

The book became an interdisciplinary study that presented factual and theoretical evidence for the hypothesis that human affinity with nature is deeply rooted in evolutionary human history. By merging chapters written by twenty different thinkers (figure 3), a general understanding of biophilia was made in the form of the biophilia hypothesis with a scientific claim. By approaching biophilia as a hypothesis underscored the need for systematic research and proof of the concept.

## The Biophilia Hypothesis

The human inclination to affiliate with life and lifelike process is:

- Inherent (that is, biologically based)
- Part of our species’ evolutionary heritage
- Associated with human competitive advantage and genetic fitness
- Likely to increase the possibility for achieving individual meaning and personal fulfilment
- The self-interested basis for a human ethic of care and conservation of nature, most especially the diversity of life

Figure 1: The biophilia hypothesis (Kellert & Wilson, 1993, p.21)

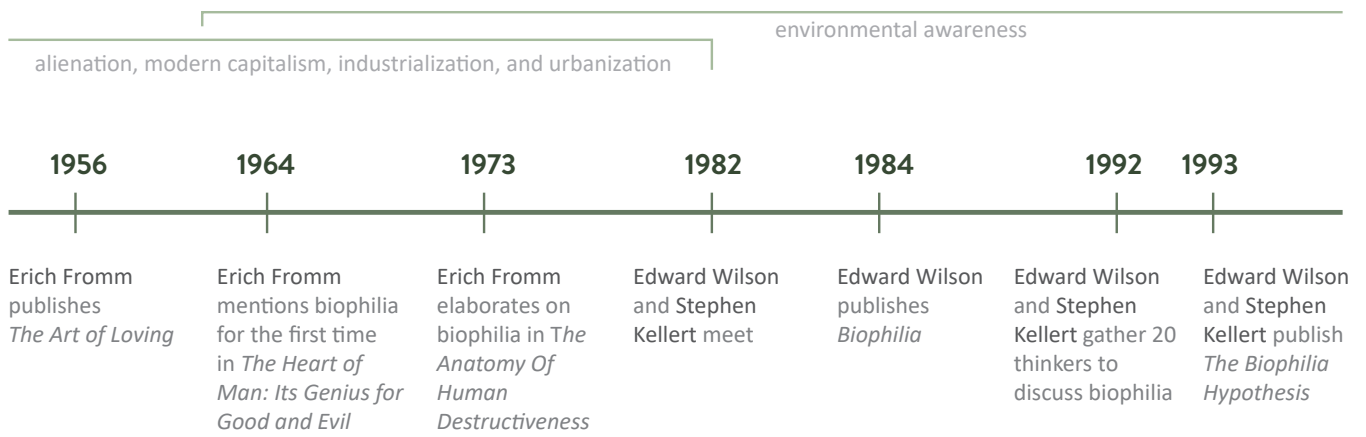


Figure 2: Timeline biophilia development



**Jared Diamond**  
Professor of physiology at the University of California Medical School



**Madhav Gadgil**  
Professor at the Indian Institute of Science and specializing in population biology, conservation biology, and human ecology



**Judith H. Heerwagen**  
Psychologist and assistant professor in psychosocial nursing at College of Architecture and Urban Planning at The University of Washington



**Aaron Katcher**  
On the faculty in the Schools of Medicine, Dentistry and Veterinary Medicine at University of Pennsylvania and researches contact with nature on human behavior and health



**Stephen Kellert**  
Professor at the Yale University School of Forestry and Environmental Studies



**Elizabeth Atwood Lawrence**  
Veterinarian, anthropologist, professor of environmental studies at the Tufts University School of Veterinary Medicine, and researches the human-animal relationship



**Lynn Margulis**  
Distinguished University Professor at the Department of Biology at the University of Massachusetts



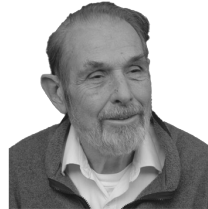
**Scott McVay**  
Director of the Geraldine R. Dodge Foundation



**Gary Paul Nabhan**  
Research director and cofounder of Native Seeds/SEARCH



**Richard Nelson**  
Professor of anthropology at the University of Alaska, and published four books on relationship to nature among Alaskan native people



**Gordon Orians**  
Professor of zoology and environmental studies at the University of Washington



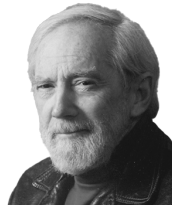
**David Orr**  
Professor and chair of environmental studies at the Oberlin College



**Holmes Rolston III**  
Distinguished professor of Philosophy at Colorado State University and president of the International Society for Environmental Ethics



**Dorion Sagan**  
Writer in the field of evolutionary biology and philosophy



**Paul Shepard**  
Author focused on the human evolution and ecology and professor of Natural Philosophy at Pitzer College and Claremont Graduate School



**Michael Soulé**  
Professor and chair of environmental studies at the University of California



**Sara St. Antoine**  
Master's degree from Yale University School of Forestry and Environmental Studies and author



**Roger Ulrich**  
Researcher on influences of human experiences with natural and built environments of psychological well-being and professor of (landscape) architecture and urban planning at Texas A&M University



**Gregory Wilkins**  
Director of clinical training and research at the Brandywine Treatment Center



**Edward O. Wilson**  
Professor of Science and curator of entomology at Harvard University and twice winner of the Pulitzer Prize and other scientific awards

Figure 3: Twenty contributors and their profession (in 1993) of *The Biophilia Hypothesis*, highlighting the diversity of disciplines and focus areas- based on Kellert & Wilson, 1993, p.458-463

# Chapter 2

# 04 The Transition to a Design Concept (1990's-2001)

## A Shift in Focus

In the 1990s, the focus on biophilia began to shift from its original psychological and biological theory, which focused on life or living organisms, towards the examination of the connection between humans and the natural world (Zhong et al., 2022). In the 70s, 80s, and 90s, various studies and theories were published in different domains with a focus on the human-nature connection (figure 6), but without using the term biophilia yet. *The Biophilia Hypothesis* played a crucial role in this focus shift as it provided an overview of various theories and scientific research, including those based upon previously published works from the past years. Kellert emphasized that biophilia is a broad concept that does not stand alone but is built on decades of research and theories of the various aspects of the human relationship with nature. "The human need for nature is linked not just to the material exploitation of the environment but also to the influence of the natural world on our emotional, cognitive, aesthetics, and even spiritual development." (Kellert, 1993, p.42). Also with *The Biophilia Hypothesis* the term had not yet been fully defined, as Kellert argued, "This book represents the start rather than the conclusion of a journey of exploration" (Kellert, 1993, p.22).

## Towards the Built Environment

The scientific theories related to the nature-human connection were also applied to the built environment. Research showed that buildings with the essential components of the preferred natural environment positively affect people's well-being and performance. The research and publications of Roger Ulrich in the 1980s and 1990s in the health and hospital context were of significant influence. Ulrich, a researcher and architecture professor at Texas A&M University, published the study *View through a Window May Influence Recovery from Surgery* in 1984. This study had a significant influence on the design of hospitals with the confirmation that stress-reducing interventions, such as a view of nature, affected clinical outcomes. This contributed to the Healing Environments (HE) movement and the Evidence-Based Design (EBD) movement in the 1990s, which used research evidence to inform the built environment (Marberry, 2010).

