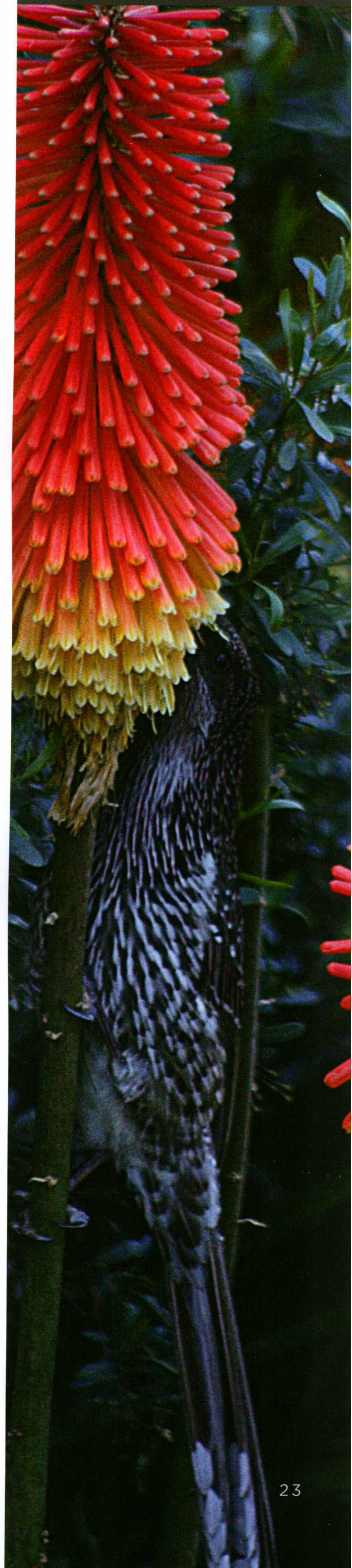


Chapter 2
An ecological worldview

"No problem can be solved from the same consciousness that created it."

Albert Einstein

Changing is a matter of choice – or is it?

Why is it that, even though we know how bad things are going to get very soon, and we know what needs to be done to prevent, or at least mitigate this, the entire global society still prevaricates and finds excuses not to make the changes we know we should? The answer is very simple. We won't act, because the choices we have to make fly in the face of everything we have been told we need to be and do, not only to survive, but to be happy and successful.

We know our choices shape our world, but we rarely recognize that these choices are themselves shaped by our beliefs about the world. These beliefs – taught by our parents, promoted by the cultures in which we grew up, shaped by our lived experiences – form what is called our worldview. A worldview can be described as the stories we tell ourselves about how the world is created, what it is made of, how it is structured and how it functions. These stories in turn allow us to construct a value system that informs our ideas of what is good and true, what constitutes ethical action, and how we define concepts such as happiness and success. It also defines the paradigms we use to discover and structure knowledge.

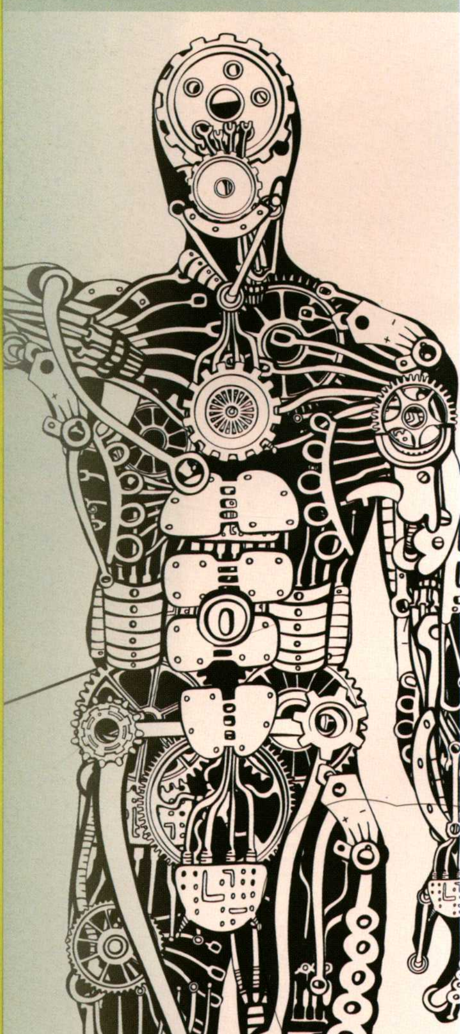
However, no single worldview can describe the full complexity of the world. It can only reveal to us the world that is made visible through its particular lens. This implies that our perspectives on, and solutions to, problems are also limited to what is possible from within a particular worldview. As the limitations of one worldview become apparent, it is eventually replaced by another.[1] It is suggested[2] that the development of worldviews is itself a process of evolution, in which any new worldview builds on the knowledge and insight accumulated through numerous preceding worldviews, but adds its own insights to increase the scope and coherence of the picture being unveiled.

