"A POWERFUL ANTIDOTE TO TODAY'S DOMINANT CULTURE"
— FRITJOF CAPRA

HOLONOMICS

BUSINESS WHERE PEOPLE AND PLANET MATTER

SIMON ROBINSON AND
MARIA MORAES ROBINSON

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Acknowledgements

Holonomics came about after many requests for recommended texts from our students at Sustentare Business School who were looking to explore more deeply the themes of complexity, sustainability, strategy, innovation, leadership and change management. Our aim was to capture in a single volume the philosophy and teachings from Schumacher College, and particularly the unique Masters degree in Holistic Science – a radical rethinking of our ecological, social and economic systems, taught by some of the most cutting-edge and influential thinkers, practitioners and scientists around the world. In structuring the book into three parts – *The Dynamics of Seeing*, *The Dynamics of Nature* and *The Dynamics of Business* – we then wished to show how these teachings could be implemented in a practical manner in business, governmental and other organisations based on our many years of experience in industry, in both the private and public sectors.

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Simon Robinson and Maria Moraes Robinson
São Paulo, Brazil, November 2013

Foreword:
A Declaration of Wholeness

This book is a declaration of wholeness. Holonomics represents a complete system of living, working and interacting.

In the modern world we are used to thinking in compartments and divisions. Our universities all over the world are notoriously organised into departments. The faculty of sciences does not connect with the faculty of the arts. The Department of Theology has nothing to do with the School of Business. The study of literature or poetry is far from the study of politics. And the classes in economics are held in total disregard for ecology. As a result, society suffers from this complete disconnection and disorientation.

In *Holonomics* Simon and Maria Robinson have made a great contribution in healing this disease of division and separation. The authors show that every discipline is connected to every other discipline.

Simon and Maria were students at Schumacher College. I am happy to say that the college benefited as much from their profound search for holistic knowledge and their experience of the business world as they benefited from the radical approach to learning at the college.

We believe that not only are economy and ecology two sides of the same coin and sciences are perfectly in harmony with the arts, ethics and business, but learning and living are also not to be divided; theory and practice should be a continuum. Our body itself is a perfect example of this wholeness. We have all the faculties of a university in our one body. With my brain I think, analyse and evaluate, with my heart I feel, intuit and appreciate, with my hands I make, create and produce. With my senses I learn to see, speak, listen, taste and touch. Intellect, intuition and action are intrinsic to my existence. If that is me – my whole self and my whole being – then why should I be compartmentalised during the course of study?

This is why at Schumacher College students participate in gardening, cooking, meditation, arts and crafts while they pursue their studies for a degree in outdoor classrooms as well as indoor classrooms.

This holistic approach to learning and living is as old as the hills and

as fresh as the morning dew. We learn from the wisdom of old masters like Spinoza and Goethe as well as new masters like James Lovelock, Ilya Prigogine and Henri Bortoft. Simon and Maria bring all these approaches together and show how thoughts and theories of complexity, chaos and emergence are fundamentally relevant to the economy, to business and to life.

The days of compartmentalisation are passing. We are at the dawn of a new age where we must look for unity in diversity, the big picture in small parts, macrocosm in microcosm, large vision in little details and holonomics in economics.

We can enter this new age of wholeness by the act of deep seeing, by expanding our consciousness, and by transforming our perceptions. This book is a handy tool to accomplish such metamorphosis, a manual to move from a linear model to a cyclical system of business.

I am delighted that two students of Schumacher College have come up with such a comprehensive understanding and explanation of a new world view, or a new paradigm which is urgently needed in our time. When the world is faced with dilemmas and dichotomies, we need Holonomics so that we can avoid disorder and build a sustainable and fulfilling future which is full of creative possibilities.

This book contains many examples, case studies and practical applications of projects which show that collaboration can override competition, happiness can be derived without endless pursuit of material accumulation, and the Buddhist wisdom is as relevant to our time as it was two and a half thousand years ago.