Architects started thinking about the theories and collaborating with different disciplines to integrate the natural environment theories. Moreover, due to the environmental crises and climate change, there was a greater focus on sustainable architecture around the 90s (Kabinesh et al., 2024). Movements such as 'Green Buildings' and 'Sustainable Architecture' emerged in the 1990s with a strong emphasis on the connection between nature and environmental quality (Ryan & Browning, 2017). A precursor project, The Herman Miller Greenhouse (1995, Michigan, US), designed by William McDonough, one of the leaders in the Green Buildings field, was one of the first projects emphasizing the impact of the relationship between people and nature. Architects started working together with researchers such as Judith Heerwagen and William D. Browning (mentioned later in the text) with a link to the concept of biophilia. The project experimented especially on

the positive impact of productivity of the building occupants, using the term Phylogenetic Design\* (Heerwagen & Hase, 2001). Although the theories of biophilia were associated with design, the term biophilia itself had not yet been used.

Judith Heerwagen and Gordon Orians had already researched the effect of nature on people in the 1980s. Heerwagen was an environmental and behavioral psychologist and has worked at the College of Architecture and Urban Planning at The University of Washington since 1982. This shifted her focus to the natural impact on the built environment (Heerwagen, 2023). Orians was a professor of zoology and environmental studies, also at the University of Washington. In 1993, they wrote chapter 4; *Humans, Habitats, and Aesthetics*, together in the book *The Biophilia Hypothesis*, in which they were the first to link the term biophilia and the built environment: "Nor have we considered the potentially powerful applications of this approach (biophilia) to the built environment." (Heerwagen & Orians, 1993, p.167). They emphasized that the characteristics of the natural environment that influence human behavior were insufficiently understood or utilized by designers. However, in their chapter, they mentioned the book *The Wright Space: Patterns and Meaning in Frank Lloyd Wright's Houses* (1991), in which author Grant Hildebrand, professor at the College of Architecture and Urban Planning at the University of Washington, linked Wright's buildings to prospect-refuge theory. "Hildebrand concludes that the power and magic of Wright's houses are nothing more than an architectural expression of the lingering biological need in human beings for refuge and prospect." (Seamon, 1992, p.132). This prospect-refugee theory was coined in 1975 by geographer Jay Appleton, who stated that humans have an evolutionary preference for environments that provide observing points (prospect) and shelter (refugee) (Houghton-Moss, 2017). Wilson also already described this theory in his book *Biophilia* (1984) as a feature of biophilia. This makes it clear that Wright's buildings were seen as pioneering examples of architecture that used biophilic features already in the 1930s.

In 1997, Stephen Kellert published another book dedicated to biophilia called *Kinship to Mastery: Biophilia in Human Evolution And Development*, which was a follow-up to the previously published *Biophilia Hypothesis* in 1993. At that time, Kellert was a professor at Yale University School of Forestry and Environmental Studies and wanted to deepen the conversation about biophilia to make it more accessible to a broader public (Yale News, 1997). With this publication, he elaborated on the influence of the nature-human connection on people's mental and psychological development (Kellert, 1997). In the 1990s context, marked by environmental degradation and rising environmental awareness, Kellert advocated for biophilia as an essential part of human health and warned that the degradation of the environment could cause serious consequences (Kellert, 1997). Therefore, Kellert also pointed out the importance of the connection between biophilia and the built environment: "And we need to develop ways for linking the natural world with the human-built environment" (Kellert, 1997, p.193).

Between 1996 and 1998 Judith Heerwagen published multiple articles with a focus on Green Buildings and the built environment: *A Tale of Two Buildings: Biophilia and the Benefits of Green Design* (1996), *The Human and Organizational Impacts of Green Buildings* (1997) and *Design, Productivity and Well-being: What are the Links?* (1998). Heerwagen had already conducted research into the impact of nature in office/built environments in the 1980s, "Heerwagen was responsible for a lot of early biophilia research." (Browning, 2013, as cited in Söderlund, 2019, p. 58). She was also present at the gathering on biophilia in 1992 and contributed a chapter in *The Biophilia Hypothesis*. Her articles described that incorporating biophilic features in the built environment (Green Buildings) could positively influence building users. She advocated for a shift in design

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\* Phylogenetic Design focuses on the evolved relationships between people and nature (Heerwagen & Hase, 2001)



Figure 4: The Herman Miller Greenhouse  
1995, Michigan, US  
By William McDonough

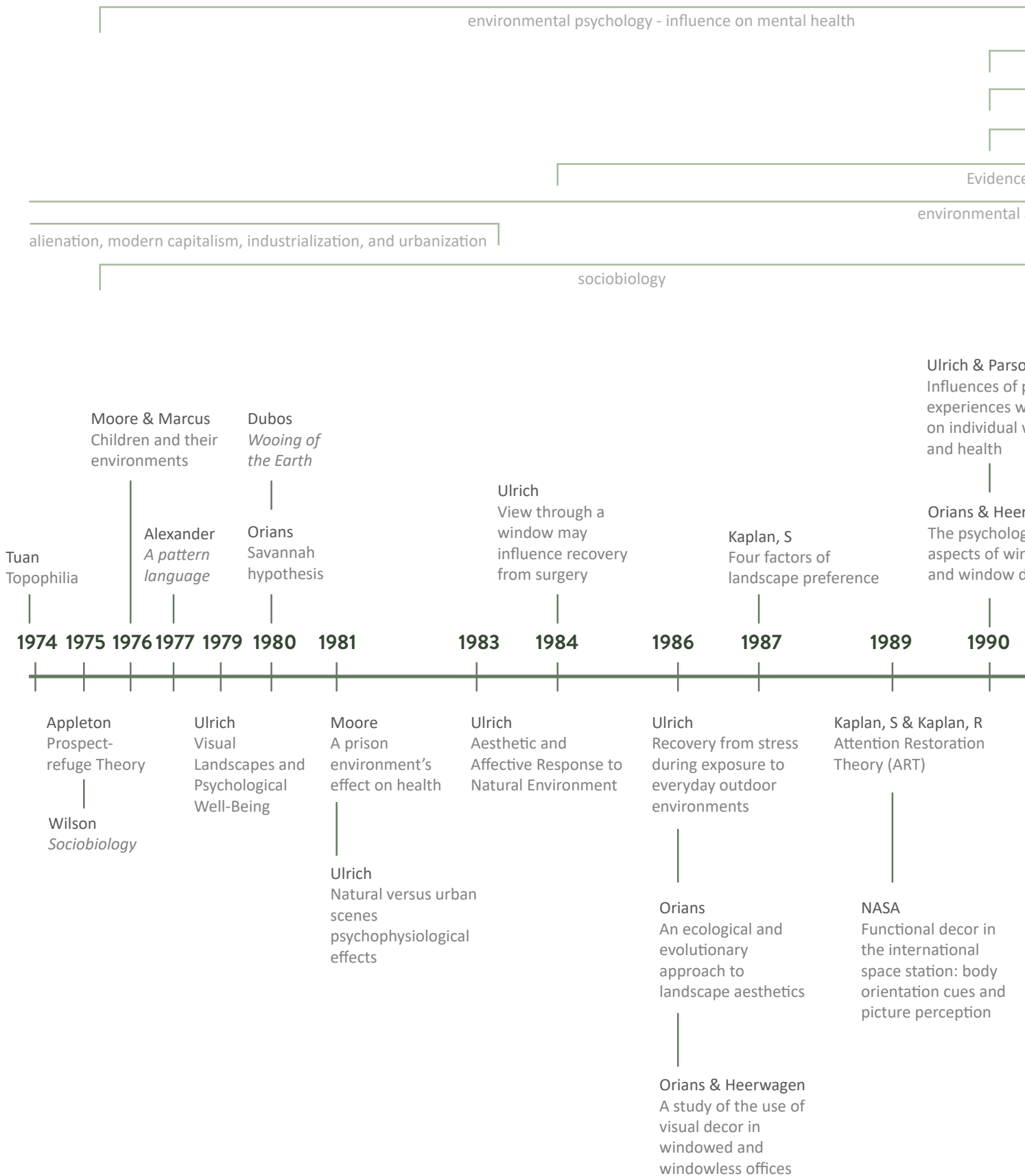
approach: “We need to shift our focus from thinking of buildings as real estate costs to thinking of buildings as an employee benefit – one that contributes significantly to health, performance, well-being, organizational attachment”. (Heerwagen, 1998, p.19). Although she did not specifically use the combination of biophilia and design in her articles, Heerwagen described the characteristics of what would later be called Biophilic Design and its importance.

