i. Methodology: emergence

I have used a transdisciplinary methodology, of which the key component is the concept of emergence, which sits within the broader field of complexity theory. Emergence, which has its roots in Aristotelian thinking (Corning, 2002), is described more fully in chapters One and Five, with the purpose of clarifying how it is applied in this thesis to landscape, to research, and to public engagement. It is not an entirely unified school of thought, and "it is still not clear what the term denotes" (Corning, 2002: 21), but a good working definition is that it describes the property of an entity which evolves to exhibit characteristics which are not reducible to the sum of its component parts.

For some theorists, this irreducibility is "a result of our limited abilities to predict, to calculate, to observe, and to explain"(Humphreys, 2006: 1). This view would suggest, for example, that although we cannot predict the exact form of a tree, river, or sand dune, over time we would be able to do so if only we had sufficient quantities of data and processing power. Thus, some research efforts are made towards the gathering of 'big data' in order to produce computer models of future scenarios. This interpretation of the concept is called 'weak' emergence. For other thinkers, myself included, it is in the very nature of emergence that the emerging properties of the entity cannot be predicted:

> "Wholes produce unique combined effects, but many of these effects may be codetermined by the context and the interactions between the whole and its environment(s). In fact, many of the "properties" of the whole may arise from such interactions. This is pre-eminently the case with living systems."
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> (Corning, 2002: 24)

In the example of a sand dune, for example, I would argue that any amount of knowledge about the properties of sand and marram grass will not mean that it is possible to accurately predict the combined effects of global climate change, wind, waves, people and other creatures on the form of the dunes. Once the 'landscape timescale,' of several decades, centuries, and more, is taken in to account, it is not even possible to accurately predict the continued presence of those dunes in that location, albeit there might be sets of conditions which make their presence likely.

In accordance with this view, therefore, it will be argued in Chapter One that the landscape is comprised of dynamic systems, which are all open to each other, and this endlessly unfolding interaction of systems means that properties of the landscape cannot be accurately predicted.

This school of thought is 'strong' emergence, and this is the theory which supports the work in my thesis.

Emergence theory has for some time been used ontologically by scientific disciplines such as computing, physics and biology. In these fields, emergent entities are "objective features of the world, their emergent status being independent of our own existence and knowledge" (Humphreys, 2006: 1). Increasingly, disciplines such as business and management use emergence to describe properties of desirable company structures, for example. In these cases, emergence is applied differently, as an epistemology which can help to inform the implementation of effective management systems. I apply both the ontological and epistemological views of emergence in this thesis, grounded as it is in a view of the 'real' emergent physical landscape, but with the aim of devising an emergent methodology for public engagement.

The study of landscape is a design-based discipline. It is concerned as much with qualities as with quantities, sociology as much as ecology. Research that is based in a constructivist epistemology can allow for the application of emergence theory both ontologically and epistemologically. They are not contradictory, because real emergent entities in the world (a tree, a fox, a landscape) are understood to interact with our subjective perceptions to form our mental constructs. It is worth noting that herein lies one of the challenges for transdisciplinary study, in that participants have widely differing views of how we know of the landscape. For example, to some people, a series of maps describing the changing course of the River Bollin over time transparently records an objective physical reality, not by any means a constructed representation. To others, a map is an interpretation of landscape, a construction, and not a purely factual depiction. Maps aim to fix physical landscape characteristics in graphical form, but can only ever be partial and qualitative representations. My data sources are primarily qualitative: participants' memories, emotions and opinions, and yet quantities can enter in: kilometres of track, numbers of otters, speeds of trains. Ultimately, many of the most significant decisions over the future of Ashley's landscape will be made by engineers, for whom quantities must be the ultimate reference point, and who may not subscribe to an emergent ontology.