This book is a manifesto for mindful living. It will help the reader to make a shift from a static state to a dynamic state of business.

Satish Kumar
Founder of Schumacher College
Editor-in-Chief, *Resurgence & Ecologist*

Authors' Preface

The introduction of a new idea is often framed with the observation that we cannot solve our existing problems with the same level of consciousness that created them. The subsequent call to action is frequently accompanied by an appeal to change our paradigms, and at other times a call to change our mental models. It is very easy to say these things, yet much more difficult to understand and more difficult still, to put into practice.

Holonomics is not a new idea *per se;* it is a new way of seeing, one which is able to comprehend the wholeness of economic systems. This way of seeing is not a 'dogmatic annunciation' but a 'creative conception' of economics which understands the deeply interwoven relationship with our planet's ecosystem.

Hence our coining of a new definition for the word 'holonomics', which can be thought of as the combination of the words 'whole' and 'economics'. If we look at the Greek origins of these words we find three components; ὅλος (holos – all, whole, entire, total), οἶκος (oikos – house) and νόμος (nomos – custom or law). Economics can be thought of as the understanding of the laws and customs of our home (*oikos* + *nomos*). We cannot have a limited view of our home, for home is a living planet of finite resources. Our understanding of economics has to encompass an understanding of the wholeness of nature and business systems in all their complexity, and this can only come from holonomic thinking.

Holonomics introduces the reader to a dynamic way of seeing and thinking about systems. It is a way of seeing which expands our mode of consciousness from the analytical to the intuitive; one that not only is able to understand the parts of a system, but at a deeper, intuitive level of perception, is also able to understand the relationships and processes within that system – not from the perspective of a whole which is superior to the parts, but from one which is able to encounter the whole through the way in which it comes to presence in the parts. ('Intuition' as we use the word should not be confused with 'feeling' as it is used in everyday language, but as a higher level of cognition to that of our

intellectual minds).

This mode of consciousness sees each part in a system as an expression of the whole, the whole of which can only be the whole because of the parts, and the parts of which can only be parts because of the whole. It is a mode of consciousness which, while acknowledging the importance of the analytical-logical-symbolic aspect of our minds, fully embraces intuition, feeling and sensing so as to enable us to encounter and comprehend systems in their entirety.

This mode of consciousness can be found in western philosophy from Plato onwards, although its articulation varies from the scientific writings of Johann Wolfgang von Goethe, the phenomenological school of philosophy founded by Edmund Husserl, and the philosophical hermeneutics of Hans-Georg Gadamer and Ludwig Wittgenstein. The late physicist and philosopher Henri Bortoft described the way of seeing which resulted from this expanded awareness as ‘the dynamics of seeing’.

Henri, along with mathematician and visionary biologist Brian Goodwin, Satish Kumar, a peace and environmental activist, and ecologist Stephan Harding, plus inspiration from a number leading thinkers and scientists such as James Lovelock, Fritjof Capra and Rupert Sheldrake, encapsulated the dynamic way of seeing in a unique Masters programme which they termed ‘Holistic Science’ and launched in 1998 at Schumacher College, Devon in the UK.

The foundations of Holistic Science covered Henri’s philosophy of ‘wholeness’, Gaia Theory, Complexity Science and Chaos Theory, plus additional modules on economics, ecology, and sustainability, and enabled students to explore a science not just of quantities, but also of qualities. Both authors of this book are alumni of Schumacher College, with Simon graduating in Holistic Science in 2010 and Maria participating in the course ‘The Economics of Happiness’. In *Holonomics* we have aimed to capture the essence of Holistic Science and the philosophy of Schumacher College, in order to lead the reader’s thinking into the dynamic way of seeing, that they may truly be able to comprehend the world and reality in a new light, perceiving new relationships in the systems in which they participate, and so inspiring new insights and solutions to the many entangled and complex economic, business, social and ecological problems that we are now facing across the globe.