In 1999, the next book was published, which brought the connection between nature and the built environment forward. In *Origins of Architectural Pleasure*, Grant Hildebrand described why buildings are attractive to people from an evolutionary and psychological point of view and build on the biological and cognitive sciences. The book was seen as the theory and practice of a new architecture (Frasca, 1999, as cited in Hildebrand, 1999).

With the aforementioned publications, it becomes clear that the interest in integrating the nature-human connection into the built environment grew from the 1990s onwards. Although there was no specific combination of the use of the term biophilia and architecture, other terms and projects reflected the theories, such as: Phylogenetic Design, Green Buildings, and Sustainable Architecture. That changed in 2001, when Judith Heerwagen and Betty Hase published *Building Biophilia: Connecting People to Nature in Building Design*. Hase was a former (workplace) interior designer at Knowledge Resource Group at Herman Miller Inc., an interior furnishing company based on the nature-human connection that coined the term Phylogenetic Design. With this article, Hase and Heerwagen were the first to describe the characteristics that a biophilic building should have. Moreover, they were the first to specifically use the term biophilia in combination with architecture: ‘building biophilia’. To conclude, the merging of the terms *biophilia* and *architecture* was established.



Figure 5: Fallingwater  
1935, Pennsylvania, US  
By Frank Lloyd Wright



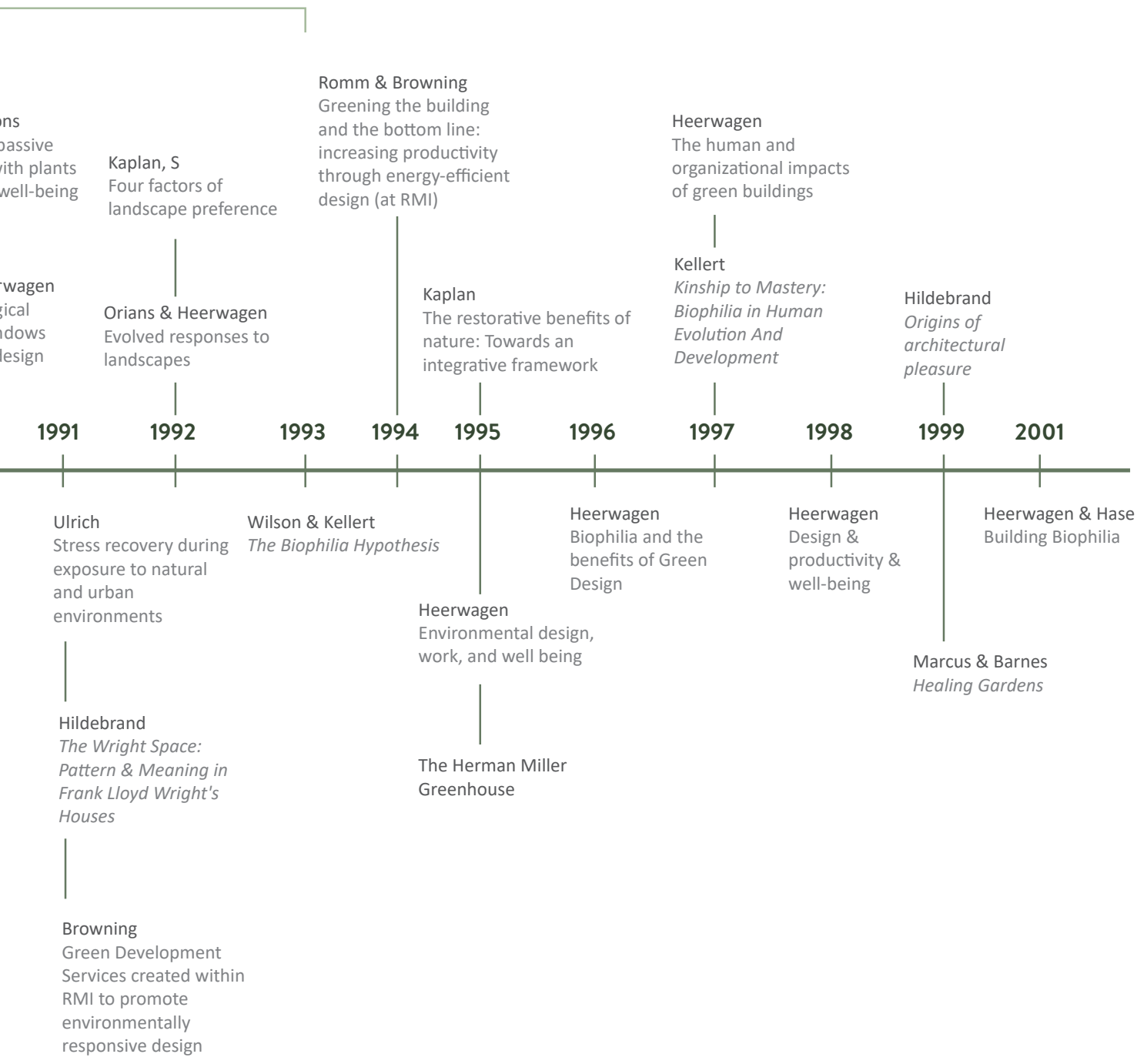
integrating nature-human connection into the built environment

rising environmental awareness

Green Buildings and Sustainable Architecture

Evidence-Based Design (EBD) and Healing Environments (HE) in the health and hospital context

awareness



published studies, it is not complete due to the quantity, but it illustrates the most important ones for this thesis

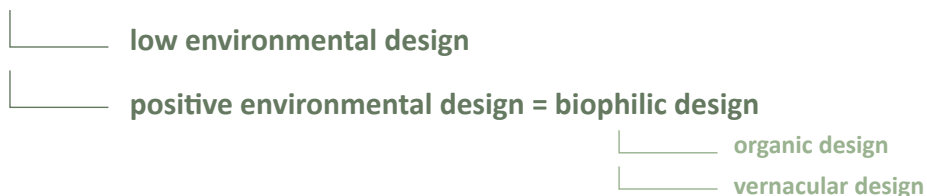
# Chapter 3

# 05 The Formal Birth of the Term Biophilic Design (2001-2008)

## From Sustainable Green Architecture to Restorative Environmental Design

With the merging of the terms ‘biophilic’ and ‘buildings’ by Heerwagen and Hase in 2001, the early rough establishment of the concept of Biophilic Design was made. In 2004, Kellert published an article called *Beyond LEED: From Low Environmental Impact to Restorative Environmental Design*, in which he argued that ‘Green Buildings’ and ‘Sustainable Design’ approaches were too narrow because they did not address the human biological and ecological need for contact with nature and were therefore unsustainable. “I would argue instead for the reformation of not only our conventional development paradigm but also prevailing approaches to sustainable design” (Kellert, 2004, p.6). His new design approach, ‘Restorative Environmental Design’ (RED), advocated for the harmonious relationship between humans and the natural world. It consisted of two parts: avoiding negative environmental impacts on natural systems (low environmental impact) and restoring the positive relationship between humans and nature (positive environmental impact) (Kellert, 2004). Kellert equated positive environmental impact with biophilic design and was the first to use the term Biophilic Design. “Positive (environmental) impact or what I prefer to call biophilic design reflect building and landscape constructions that enhance people’s physical and mental well-being through positive connections to the natural environment in places of ecological and cultural meaning and familiarity” (Kellert, 2004, p.12). With this, the term Biophilic Design (BD) was mentioned for the first time and was seen as the missing link in achieving true sustainable design (Patel et al., 2022). With his sustainable approach, Kellert added an extra dimension to the sustainability discourse in which energy-efficient technologies and renewable materials were formerly the main focus points. The introduction of BD into the field of sustainability and ecologically confirms the interdisciplinarity of the biophilia concept and indicates that the term extends beyond just the innate tendency to connect with nature, changing the biophilia discourse.