Over the past 500 years the world has gradually become dominated by a worldview that is powerfully seductive, but ultimately treacherous. During the Renaissance a number of scientific discoveries, especially that of Copernicus and Galileo, put paid to the preceding view of a world governed by divine purpose. The game-changing influence of their work lies in the fact that their discoveries were based on what they could observe, not on what the church said they should observe. René Descartes took this train of thought further by separating mind from matter, and the subjective from the objective. Henceforth the only true knowledge was to be that which could be objectively observed and measured. Add to this Newton's mechanics and the call from Francis Bacon that the purpose of science is to invent useful things for the improvement of the human condition and its estate, and we have a worldview that tells us some interesting stories. The first of these is that we live in a universe that functions like a very sophisticated mechanical system, governed by universal laws (such as the laws of physics, mathematics and chemistry) that can be used to predict and thus determine the behaviour of the parts (from atoms to galaxies) that constitute the universe, based on the properties of these parts – in essence a clockwork universe as Gottfried Leibniz described it. Once we have discovered these laws, we can not only explain all phenomena, but ultimately, through scientific and technological development, replicate and control them, thus placing us in control of nature to create all kinds of useful things to improve life for humans.

The second story this worldview tells, is that living systems and mechanical systems can be approached in the same way – as a collection of parts that could be studied (and fixed) in isolation. This view influenced how we approach adversity: analysing it into isolated problems each with their own solution or means of control.[3] The third, and possibly most dangerous story of this worldview, is that not only can growth, development and progress continue indefinitely, only limited by our imaginations and technological sophistication, but that unfettered growth is something for which we should strive.

This worldview ultimately led to a social value system focused on that which would serve the individual and the fulfilment of his or her needs in a competitive environment, in which truth and value can only be deduced from observable and measurable evidence. In a world where only that which can be measured counts, concepts such as success, wealth and happiness came to be defined by the ability to consume. Measuring our self-worth in terms of the possession of material goods is one of the reasons why modern society finds it so difficult to move to a more sustainable way of living. This value system also allowed us to separate humans from nature, and then place humans above nature, with the right to use its resources and change its processes to provide maximum benefit for the human species.

While this worldview was extremely successful in furthering technological



Living systems are not mechanical systems.
IMAGE: RYGER / SHUTTERSTOCK.COM

development, thus improving human well-being, it has limitations. During the past century the flaws have become more apparent. New fields in science, such as quantum physics, complexity science, ecology and neuroscience are finding that, while the scientific paradigm underpinning this worldview is very effective when dealing with mechanical systems, it cannot adequately explain all of reality, especially when it comes to living systems and the sub-atomic realm. It has also become clear that the mechanistic approach to responding to some of the world's critical problems is failing because the linear, reductionist methodologies used to develop strategies, cannot foresee or address the unintended consequences inherent in the complex dynamic systems that constitutes life on Earth. But probably the most damning aspect of this worldview was the psychological separation it created between humans and nature. This allowed the development of an economic model that ignored the limits to growth posed by the reality of a finite and interconnected planet, and which now threatens vital planetary functions such as climate regulation.

The current mechanistic worldview cannot adequately explain all of reality, especially when it comes to living systems.

It is becoming increasingly clear that it is not technology, or the economy, or politics that presents us with the biggest challenge in creating a sustainable world, but escaping the trap of this mechanistic worldview. Consciously changing our worldviews is not an easy task, if at all possible. However, if we really want to leave the children of this and centuries to come a legacy of abundance, it is our only choice. We need to shift to a worldview that is more relevant to the complex and living systems of which we form part; a worldview that would open solutions to us that are simply not possible using the thinking of the worldview which created the challenges in the first place.

Fortunately an alternative worldview has been gaining ground. While referred to as a new worldview, in reality it is emerging from an amalgamation of ancient worldviews and the findings from both classical and new sciences. This worldview has been labelled respectively as ecological,[4] evolutionary,[5] reflective/living systems[6] and integral.[7] We will use the term ecological both in homage to the wisdom of the first to identify it, and because the term reminds us that we, as humans, are part of a much larger web of life. We may bring to that web abilities such as self-reflection and what Ken Wilber[8] calls "the 'software' of philosophy and the 'transcendental ware' of mystical-spiritual religion", but we are first and foremost part of a living system and all that comes with such systems, such as flows, relationships, interdependence, and evolution.