While Henri was writing his final book, the name he almost settled on

was *The Dynamics of Being*. It was at the last moment that he had the inspiration to call it *Taking Appearance Seriously*, a name which is a philosophical play on the word 'appearance', which can be read as either a noun – the outward appearance of an object – or as a verb – the appearing of an object. We named the three parts of *Holonomics* as *The Dynamics of Seeing*, *The Dynamics of Nature*, and *The Dynamics of Business* in honour of the profound insights of Henri, and they are written in a manner that will lead the reader towards their own understanding and experience of the dynamics of being. We have such great affection for Henri, as do so many of his students, colleagues and friends who knew him, that we have taken the liberty in referring to him by his first name, as opposed to the more formal 'Bortoft', a break in convention which we hope the reader will forgive.

Part One of this book is devoted to leading the reader into the dynamics of seeing. These four chapters introduce the reader to the work of Henri who passed away in 2012, just a few months after the publication of *Taking Appearance Seriously: The Dynamic Way of Seeing in Goethe and European Thought*. This last book built on his previous two works *Goethe's Scientific Consciousness* (1986) and *The Wholeness of Nature: Goethe's Way of Science* (1996).

Henri taught Simon at Schumacher College in 2009. He was a truly remarkable teacher, a philosopher who dedicated his life to the study of authenticity and wholeness, and who, as our fellow student Ben put it, 'took words to places I thought they couldn't go'. Henri had a deliciously witty sense of humour, which he would put to great use in his classes in a way that, more often than not, would either leave students spellbound or perplexed, bewildered and unsettled. Henri's teachings were less about the transmission of facts which could be easily integrated into one's existing body of knowledge, and more about shifting the student's mode of consciousness. This is by no means easy to grasp in the first instance, especially if one has grown up with the western scientific mechanistic paradigm – a Cartesian conception of reality.

The rewards to those who have a genuine desire to experience the dynamics of seeing cannot, however, be underestimated. The greatest asset that businesses have in this post-industrial era of the knowledge economy is the intelligence of its workforce, and the competitive advantage which comes from the creativity not only of the leadership, but also of the whole organisation. *Holonomics*, through the dynamics of seeing, will enable the reader to understand the exciting and emerging

new business models of a new economics with what one of our students described as ‘an entirely new window on the world’.

In Part Two of *Holonomics* we examine Complexity Science, Chaos Theory and Systems Thinking, starting with non-linear chemical reactions and amoebas, and ending with an analysis of Gaia Theory – our biosphere as a whole. We explore the concepts of emergence, bifurcation, self-organisation and feedback loops from the perspective which Philip Franses, lecturer in Complexity at Schumacher College, terms ‘Transition Science’. Philip and Satish Kumar are introducing Holistic Science to people via a way of learning which they call ‘Process and Pilgrimage’. To truly comprehend the deep insights from complexity science and quantum theory, we have to let go of our Cartesian fixed frameworks of reality. Pilgrimage is about both the inner journey as well as the outer journey, and so Franses and Kumar take their students on journeys of transformation, where students are no longer fixed or rigid in their thinking, but are fluid and flexible, and are able to evolve their consciousness, just as life is always evolving.

One of the key insights from Part Two is the manner in which the dynamic way of seeing can prevent systems thinking from falling into the trap of what Henri called ‘dogmatic annunciation’. To be able to perceive authentic wholes – whole systems – we need more than just our analytical mode of consciousness. When we describe systems in this mode of consciousness, we attempt to bring together the parts of a system artificially, in a counterfeit manner, imagining that the whole is superior to the sum of the parts. In Henri’s language, we force the parts to belong *together*. But in organic systems, the parts only have an existence and meaning because of their relationship to the whole, a whole which can only be experienced in the way in which it comes to presence in the parts. We therefore need a higher intuitive mode of consciousness to experience the *belonging* together of the parts in what we now perceive as an authentic whole.

