



## Perspective Essay

## Gaps and futures in working between ecology and design for constructed ecologies



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## H I G H L I G H T S

- Ecologists and designers are changing their boundaries; habits of thinking need to match.
- Major gaps in cultures between ecologists and designers, and where to close gaps, are outlined.
- Checklists will assist in closing tensions between site and theory.
- Performative design will assist in greater engagement between ecologists and designers.

## A R T I C L E I N F O

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## A B S T R A C T

A trend in ecology has been increased engagement with areas traditionally the territory of designers and planners. While ecological science has called for greater collaboration, such collaboration has been occurring for decades in design practice. This paper is a reflection upon gaps in understanding between design and ecological science. Despite many similarities between ecological science and its sister landscape architectural design, differences remain and these need to be understood to assist collaboration and outcomes in constructed ecologies. From the perspective of both designer and ecologist, a suite of conceptual positions stresses understanding between these disciplines; in focus here are approaches to site, language and publication methods, and differences in perception. Closing the gaps focuses on attitudes to data, the increased role of the experiment in design, linking data to design, and the role of culture. Just as other disciplines involved in constructing ecologies are changing their territories, so is ecology. However, ecology must upgrade its intellectual modus operandi. Digital design plays a key role in potentials for greater collaboration between ecologists and designers, with no set forms of working, and a lessening of boundaries.

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## 1. Introduction: the designers' contentions

Many current dialogues in ecological science are increasingly concerned with the city, the garden, and messy nature and the idea that 'the world has changed' from that studied in more traditional 'pristine nature' because much of the world is now organised, altered, or constructed as ecologies (Box 1). In short, ecological science has been shifting its focus from an almost sole concentration on the measurement of natural phenomena and species in natural regions, towards the built environment and other constructed ecologies. This shift of emphasis has been noted by designers, who welcome it because it brings new and different expertise into realms which lie in the heart of design professions

such as landscape architecture. However, aspects of the shift of emphasis by ecological scientists are of concern to the design professions. There are two central contentions. First, the discovery of constructed ecologies by ecological scientists appears with scant recourse to the theory and practice of design. While the design disciplines have long addressed the history, design, spaces, ecology, and general workings, politics, governance, and cultures of cities, gardens, messy nature, and re-vitalised 'new nature' sites of our constructed ecologies, both design practice and design theory remain largely unexamined and uncited by ecologists. Second, engagement between designers and ecologists has been occurring for some time in practice, thus calls in the academic ecological science press (e.g. Nisbet, Hixon, Moore, & Nelson, 2010) for collaboration between these two groups, or for 'working together' after the fact. Much of the context of this perspective paper comes from knowledge of the engagement of designers and ecologists working in teams with engineers, social scientists, and planners

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**Box 1: What are 'constructed ecologies'?**

Constructed ecologies can be seen as of two general types. First are those which have come into being as accidental or haphazard by-products of human exigency. This might be the down-stream impacts of a dam, where the ambition was for hydro-power but the impacts on the ecologies of the region were largely unknown or not fully anticipated, or the incidentally constructed ecologies within the built environment. The second type are the deliberately planted and designed landscapes, perhaps with nominated species, such as for a constructed wetland or a public park, with or without particular biodiversity ambitions, and with or without the opportunity for nature to take spontaneous and unknown directions. Constructed ecologies is a different and wider expression than the term novel ecosystems, which is focussed on biological changes, because it includes all aspects of design, including engineered infrastructure and materiality. Constructed ecologies might be actively managed, as in the constructed ecology of a farm or public park, or occur without purposeful human management, such as in a derelict urban space.

to construct ecologies, often in urban or suburban environments. Lack of interdisciplinary engagement with designers at theoretical and academic levels in ecology means that ecological academia is in danger of irrelevancy for best ecological outcomes, and is further acerbated because it appears separated from its own practice of working collaboratively on projects. How has such lack of interdisciplinary engagement occurred at academic levels, and how is it expressed?

This paper lays open to view major gaps in the cultures of thinking between ecologists and designers (here landscape architects) with the intention of clarifying what these two sister disciplines privilege in terms of language, theory, and approach, and to ask questions about the continually evolving relationships between design and ecology. If we are to continue to work together more knowingly and productively it is important to understand the different cultures of our related disciplines, and to understand what the other discipline brings to work on constructing or conserving ecologies today. This is not a discussion of binaries, nor do I take sides, nor are there oppositions between science and design; we need not erect boundaries, "shutting out and shutting in" (Ammon, 1965). Both disciplines are in a state of plasticity but our ambitions are usually equal in the hope and vision of a 'best' ecological outcome, whatever that outcome might be for a specific site.