### Restorative Environmental Design



In 2005, Kellert published *Building for Life: Designing and Understanding the Human-Nature Connection*, in which he explained and elaborated his theories of RED in more detail. In this book, he compiled the thinkers and scientific studies that demonstrated the positive effects of the human-nature connection, which supported his RED theories (figure 6). By focusing on Biophilic Design in Chapter 5, he introduced the term to a broader audience. He explained that the current architecture hindered the connection between humans and nature, which, according to him, could lead to mediocre architecture and lower well-being. With this, Kellert advocated for a shift in architectural approach from sustainable and energy-efficient design to Biophilic Design (Millar, 2006).

**“What is more sustainable, a technologically sophisticated low environmental impact building isolated from the natural world and likely abandoned once its high technology systems are no longer novel or cutting-edge, or constructions people revere and recycle generation after generation because they affirm our enduring affinity for connection with the natural environment?”** (Kellert, 2004, p.11-12)

## A Different Birth

Although Kellert first mentioned the term in 2004 and 2005, this is not well described in the literature as the formal emergence of the term BD. For instance, in her detailed book (239 pages) *The Emergence of Biophilic Design* (2019), biophilia researcher and author Jana Söderlund does not reference both of Kellert’s publications from 2004 and 2005. Instead, she identifies events in 2006 and 2008 as the formal birth of the term.

William D. Browning, the founder of Green Development Services at the Rocky Mountain Institute\* (RMI), was mainly interested in the positive impact of nature on humans through the built environment. At the RMI, he developed a database of research on biophilia, with which Kellert came in contact. This resulted in conversations between Browning and Kellert about studies on biophilia and design and led to the organization of a symposium in May 2006 by Kellert, Browning, and Heerwagen called *Bringing Buildings to Life: The Theory, Science and Practice of Biophilic Building Design* at the Rhode Island Conference Center in the United States (Browning, 2013; Millar, 2006). A diverse group of forty experts from different fields came together for three days to discuss the connection between biophilia and design. “Kellert’s reputation as a leader in the field was a huge benefit in attracting this group and keeping them there for three days” (Heerwagen, 2006, as cited in Millar, 2006). The group comprised academics, industry representatives, real estate investors, sociologists, doctors, mathematicians, artists, interior designers, local government, and journalists. (Millar, 2006; Söderlund, 2019) The three-day symposium aimed to discuss how nature could re-enter the built environment. Previously, various professions used different terms, but not BD. However, during the symposium, the term was used as a universal term (Beatley, 2013).

**“The idea of biophilic design arises from the increasing recognition that the human mind and body evolved in a sensorially rich world, one that continues to be critical to people’s health, productivity, emotional, intellectual, and even spiritual well-being.”** (Kellert et al., 2008, p. vii)

The outcome of this symposium was published in 2008 in the form of the book *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*, written by Stephen Kellert, Martin Mador, and Judith Heerwagen. Mador worked in the field of Green Buildings and did Biophilic Design research with Kellert at Yale University (Kellert et al., 2008). The book was a compilation of essays and research from 34 different experts (figure 7) in the field of BD who had also contributed to the discussions at the 2006 symposium (Kellert et al., 2008). It described the theory behind BD, the scientific evidence for its benefits, and its practices. “The book presented the birth of biophilic design...” (Söderlund, 2019, p.6). With this, Söderlund framed the 2008 book as the formal birth of BD. Although the book presents the term and its framework clearly and in detail for the general public, the term already emerged in 2004 and 2005 by Kellert.

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\* Rocky Mountain Institute (RMI) is a research and educational foundation of which Green Development Services is a part, that focuses on environmentally responsive development and promotes sustainable development in the built environment (Room & Browning, 1994)



**Bob Berkebile**



**Stephen Kieran**



**Frances Kuo**



**Bob Pyle, Stephen Kellert, and Edward O. Wilson**



**Gordon Orians, Richard Forman, and Vivian Loftness**



**Richard Louv**

Figure 6: Contributors at the symposium: Bringing Buildings to Life at the Whispering Pines Conference Center at Rhode Island



**Timothy Beatley**  
 Professor of Sustainable Communities, in the Department of Urban and Environmental Planning, School of Architecture at the University of Virginia



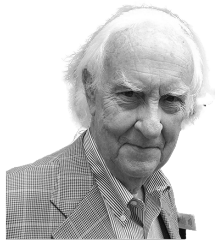
**Tom Bender**  
 One of the founders of the Green Architecture and Sustainability movements



**Janine Benyus**  
 Biologist, innovation consultant, author, and owner of The Biomimicry Guild



**Bob Berkebile**  
 Environmentalists, preservationists, and principal of BNIM Architects of Kansas City



**Kent Bloomer**  
 Sculptor, architectural designer, and adjunct professor of Architecture at Yale University



**Tina Bringslimark**  
 Ph.D at the Department of Plant and Environmental Sciences at the Norwegian University of Life Sciences



**Hillary Brown**  
 Principal of New Civic Works and teaches sustainable design at Princeton and Columbia University Schools of Architecture



**William D. Browning**  
 Partner in Terrapin Bright Green LLC and founder Rocky Mountain Institute's Green Development Services



**Clare Cooper Marcus**  
 Professor Emerita in the departments of Architecture and Landscape Architecture, University of California



**Pliny Fisk**  
 Codirector at Center for Maximum Potential Building Systems and Fellow in Sustainable Urbanism and Fellow in Health Systems Design at Texas A&M University



**Robert Fox**  
 Founder of Cook+Fox Architects and Fox & Fowle Architects



**Howard Frumkin**  
 Internist, environmental and occupational medicine specialist, and epidemiologist



**Bert Gregory**  
 President and CEO of Mithun and a A USGBC LEED® accredited designer



**Terry Hartig**  
 Associate Professor of Applied Psychology with the Institute for Housing and Urban Research and the Department of Psychology of Uppsala University in Sweden



**Alice Hartley**  
 Works at Cook+Fox Architects and coordinates green materials research, educational resources, and internal sustainability initiatives



**Judith Heerwagen**  
 psychologist whose research and writing have focused on sustainability, biophilia, and the evolutionary basis of environmental aesthetics



**Grant Hildebrand**  
 Architect, author, and teacher at College of Architecture and Urban Planning at University of Washington



**Stephen Kellert**  
Tweedy Ordway Professor of Social Ecology at the Yale University School of Forestry and Environmental Studies



**Stephen Kieran**  
Partner at KieranTimberlake Associates LLP and adjunct professor at the University of Pennsylvania's School of Design



**Vivian Loftness**  
Researcher, author, and educator with a focus on environmental design, sustainability, advanced building systems, climate, and regionalism in architecture



**Richard Louv**  
Author of seven books and chairs the Children & Nature Network



**Martin Mador**  
Worked on green building issues in Connecticut and researches biophilic design at Yale with Stephen Kellert



**Kenneth G. Masden II**  
Associate Professor of Architecture at the University of Texas at San Antonio



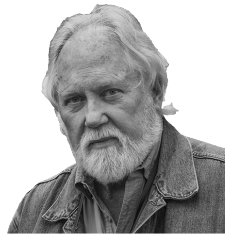
**Robin Moore**  
Professor of Landscape Architecture, adjunct professor of Family and Consumer Sciences, and director of the Natural Learning Initiative, North Carolina State University