When we develop systems models, we need to avoid this ‘dogmatic annunciation’ whereby we are convinced that we now have the truth, and we move to a more fluid and dynamic mode of consciousness, whereby our models are seen as ‘constructive conceptions’. These models are not the truth, but have a sufficient level of truth to be able to move our thinking and understanding forward. Science comes to be understood as ‘Transition Science’, since the scientist is no longer an outside observer immersed in abstract models, but becomes transformed from within as he

or she experiences genuine encounters with the phenomena that they are studying.

Having explored the notion of a more expansive holonomic vision, Part Three turns to business and economics, and asks how this new mode of consciousness and seeing can be applied in practice. The case studies which we cite – PUMA SE's environmental profit and loss accounting, Robert Kaplan and David Norton's Balanced Scorecard methodology, Visa Inc.'s chaordic structure, Kyocera's amoeba management system, Gore Associates' lattice organisation, Genie Internet's agile structure, Toyota's dynamic way of seeing, and DPaschoal's business ecosystem – all represent key aspects of holonomic thinking, demonstrating how a change in our mode of consciousness can directly impact on financial results while at the same time facilitating a shift to authentic and long-term sustainability.

We end Part Three with an exploration of mindful leadership and the importance of human values, and we ask the question: 'Is being happy an impossible dream?' Having examined mechanistic thinking, which focuses on objects, and systems thinking which focuses on relationships, we arrive at a complete understanding of holonomic thinking, where the wholeness of systems can be encountered and profound meaning comes into vision.

Ultimately, then, we are asking the reader to undertake a restructuring of their consciousness in order for them to be able to see a complex system whole. Our aim is to help the reader to be able to see both the *intrinsic* as well as *extrinsic* dimensions of complex systems. Once a person is able to see authentic wholes and the processes, dynamics and meaning of living systems, they reach a deeper understanding of the world, one in which economics is no longer seen as separate from ecology. It is a new world of holonomics – business where people and planet matter.

PART I

The Dynamics of Seeing: The Transition to Holonomic Thinking

1. Holonomic Thinking

What is Holonomics?

Do you remember your first mobile phone? In 1993 Nokia launched their 2110 handset to great critical acclaim. Although a simple phone with text messaging and no internet capabilities, it is a design classic, with its oval and graphical (albeit text) display and context-sensitive menus integrating harmoniously and intuitively into the innovative soft keys. At the time it was inconceivable that anyone could knock Nokia off its dominant perch, but Apple achieved this with its iPhone, which now generates more revenue than Microsoft's entire product range.[1]

Although functionally simple compared to phones of today, we can say that the Nokia 2110 was complicated, because if you had an adequate level of expert knowledge, it could be fully understood. While the last twenty years have seen a huge amount of technological progress, the Apple iPhone can still be thought of as complicated, since it too is a piece of technology which although requiring a wider range of expert knowledge, can still be fully understood.

Now think about a plant. If you have one to hand, take a close look at it. With some plants you can take a small piece of say a stem or leaf from which, if you then plant in a new location, an entire new plant will grow. But take one piece out of your phone's circuitry and it will fail. There is something fundamentally different about the organisation of a plant, whereby the whole is contained within the parts. The thinking that has got us from the 2110 to the iPhone is not the same type of thinking that we need to understand a complex, dynamic and organic living plant. Many people in business are now discovering that the same organisational principles that are required to understand the plant can now be used to understand their own organisations, which are also complex living dynamic systems, and not just fixed hierarchical structures. To truly understand an organic system we need 'holonomic thinking'.

The term 'holonomic' was first introduced in 1894 by German physicist Heinrich Rudolf Hertz (1857–94).[2] The term is derived from the Greek ὅλος meaning 'whole', 'entire' and νόμ-ος meaning 'law'. The term 'holonomics' as used by us takes inspiration from the word 'holon', coined by Arthur Koestler in his 1967 work *The Ghost in the Machine*. Our use of the term 'holonomics' represents a way of understanding economics from a perspective which is able to comprehend complete systems – living, working and interacting.

