



## Working regeneratively across scales—insights from nature applied to the built environment



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### ABSTRACT

Regenerative design and development calls for a paradigm shift from a ‘mechanistic’ to the ‘ecological’ or living systems worldview that has emerged from living systems sciences over the last century. The challenge for design practitioners educated and now working in a field mainly shaped by a mechanistic worldview is two-fold: first, to develop an understanding of how life and living systems work and, second, to translate that understanding into application. The benefit of taking on this challenge is that understanding natural systems offers powerful insights into how to work across different scales of the built environment.

This article looks at key and interrelated living systems’ principles and discusses how they translate into design and development practices, using examples of how actual projects worked across multiple scales. Principles considered include the nested or holarchic nature of living systems and the fact that a living system is not separable from its environment. Mapping a design project as a socio-ecological system nested within its immediate and larger contexts shifts designers’ attention to the unique and distinctive character of the project environment and the reciprocal influence project and environment exercise on each other.

A second principle, that ecosystems’ self-organizing and self-regenerating capacity depends on its members carrying out their systemic roles, provides the basis for defining and designing a distinctive and generative role for a project within its place. This role enables the project to be both more valuable and valued as a source of greater viability and vitality and, drawing on the first principle, to have a positive influence across different scales of nested wholes.

The third principle relates to the webs of dynamic flows and metabolic exchanges that enable life to continuously produce, repair, and perpetuate itself. Using insights gained from the understanding of the essence of a place, design practitioners are able to identify transformative nodal points within those webs where targeted acupuncture interventions, sometimes small, can influence the health and renewal of the whole system.

In conclusion, the article first summarizes how working from an understanding of living systems principles provides insights into working regeneratively across and within different scales. Second, it addresses the need for the role of designers to shift and for new capabilities to be developed in order to incorporate those insights into new development and design practices. Third, it highlights some of the challenges design practitioners might face when implementing a living systems approach within the complexity of multi-disciplinary design projects.

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## 1. Introduction

The emerging “regenerative paradigm” constitutes a significant evolution of the field of sustainability, a radical shift in worldview from the mechanistic, which shaped the modern design industry and the “green building” movement (i.e., technological sustainability paradigm), to the ecological (Mang and Reed, 2012,

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Encyclopedia; Du Plessis, 2012; Cole, 2012a,b). At a time when unsustainable conditions seem to be increasing to dangerous levels, there is growing attraction to design and development practices that go beyond simply mitigating depletion and degradation of resources to having a positive impact on the health of ecosystems and the entire biosphere. However, design and planning professionals educated in a field mainly shaped by a mechanistic worldview are challenged on a number of levels as they seek to reconcile these two paradigms within their practices.

This article proposes that some if not most of these challenges result from attempting to adopt regenerative practices without understanding the fundamentally different, sometimes contradictory premises that underlie the mechanistic and ecological worldviews and the divergent definitions of sustainability that are embedded in their different sustainability paradigms. Here we explore one of these challenges—the question of how to work regeneratively across scales—and how understanding the working of living systems provides insight for addressing this issue.

Following this introduction, Section 2 provides an overview of the two worldviews and sustainability paradigms and their implications for sustainable design and development. It shows how living systems and the ways they work (as differentiated from mechanical systems) are the basis of the regenerative sustainability paradigm. Section 3 illustrates how principles drawn from ecology and living systems theory can be translated into guidelines and practices to address the challenge of designing for regenerative effects across scales. Section 4 presents two case studies in which these and other ecology-based regenerative development and design principles were applied. Section 5 concludes the article by summarizing how working from an understanding of living systems principles provides insights into working regeneratively across and within different scales. It also addresses the need for the role of the designer to shift and for new capabilities to be developed in order to incorporate these insights into new development and design practices. Finally, it highlights some of the challenges design practitioners might face when implementing a living systems approach within the complexity of multidisciplinary design projects.