**David Orr**  
Professor of Environmental Studies and Politics and chair of the Environmental Studies Program at Oberlin College



**Grete Grindal Patil**  
Associate professor at the Department of Plant and Environmental Sciences, Norwegian University of Life Sciences



**Robert Pyle**  
Butterfly conservation consultant, professor, and writer



**Jonathan Rose**  
Leading thinker in the Smart Growth and green building movements



**Nikos Salingaros**  
Author and professor of mathematics at the University of Texas at San Antonio and architecture professor in Holland, Italy, and Mexico



**Jenifer Seal Cramer**  
Author, architect, and researcher in high-performance buildings and developments



**Megan Snyder**  
Doctoral student at the Center for Building Performance and Diagnostics in the Department of Architecture at Carnegie Mellon University



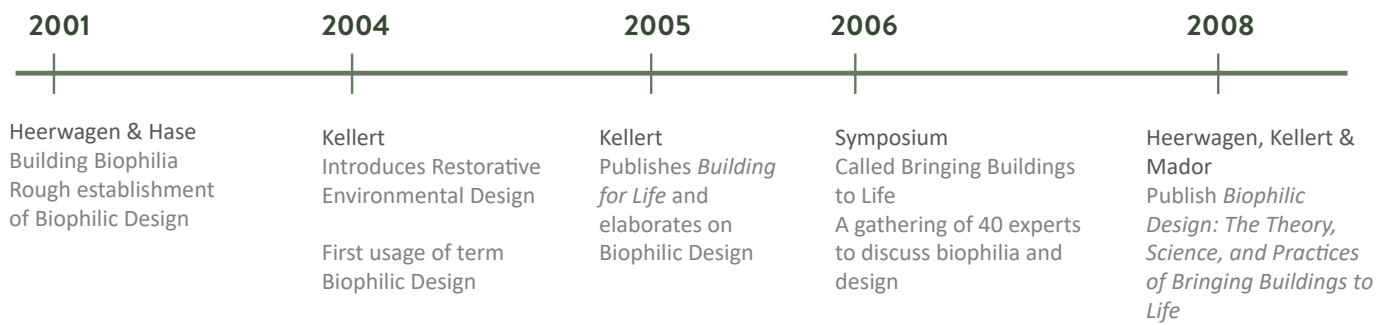
**Roger Ulrich**  
Professor of Health Facilities Design at Texas A&M University and a faculty fellow of the Center for Health Systems and Design, and behavioral scientist



**Alex Wilson**  
President of BuildingGreen in Vermont, editor, and author



**Edward O. Wilson**  
University Research Professor Emeritus and Honorary Curator in Entomology of the Museum of Comparative Zoology at Harvard



**Discussion**  
**Conclusion**

# 06 Discussion

The emergence of the term Biophilic Design had a broad and long rise from 1964 to 2008. Erich Fromm was the first thinker who introduced the term biophilia in 1964. He described it from a psychological perspective as “love with everything that is alive” (Fromm, 1964, p.47). In 1984, Edward Wilson expanded the term from an evolutionary/biological approach, describing it as “the innate tendency to focus on life and lifelike processes” (Wilson, 1984, p.1). The publications and theories of biophilia gave rise to discussions and scientific studies in various disciplines. This research laid the groundwork for a broader understanding of biophilia in *The Biophilia Hypothesis* (1993). The book became an interdisciplinary study that presented factual and theoretical evidence for the hypothesis that human affinity with nature is deeply rooted in evolutionary human history.

The theories were applied to the built environment from the 90s onwards, with different actors advocating for linking the natural world with the built environment because of its positive effects on humans and nature, but without using the term BD yet. Heerwagen and Hase were the first to specifically link biophilia and architecture in 2001. However, it was Stephen Kellert who established the merging between biophilia and design in 2004 by introducing the term ‘Biophilic Design’. In his publications, he advocated for a truly sustainable design through Restorative Environmental Design (RED), of which Biophilic Design was a complementary part. In his follow-up book in 2005, he elaborated further on BD by dedicating a chapter to it. However, biophilia researcher and author Jana Söderlund, who researched the emergence of Biophilic Design, did not refer to Kellert’s publications from 2004 and 2005. Instead, she identified the events in 2006 and 2008 as the formal birth of the term.

In 2006, a three-day symposium was organized where BD was used as a universal term and aimed to discuss the reintegration of nature in buildings with people from various disciplines. The outcome was the book *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life* (2008), which described the theory behind BD, the scientific evidence for its benefits, and its applications. This publication introduced the term BD and its framework as a standalone concept instead of a complementary part of RED and popularized the term among a greater public.

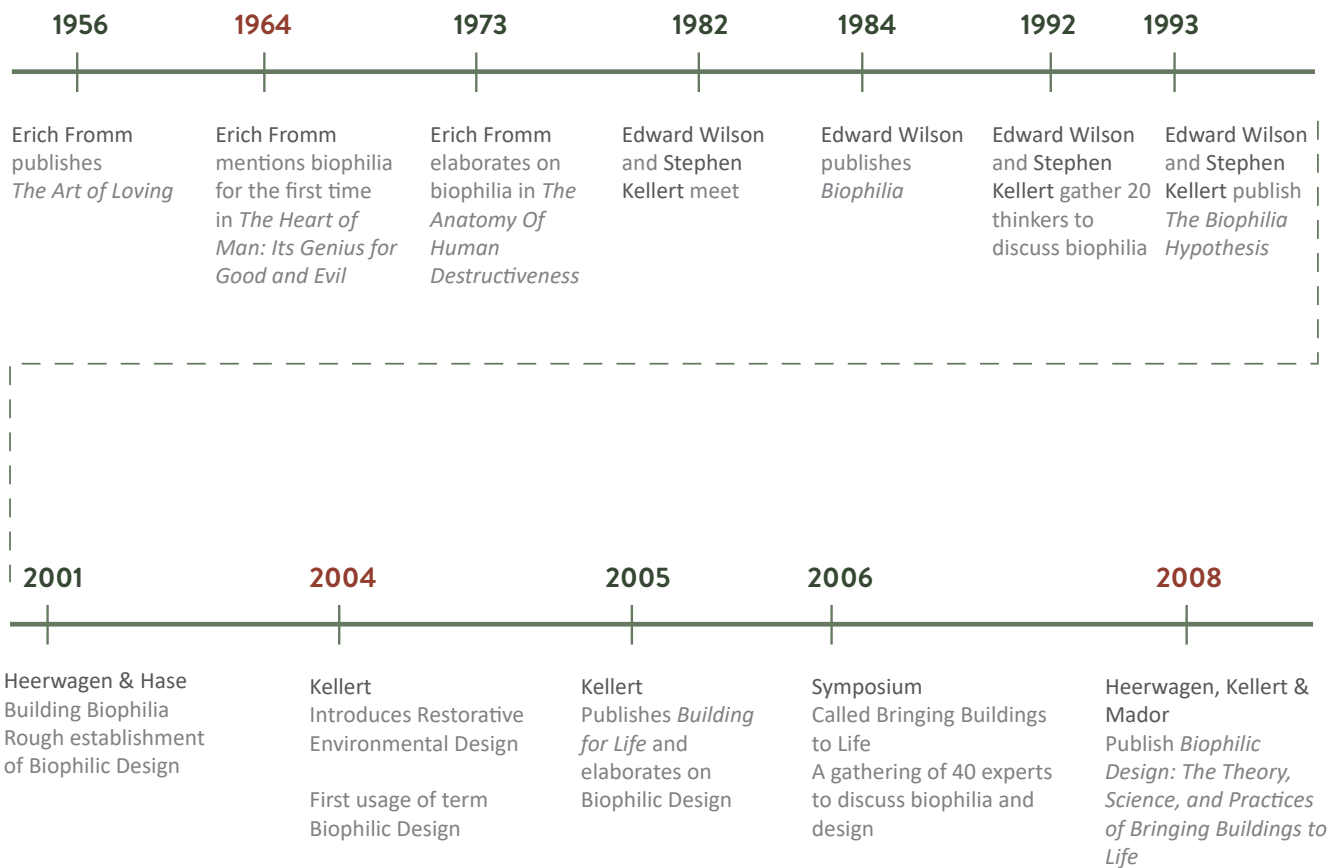


Figure 9: Timeline of the formulation of the terms biophilia and Biophilic Design

# 07 Conclusion

The emergence of Biophilic Design (BD) has seen an interdisciplinary development throughout history. It started with the concept of biophilia, which was initially approached from a psychological perspective but was later examined from a biological framework. Over the years, the concept has been enriched by theories and research from various disciplines and experts, primarily in the United States, which ultimately led to BD.