To help us understand what he means by 'holon', Koestler introduces us to two watchmakers in a story created by Herbert Simon, one of the founding

fathers of both artificial intelligence and complexity science.[3] Both watchmakers made watches of around one thousand parts each, and even though watches from both makers were in high demand, one maker had to close while the other prospered. The key difference was how they manufactured their watches. One would construct his watches one bit at a time, and every time he was interrupted or made a mistake, he would have to start all over again. The other, though, created subassemblies of ten parts, and these could then be built into larger subassemblies, before the units were brought together forming the final watch. Any interruption or mistake would therefore have very limited consequences. There has not been enough time available for life to evolve in the manner of the failed watches, Koestler argues, but complex life can evolve from more simple life forms if it does so in a hierarchical manner.

Organic life is organised hierarchically, as is social life. But if we look at what a part is in a hierarchy, it has an ambiguous existence. As well as being a part of a greater whole, in which case we think of the part as being somehow incomplete, a part is also a whole in its own right. Just as our bodies are composed of cells, cells are whole systems in their own right too. To help us think about these 'sub-wholes', Koestler invoked the image of Janus, the double-faced Roman god, who could look in opposite directions at the same time. Hence he coined the term 'holon' to refer to parts which behave 'partly as wholes and wholly as parts'.[4]

Koestler identified a variety of hierarchies operating in human societies, including authoritarian 'control' hierarchies, 'geographical' hierarchies, 'distribution' hierarchies, and 'family-clan-caste' hierarchies. We confront hierarchies in all aspects of our lives, and would easily be able to identify many. Koestler did so in order to be able to compare a hierarchy with a 'holarchy of holons'. He felt that 'Behaviourism' (an extreme school of thought in Psychology) was too atomistic, and that 'Gestalt' psychology was wrong to conceive of wholes as absolutes. Both schools of thought failed to take into account the intermediate structures in between parts and wholes. Although Koestler's holon is not a widely used term, it is excellent in helping to broaden our discussion about systems, and the relationships between wholes and parts.

There are four current uses of the word 'holonomics'. The first use, which we have previously mentioned, is in physics and comes from classical mechanics, relating to mechanical systems ('holonomic systems'). The second use refers to a technical term in mathematics ('holonomic basis'), and the third use of the term (phrased as 'holonomicity') comes from robotics, and relates to the degrees of freedom a robot or controllable object such as a car has.

The final use of the word relates to 'holonomic brain theory', normally associated with Karl Pribram and David Bohm. Here the word 'holonomic' is relating more to 'hologram', where both theories of the brain and of subatomic particles were influenced and inspired by thinking about the holographic principle, where each part of a hologram contains the whole.

In the business world we occasionally see words derived from ‘holos’, one example being ‘Holacracy’, a social technology for structuring, governing, and running an organisation developed by HolacracyOne. In *Beyond Business Process Reengineering: Towards the Holonic Enterprise*, Patrick McHugh, Giorgio Merli and William Wheeler use Koestler’s terminology in their description of ‘holonic networks’ which they define as ‘a set of companies that acts integratedly and organically’.[5] Holonic networks are virtual business organisations made up of a number of equal partners – holons – who all contribute unique core competencies. The theory is that holonic networks, being non-hierarchical, self-regulating, self-learning, evolutionary and open, allow business systems to continually ‘de-invent and reinvent themselves as they face increasingly ambiguous markets’.[6]

As authors, we decided to call our book *Holonomics* in order to be able to discuss what we call ‘holonomic thinking’, a profound way of thinking about mental models, systems models, and business and economic models. At the heart of all strategic business thinking is the desire to understand new business models. Much of this new thinking is influenced by paradigms and frameworks which are still based on a Taylorian, linear and Newtonian world view. A newer world view, taking inspiration from complexity science, is challenging the assumption that what has worked in the past will still continue to now work in the modern hyper-connected and complex world that we are living in, suggesting that we are now experiencing a turning point in society, where a new form of thinking is required. Many new business models have their basis in the organic and dynamic organisational models found in nature, and that is why, before we can discuss these new business models, we first have to examine systems models and systems thinking.