## 2. Premises of the mechanistic and ecological worldviews and two related paradigms

### 2.1. Worldviews

The term, *worldview*, in the sense that we use it here, “is not merely a collection of separate, independent, unrelated beliefs, but is instead an intertwined, interrelated, interconnected *system* of beliefs” (DeWitt, 2010, p. 7, emphasis his). A worldview “acts as a ‘filter’ through which phenomena are perceived and comprehended” (Miller and West, 1993, p. 3). As such, it shapes how individuals interpret and interact with the world around them, defining what can be known or done and how and what goals should or even can be pursued (Koltko-Rivera, 2004; Mang and Reed, 2012). Perhaps most importantly, it does this while largely invisible to the individuals and organizations whose thinking and behavior it influences.

A “consciously held worldview can shape new practices and transform the way we engage with the built environment” (Hes and Du Plessis, 2014, p.98). Alternatively, when one is unconscious of a worldview and how it shapes one's thinking and behavior, it can become a mental blinder. This occurs frequently, often across whole sectors of a society. The technological and regenerative sustainability paradigms are products of two very different worldviews—mechanistic and ecological. Lack of awareness of differences between these views and their implications is a major,

often invisible challenge to design professionals seeking to integrate or move between the two sustainability paradigms.<sup>1</sup>

#### 2.1.1. Overview of the mechanistic worldview

Francis Bacon, René Descartes, and Isaac Newton are usually seen as sourcing the primary ideas that coalesced in the sixteenth and seventeenth centuries into the mechanistic (or Cartesian and/or Newtonian) worldview. The scientific revolution that began in this era brought new metaphors that replaced the medieval notion of an organic, living, and spiritual universe with the metaphor of the world as a machine (hence the term “mechanistic”). Five hundred years later, the mechanistic belief system pervades and shapes all facets of modern life, including science, education, business, the economy, and how we design and construct human habitations and ways to manage the Earth (Du Plessis, 2009, Ph.D. Thesis).

At the core of this worldview is the assumption that the universe as a whole and all of its material components, including living organisms, function like mechanical systems that are governed by universal laws. This results in core beliefs of: reductionism, determinism, dualism, and anthropocentrism.

- *Reductionism* (a form of analysis often referred to as the “scientific method”) describes the belief that “the complexity of the world is only apparent; to deal with it you need to analyze phenomena into their simplest components” (Heylighen, 2006, para. 11) and that knowledge of the whole is gained from analysis of the parts. Thus, to understand any complex phenomenon requires taking it apart, reducing it to its individual components.
- *Determinism* describes the belief that predictable universal laws determine how the component parts of any system will behave and thus enable predictions concerning the behavior of the whole. The effect of a cause on a system can be predicted based on the knowledge of the cause and of the properties of the parts based on their objectively measurable properties (Gleick, 1987; Tarnas, 1991).
- *Dualism* describes the beliefs that mind and matter, the subjective and the objective, are wholly separate and independent phenomena. The universe consists entirely of matter and of the dynamics or forces affecting it. Humans, for whom mind (thinking) is the distinguishing feature (Descartes's “I think therefore I am.”), thus stand apart from nature (Harman and Sahtouris, 1998). Separating mind from matter and the subjective from the objective dictates that the only true knowledge is whatever can be objectively observed and measured (Hes and Du Plessis, 2014).
- *Anthropocentrism* describes the belief that the purpose of science (indeed, of all activities) and the knowledge gained from its pursuit is “to create useful things for the improvement of the human condition and its estate,” and that nature is to be controlled and managed toward that end (Hes and Du Plessis, 2014, p. 24).

#### 2.1.2. Changing worldviews

The sciences behind the mechanistic worldview led to remarkable technological advances that improved human life. By the middle of the twentieth century, however, its core beliefs were facing serious challenges on a number of fronts. New

<sup>1</sup> The following brief overviews of the mechanistic and ecological worldviews are by no means comprehensive. Much has been written across many disciplines about both, and those interested in a more in depth understanding are encouraged to explore them further (Capra, 1996; Harman and Sahtouris, 1998; László, 2012; Elgin and LeDrew, 1997).

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