There have been numerous attempts at outlining aspects of this ecological worldview by scholars in fields as diverse as theoretical physics, cosmology, ecology, transpersonal psychology, indigenous knowledge systems, and even religion and spirituality.[9] All these descriptions can be structured around two key themes: wholeness and change. In this chapter we discuss how these two themes influence the way we look at the world; the value system that flows from these themes; and the guidelines for action provided by these values. Lastly we discuss what the practical implications of this worldview are for how we generate and use knowledge, our interpretation of sustainability and our approaches to design.[10]

Change is the only constant

The notions of impermanence and the continuous cycles of creation, embodiment, preservation, destruction and release of the universe are well established in most religious and philosophical traditions. As Greek philosopher Heraclitus proposed: "though things may appear to be stable, they are actually in an endless process of becoming, in a state of constant flux".[25] Medical science has shown that the human body is changing all the time as

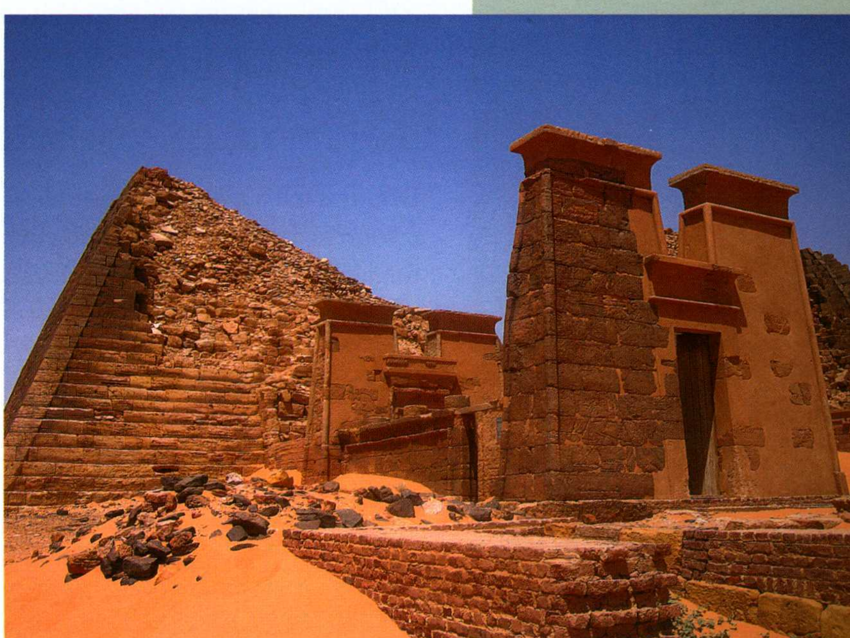


PHOTO: C DU PLESSIS

cells renew themselves according to regular cycles. Geology studies how the surface of the earth is constantly changing, as rocks, mountains and continents are born and erode to dust. Astronomy studies how the cosmos itself changes as stars are born and die, and galaxies spin further from the centre of the universe. Thus even seemingly permanent phenomena are undergoing constant change at both a micro and macro scale of existence.

The new field of resilience theory uses the metaphor of the Adaptive Cycle to describe the recurring cycles of rapid growth, conservation, release, and reorganization found in nature.[26] While the Adaptive Cycle is not a fixed cycle, as research has found numerous examples of variations on the cycle that have bypassed phases or even returned to previous phases, it still provides a valuable tool for understanding change in living systems.[27]

In essence, the Adaptive Cycle consists of four phases controlled by four functions: exploitation, conservation, release and reorganization. The exploitation phase (r-phase) is characterized by rapid growth and high environmental variation. It is the phase in which pioneers, opportunists and entrepreneurs thrive, as they exploit new opportunities and niches in a system with weak internal regulations and connections. During the Conservation phase (or K-phase), components become more strongly interconnected, energy is stored, and materials (or potential) accumulated. The internal state becomes more strongly regulated and more efficient; new ways of doing things are excluded, and capital becomes tied up in unavailable forms.[28] The system becomes more rigid, and resilience decreases as flexibility and redundancy is replaced by efficiency. During this stage "the competitive edge shifts from opportunists to specialists who reduce the impact of variability through their own mutually reinforcing relationships".[29]

As systems become more rigidly tied up in certain structures and patterns of behaviour, they become ripe for collapse.[30] Such collapse can be catastrophic, destroying the entire system, or it can be a small release of potential that relieves the pressure. The longer a system is in the conservation phase, the more vulnerable it becomes to even small shocks and the greater the chance of total collapse.[31] One way of avoiding catastrophic collapse is through a series of small, controlled releases. This strategy is used, for example, to manage wildfire risk through controlled burns.

During such a release (omega phase), regulatory controls are weakened and resources are released, resulting in chaotic dynamics.[32] Following rapidly on the release phase, is the reorganization or alpha phase. During this stage, the system is open to innovation and invasion, novelty thrives, unlikely agents can combine and form new entities, and small chance events have the power to shape the future. The reorganization phase begins to order the chaos of the release phase. The release and reorganization phases of the cycle present the greatest potential for destructive or creative change in the system.[33]

The Adaptive Cycle helps us understand that change is necessary, and that the occasional collapse of a system may be beneficial to the overall health of the system, as it allows for different, possibly better conditions to emerge.