This paper intends to encourage discussion of the gaps in culture between these sister disciplines by first discussing the relationships between ecology and design, and second by examining where we might most actively close the gaps in culture between ecological science and design in constructed ecologies. Thus I discuss more subtle cultural separation points between the two fields of landscape architecture and ecology than usually noted, and draw a picture of how these separations impact negatively on academic discourse despite the strong commonalities between ecological science and landscape architecture. Enhanced understanding of the separation points will improve dialogue, relationships, collaboration, and thus built projects. The separation points appear to be about community identity and group thinking within academic territories (Becher & Trowler, 2001). For example, fundamental to much ecological science literature is the relative novelty of the nature of cities which has become as a new 'notion of truth' for that group (*sensu* Bohm, 1996); however, vast numbers of people never doubted that the city always was and remains part of the natural world (Spirn, 2008).

**2. What is happening that we need to re-think and reappraise our design-ecology relationships?**

The move of ecologists into constructed ecologies is a reflection of snowballing changes this century where both disciplines of ecological science and landscape architecture are shifting their fields of interest, forging possibly unforeseen directions for their disciplines. For example, landscape architects are now working with infrastructure engineering and it is likely that we will continue to see an expansion of work, teaching, and experimentation through performative design practices in that arena and related areas. In doing so, designers are needing to change their manners of operation and their thinking; such changes can be seen in emerging teaching practices, such as those beginning to draw upon architecture's explorations of modelling energy and urban systems and symbiosis (e.g. Weinstock & Gharleghi, 2013; Picon, 2010), and with the nascent move towards more purposeful exploratory design of constructed ecologies using big data and data mining (Kitchin, 2014). A contention here is that as ecology is moving its field of interest into constructed ecologies, it also needs to move its thinking and manner of operation at the academic level. In particular, constructed ecologies take scientists into the realm of design practice and design academic discourse.

A need for re-thinking within ecology is particularly acute in urban ecology, because cities are paramount constructed ecologies, and the built environment lies firmly at the intersections of design and ecology. Ecological science appears to be in the process of discovering that cities are historical and change over time (e.g. Ramalho & Hobbs, 2011), both spatially and culturally, but history and spatial complexity are not new domains in design theory or in designers' considerations. Change in spatial form over time is fundamental in both academic teaching courses and in design practice; indeed it would be unthinkable to do otherwise and is often a starting point in both design teaching and practice. Urban ecologists are ignoring the extent and depth of earlier discussions on the history of cities and other constructed ecologies in the urban design disciplines, where urban growth as a dynamic process in space and time has long been the subject of study. Temporal study is fundamental to design teaching and can be revealed in studies of (as examples) the evolution of cities, the changing nature of Rome from wood to brick to marble, the problems of ghettos, the need for water systems for sanitation, fluxing changes of housing density over time, why Central Park was built in the 1850s on what was the swampy edge of New York City, the covering of urban rivers in the nineteenth century and their uncovering ('daylighting') in the twenty-first, or the expansion of Abu Dhabi from a fishing village of a few decades ago. The American environmental historian Donald Worster noted that there is an unfortunate tendency amongst scientists to believe that 'the more recent the date, the more truthful the paper', but for historians dates do not appear in that manner (Worster, 1996). The environmental historian Libby Robin (2011) pointed out that, while the imperatives of sustainability have already influenced biology, biologists have yet to engage seriously with history. Yet Darwin's *On the Origin of Species* (1859) is fundamentally an historical study of 'how did all life forms get where they are?'

Recently, two theoretical physicists delivered a mathematical equation as a 'unified theory of urban living' for city function (Bettencourt & West, 2010). While Pickett, McGrath, and Cadenasso (2013) noted that the theory does not fit the complexity of many aspects of urban living, such as patch dynamics and complexity, this unified theory has confounded urban planners. Gleeson (2013) described the theory as 'textbook positivism', because the built environment is seen by urbanists of having enduring cultural differences across regions, nor are cultural responses to cities the same; cities are not scaled versions of one another 'despite appearances' (Bettencourt & West, 2010); on the contrary,

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