The development of BD is characterized by four significant moments of interdisciplinary collaboration. Firstly, in 1992, a gathering was organized by Stephen Kellert and Edward Wilson, who brought together twenty experts from different disciplines to discuss the concept of biophilia. This changed the former narrow perspectives into a broader, more holistic interpretation. Secondly, this gathering resulted in the publication of the book *The Biophilia Hypothesis* in 1993 by Kellert and Wilson, in which the gathering participants each wrote a chapter, alone or together with another expert. This marked how crucial collaboration was for broadening the perspectives. Thirdly, in 2006, a three-day symposium was organized by Kellert, Browning, and Heerwagen, who brought together forty experts from different disciplines to discuss the connection between biophilia and design. Lastly, this gathering resulted in the book *Biophilic Design* in 2008 by Kellert, Heerwagen, and Mador, to which 34 authors, who also participated in the symposium, contributed. Each expert wrote a chapter in this book, either individually or together.

Several key figures played a consistent role in these collaborations and, therefore, in the total development of BD, including Judith Heerwagen, Roger Ulrich, David Orr, Edward Wilson, and Stephen Kellert (figure 10). These experts were present at all four collaboration moments and did influential research, most notably Stephen Kellert. He played a leading role throughout the total emergence and was the initiator and driving force, as Heerwagen stated: "Kellert's reputation as a leader in the field..." (Heerwagen, 2006, as cited in Millar, 2006, p.7). Furthermore, he was the first to mention the term Biophilic Design as a result of years of development and merging of studies and theories. Heerwagen herself was also of great influence in the development as Browning stated: "Heerwagen was responsible for a lot of early biophilia research." (Browning, 2013, as cited in Söderlund, 2019, p. 58).

The emergence of BD, in its historical and interdisciplinary context, shows that experts from different disciplines collaborated to develop a deeper understanding of the concept by writing articles and books, researching, and discussing at gatherings (figure 11,12,13). The different disciplines needed each other, as Heerwagen stated: "Biologists don't understand building design and designers don't have the biological background." (Heerwagen, 2013 as cited in Söderlund, 2019, p. 53 ). Moreover, one discipline enriched the other. This shows the breadth of the concept and demonstrates that it cannot be attributed to the single architectural discipline. This process shows that the traditional boundaries between disciplines are becoming more irrelevant. Architecture can no longer be seen as a standalone discipline, which is separated from ecology, psychology, sociology, or other disciplines. It makes me wonder where the architectural discipline begins and ends. Or is this question equally relevant in a world where the integration of nature and the built environment, and thus an interdisciplinary approach, is becoming increasingly crucial?

The historical context of the development of BD also makes it clear that societal dynamics and theoretical discourses have played a decisive role in the formation of the term. By researching this framework, the underlying meaning becomes visible, which is important to counter the current ease and misuse of the term. Researching theories in their historical context is essential for understanding the broader discourse and, therefore, the true meaning of ideas and theories.

The emergence of Biophilic Design is not just about architecture but about the importance of understanding historical contextualization and fostering the interconnectedness between disciplines.

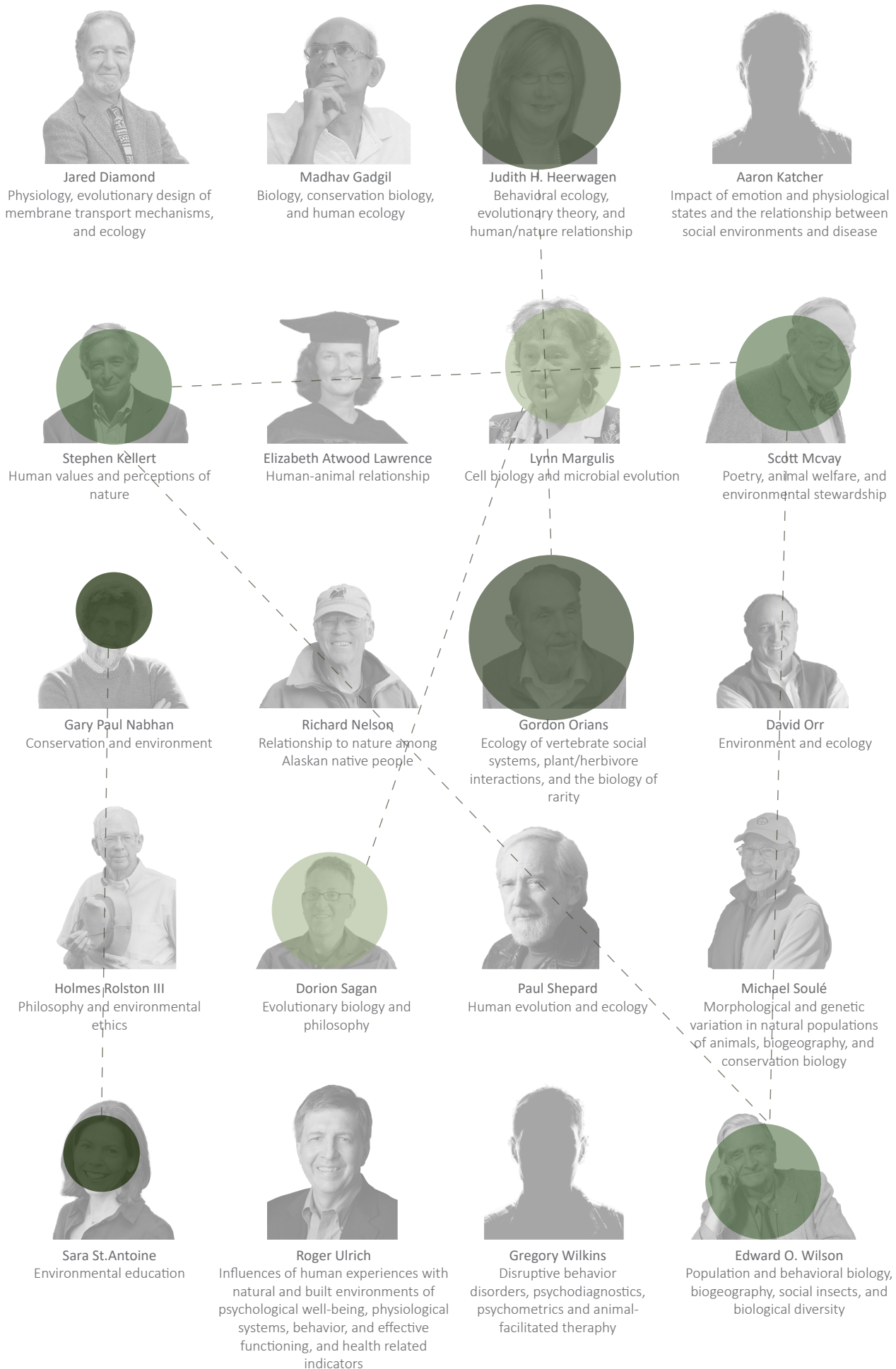
**1** **1992** **Gathering with 20 thinkers from various disciplines about biophilia**  
Jared Diamond, Madhav Gadgil, **Judith Heerwagen**, Aaron Katcher, **Stephen Kellert**, Elizabeth Atwood, Lawrence, Lynn Margulis, Scott McVay, Gary Paul Nabhan, Rich Holmes Rolston III, Richard Nelson, Gordon Orians, **David Orr**, Dorion Sagan, Paul Shepard, Michael Soulé, Sara St. Antoine, **Roger Ulrich**, Gregory Wilkins, and **Edward O. Wilson**