When collapse bring benefits

On 1 June 2011 a tornado devastated the town of Springfield, Massachusetts. In the aftermath members of a youth drama group[34] wrote a poem entitled *To Our Mother Tornado*, in which they describe the tornado as a beneficial force that "came to clean up a disaster". In this destruction, they saw hope for a better life now that the structures which have kept them in fear and despair have been broken open, and people were forced to work together to rebuild not just their city, but their community.

> "Our Mother, helping her children
> The North and the South make peace.
> Work together like they should
> to help our city be reborn.
> She gave us a blank page
> So we can draw colourful streets
> Full of lights,
> clean and beautiful."

Another town destroyed by a tornado, Greensburg, Kansas, decided to use the opportunity to rebuild as one of the greenest towns in the United States. In the city of Detroit, successive economic disasters have created the space for a city once known for its industrial wastelands and violence to slowly rebuild itself as a functioning and regenerative social-ecological system. The youths from Springfield realized what few adult disaster managers do: that disaster brings opportunity for renewal and reinvention that should not be wasted. A lesson to remember as we come to terms with the challenges of climate change and global recessions. Greensburg and Detroit remind us that we do not have to rebuild in a way that supports the old paradigms. We can choose how to respond to disaster, and our choices can be regenerative, not degenerative.

In all systems, change is caused by the interactions between the different components of that system. These interactions are governed by positive and negative feedback that can be initiated by events quite distant in time and/or space from where the effect becomes visible. Furthermore, the increasing returns provided by positive feedback loops can get magnified into outcomes that are historically irreversible,[35] or at least totally disproportionate to the initial event that triggered the feedback. Newtonian science (underpinning the mechanistic worldview) assumes that if we have approximate knowledge of a system's initial conditions and an understanding of natural law, it is possible to calculate the approximate behaviour of the system, and therefore predict changes in this behaviour.[36] However, 20th century scientists realized that linear prediction was only a simplified viewpoint applicable to relatively few systems, most of them created by humans, whereas the world is a complex, adaptive and dynamic system governed by non-linear dynamics.

The difference between complicated and complex systems is that the former can be reduced to their parts, whereas complex systems cannot be reduced without destroying or fundamentally altering the system. For example, one can take a complicated system like an engine apart, replace some of the parts, and put the engine together again. If one was a competent mechanic, the engine would work perfectly again. However, if one was to take apart a complex system such as a flower (or Humpty Dumpty), it will no longer function, even if one was able to put the parts together again. Complex adaptive systems are further characterized by the dynamic interactions between the elements that make up that system.

Complex adaptive systems have a number of features influencing how we look at their functioning. The following are the most important:

- They are more than the sum of their parts – i.e. they show emergent properties not found in the properties of the individual parts.
- The interactions between simpler elements allow self-organization into more complex structures.
- They have histories, with past behaviour and experience influencing current behaviour, allowing agents to learn from experience and anticipate the future.
- The dynamics within these systems are non-linear, which implies that small causes can have large results.
- The system operates far from equilibrium and exhibits irreversible behaviour – i.e. it may resist change up to a threshold at which it flips irreversibly into a different state.
- Complex adaptive systems are constantly unfolding and in transition and are characterized by perpetual novelty, calling into doubt the idea that the behaviour of any agent can be optimized.[37]

We are connected to the consequences of our actions.

The study of complex systems such as the weather, stock markets and even traffic jams shows how sensitive these systems are to even small variations in initial conditions, with a small change in input somewhere in the system causing a profound effect at another point (in both space and time) in the system. For example, the hypothetical butterfly flapping its wings in Brazil causing a storm in Texas two weeks later;[38] a slightly braking car causing a traffic jam a few kilometres back up the road; or the assassination of an archduke triggering the First World War and an end to the feudal social order in Europe and Russia. This means no act happens without influencing the system within which it happens, thus also changing the conditions within which the actor operates. We are therefore connected to the consequences of our actions.

Climate change is a good example of how a relatively small set of transactions (e.g. use of fossil fuels and agricultural processes by the organism Homo sapiens) can influence a range of relationships between the biotic and abiotic elements of the biosphere. These relationships have managed to maintain the planetary atmosphere within a certain range of conditions supportive of mammalian life for millions of years. Yet, a relatively small change in the concentration of greenhouse gases appears to be causing major changes in weather patterns, the acid levels of the oceans and the health of entire ecosystems. Furthermore, these initial changes then interact with the other planetary processes, eventually creating positive feedback loops that increase the amount of these greenhouse gases, for example the release of the potent greenhouse gas methane as a result of melting permafrost.[39] In this way, the small, individual actions of humans have set in motion a train of climate change events that will, in turn, have consequences for each individual.

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