**2** **1993** ***The Biophilia Hypothesis* - a compilation of theories by the 20 thinkers**  
Jared Diamond, Madhav Gadgil, **Judith Heerwagen**, Aaron Katcher, **Stephen Kellert**, Elizabeth Atwood, Lawrence, Lynn Margulis, Scott McVay, Gary Paul Nabhan, Rich Holmes Rolston III, Richard Nelson, Gordon Orians, **David Orr**, Dorion Sagan, Paul Shepard, Michael Soulé, Sara St. Antoine, **Roger Ulrich**, Gregory Wilkins, and **Edward O. Wilson**

**3** **2006** **Three-day symposium with 40 experts from different disciplines to discuss the connection between biophilia and design**  
Timothy Beatley, Tom Bender, Janine Benyus, Bob Berkebile, Kent Bloomer, Tina Bringslimark, Hillary Brown, **William D. Browning**, Clare Cooper Marcus, Pliny Fisk, Robert Fox, Howard Frumkin, Bert Gregory, Terry Hartig, Alice Hartley, **Judith Heerwagen**, Grant Hildebrand, **Stephen Kellert**, Stephen Kieran, Vivian Loftness, Richard Louv, Martin Mador, Kenneth G. Masden II, Robin Moore, **David Orr**, Grete Grindal Patil, Robert Pyle, Jonathan Rose, Nikos Salingaros, Jenifer Seal Cramer, Megan Snyder, **Roger Ulrich**, Alex Wilson, **Edward O. Wilson**, Frances Kuo, and five others

**4** **2008** ***Biophilic Design: The Theory, Science, and Practices of Bringing Buildings to Life* - a compilation of chapters by 34 experts**  
Timothy Beatley, Tom Bender, Janine Benyus, Bob Berkebile, Kent Bloomer, Tina Bringslimark, Hillary Brown, William D. Browning, Clare Cooper Marcus, Pliny Fisk, Robert Fox, Howard Frumkin, Bert Gregory, Terry Hartig, Alice Hartley, **Judith Heerwagen**, Grant Hildebrand, **Stephen Kellert**, Stephen Kieran, Vivian Loftness, Richard Louv, **Martin Mador**, Kenneth G. Masden II, Robin Moore, **David Orr**, Grete Grindal Patil, Robert Pyle, Jonathan Rose, Nikos Salingaros, Jenifer Seal Cramer, Megan Snyder, **Roger Ulrich**, Alex Wilson, and **Edward O. Wilson**

Figure 10: Overview of the four influential collaborations,



36 Figure 11: Collaboration-map of twenty contributors of *The Biophilia Hypothesis* (1993) with their disciplinary focus until 1993, highlighting the diversity of disciplines and focus areas - based on Kellert & Wilson, 1993, p.458-463



### **Lynn Margulis and Dorion Sagan**

- Micro-Cosmos: Four Billion Years of Microbial Evolution (1989)
- Biospheres from Earth to Space (1989)
- Origins of Sex: Three Billion Years of Genetic Recombination (1990)
- Mystery Dance: On the Evolution of Human Sexuality (1992)
- God, Gaia, and Biophilia (1993)



### **Gary Paul Nabhan and Sara St.Antoine**

- The Loss of Floral and Faunal Story: The Extinction of Experience (1993)



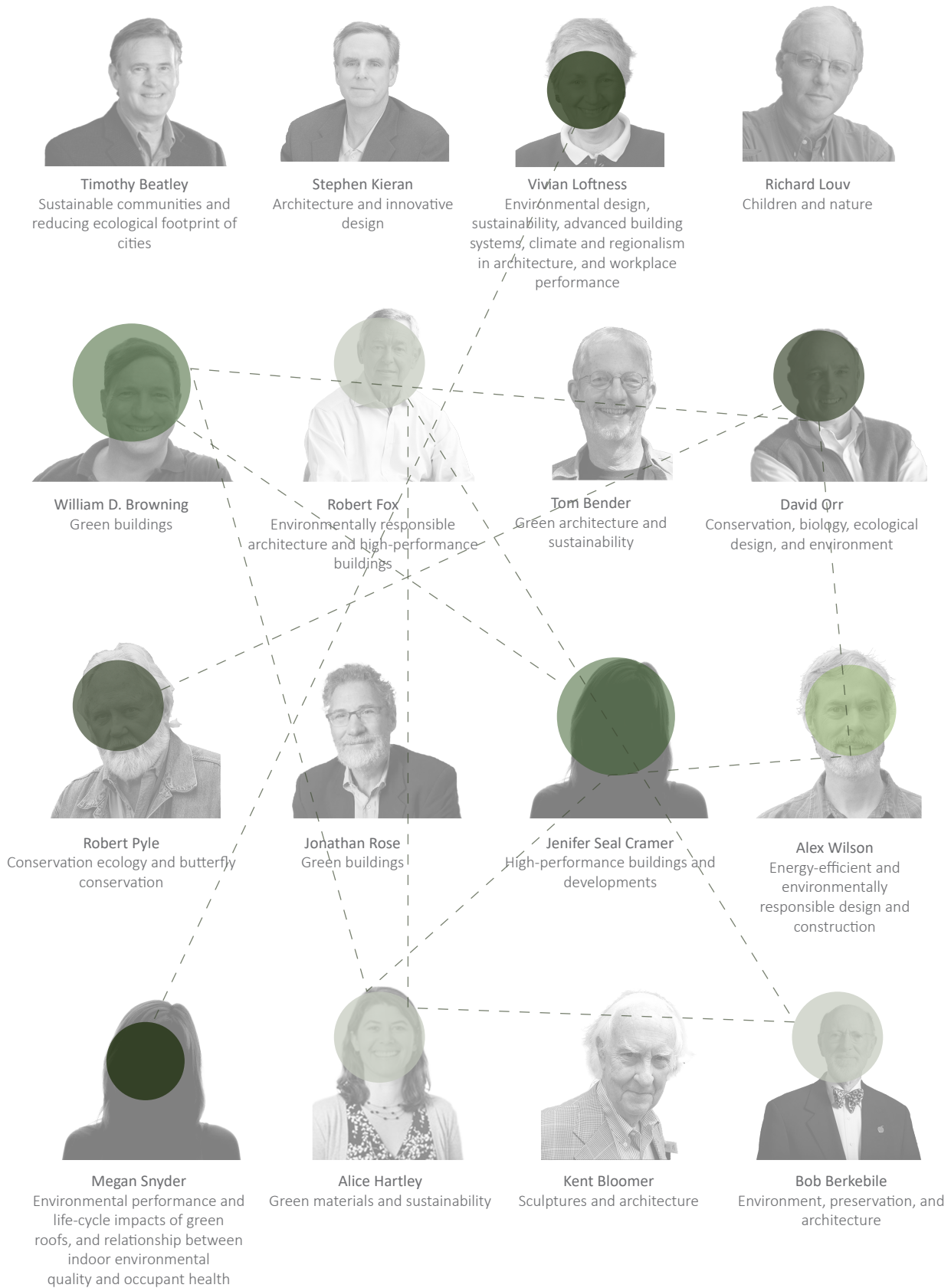
### **Stephen Kellert, Edward Wilson, and Scott McVay**

- Kellert and Wilson met in 1982
- Organized the gathering about Biophilia (1992)
- Wrote together *The Biophilia Hypothesis* (1993), in which Kellert and Wilson were main authors and Mcvay wrote the prelude



### **Judith Heerwagen and Gordon Orians**

- Adaptations to windowlessness: A study of the use of visual decor in windowed and windowless offices (1986)
- The psychological aspects of windows and window design (1990)
- Evolved responses to landscapes (1992)
- The adapted mind: Evolutionary psychology and the generation of culture (1992)
- Humans, Habitats, and Aesthetics (1993)



38 Figure 12: Collaboration-map of contributors of *Biophilic Design* (2008) with their disciplinary focus until 2008, highlighting the diversity of disciplines and focus areas- based on Kellert et al., 2008, p. 357-364



### **Vivian Loftness and Megan Snyder**

- Greening the Operation and Maintenance of the Children's Hospital of Pittsburgh: Benchmarks and opportunities for innovation of material and utility flows (2005)
- Sustainability and Health are Integral Goals for the Built Environment (2006)
- Where Windows Become Doors (2008)



### **Jenifer Seal Cramer and William Dee Browning**

- Transforming Building Practices Through Biophilic Design (2008)



### **David Orr and Robert Michael Pyle**

- The Extinction of Natural Experience in the Built Environment (2008)



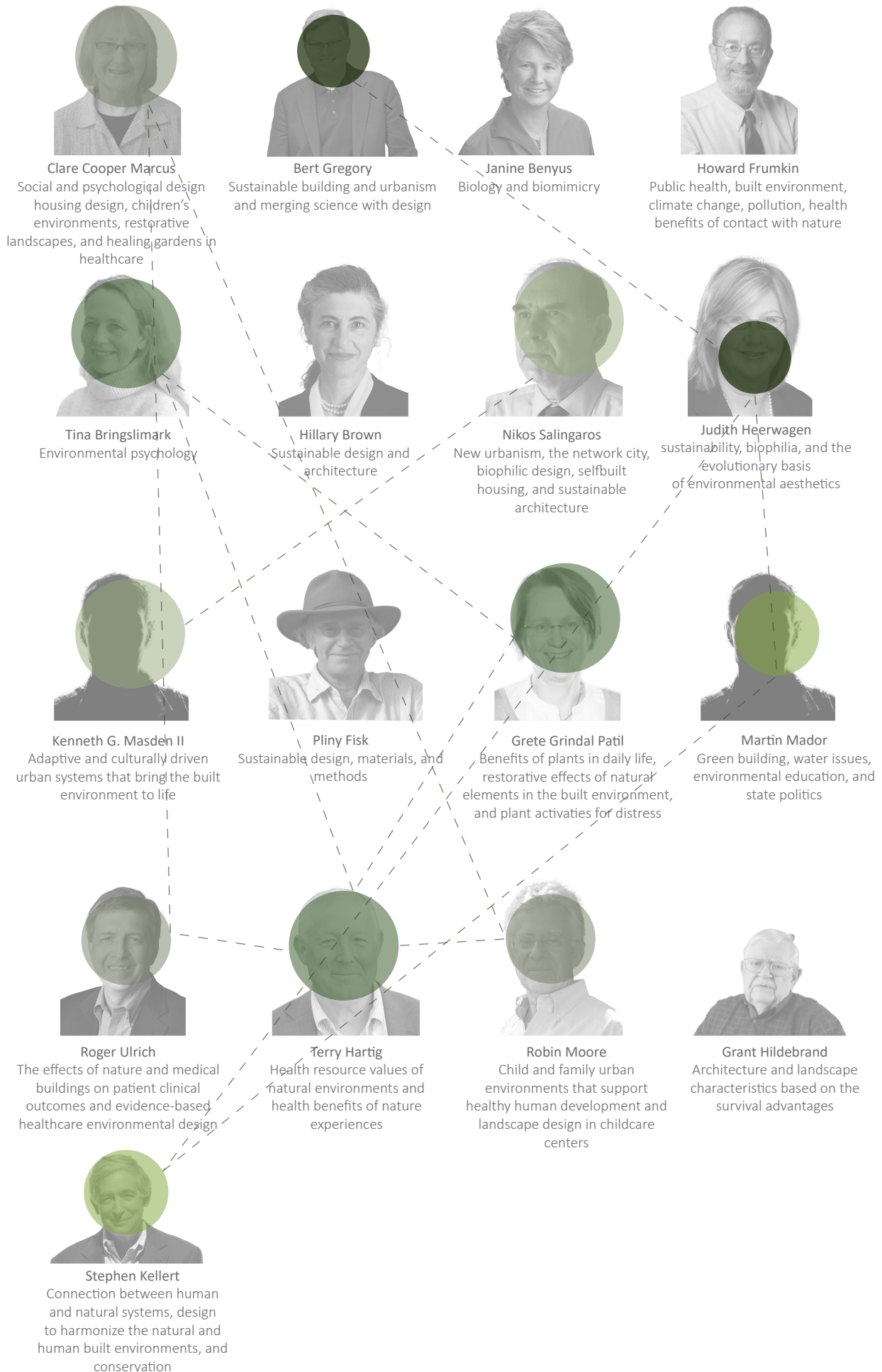
### **Bob Berkebile, Bob Fox, and Alice Hartley**

- Reflections on Implementing Biophilic Design (2008)



### **Alex Wilson, William Dee Browning, Alice Hartley, David Orr, and Jenifer Seal Cramer**

- All connected to The Rocky Mountain Institute (RMI)
- Wilson was author of the RMI textbook: *Green Development: Integrating Ecology and Real Estate* (1998)
- Browning was founder of RMI's Green Development Services (1991)
- Hartley worked for the RMI
- Orr served on the Boards of RMI
- Cramer served as a principal in Research and Consulting group at RMI



40 Figure 12: Collaboration-map of contributors of *Biophilic Design* (2008) with their disciplinary focus until 2008, highlighting the diversity of disciplines and focus areas- based on Kellert et al., 2008, p. 357-364

**Nikos A. Salingaros and Kenneth G. Masden II**

- A Theory of Architecture written by Salingaros, with a foreword by Masden II (2006)
- Neuroscience, the Natural Environment, and Building Design (2008)

**Judith Heerwagen and Bert Gregory**

- Biophilia and Sensory Aesthetics (2008)

**Terry Hartig, Tina Bringslimark, and Grete Grindal Patil**

- Adaptation to Windowlessness: Do Office Workers Compensate for a Lack of Visual Access to the Outdoors? (2007)
- Psychological Benefits of Indoor Plants in Workplaces: Putting Experimental Results into Context (2007)
- Restorative Environmental Design: What, When, Where, and for Whom? (2008)
- The association between indoor plants, stress, productivity and sick leave (2008)

**Robin C. Moore and Clare Cooper Marcus**

- Children and Their Environments: a review of research 1955–1975 (1976)
- Healthy Planet, Healthy Children: Designing Nature into the Daily Spaces of Childhood (2008)

**Robin C. Moore, Clare Cooper Marcus, Roger Ulrich, and Terry Hartig**

- Healing gardens : therapeutic benefits and design recommendations (1999)

**Judith Heerwagen, Stephen Kellert, and Martin Mador**

- Biophilic design : the theory, science, and practice of bringing buildings to life (2008)

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