While science as a discipline is transforming itself greatly, based on dramatically new ways of thinking, the business world has been slow to adapt and to exploit the new sciences. The reason is fundamental. Before we can acquire new ways of thinking, we have to understand the limitations and traps within our current ways of thinking, and this requires us to examine our mental models of our world view. If the introduction of new ideas is done without understanding either the systemic nature of organisations or people’s current ways of thinking, then new paradigms or frameworks will be forced into the old ways of thinking and ultimately will not be successful.

In Part One of this book we will be focusing on the concept of ‘wholeness’ and the relationship between the parts and the whole. Systems theory has been attempting to provide methodologies and frameworks to answer this question, starting with the cybernetic approach pioneered in the early part of the twentieth century, which then evolved in its attempt to understand the notion of ‘control’. This gradually evolved into what is now known as ‘systems thinking’. It is important, though, to note that this term – systems thinking – covers an extremely diverse range of theories, frameworks and world views, and as such it should

perhaps be seen only as a general umbrella term.

Complexity in Business

In 2010, IBM published a study *Capitalizing on Complexity* based on face-to-face conversations with more than 1,500 chief executive officers worldwide.[7] The four main findings were as follows:

- Today's complexity was only expected to rise, and more than half of the CEOs doubted their ability to manage it.
- Creativity was the most important leadership quality.
- The most successful organisations co-created products and services with customers, and integrated customers into core processes.
- Better performers managed complexity on behalf of their organisations, customers and partners.

Interestingly, IBM referred to what they called the 'complexity gap'. While 79% of CEOs expected a high degree of complexity over the next five years, only 49% felt prepared for it. IBM used the term 'standouts' for those companies best able to handle complexity. The three main factors which led to the success of these companies in a complex environment were:

Embodying creative leadership.
Reinventing customer relationships.
Building operational dexterity.

A similar recent study by KPMG also examined complexity in business and came to the same conclusion – that complexity was the overriding issue for CEOs and businesses today.[8] This study asked business leaders how they had attempted to manage complexity in the last two years, and how they were expecting to deal with complexity in the future. In both cases, the three most popular strategies were:

Improve information management.
Reorganise all or part of the business.
Significantly change the approach to human resources.

In many ways this is not a surprising observation. The world has moved from the industrial age to the information age, and much of the complexity arises from the greater involvement of people in business processes, as opposed to pure manufacturing. When working with business executives, it is always interesting to ask the questions: 'What is complexity?' and 'What comes into your mind

when you think of the word “complexity”?’ Both of us (the authors) teach holonomic thinking to MBA and postgraduate students at Sustentare Business School in Joinville, Brazil. Our students are always asked to fill in a pre-course questionnaire which probes their conceptual understanding of complexity, and their replies are always highly revealing:

> Complexity can be understood as a situation that involves many variables to achieve a common goal.
> Complexity for me means that we need to put into practice our creativity in solving problems; simplification of processes that will optimise the outcome of the organisation. Words that I relate complexity to are: bureaucracy, slow, problems.

> Complexity is a very broad definition in my opinion. Complexity is a set of factors that make a goal, regardless of its nature, extremely challenging. In plain language, complexity means to me something running hard but which can be highly enjoyable at the end. Words associated with complexity: fear, difficulty, challenge, opportunity.

> I define complexity as something complex, involving a higher level of knowledge for better understanding. To me that word relates to the difficulty involved in assimilating a given activity, so I associate complexity with difficulty.

> I define complexity as something that requires a great effort to be understood or interpreted. I do not see complexity in a bad light. On the contrary, I think complexity relates to something that is not divided into small parts. Every structure or complex problem follows logical, separate elements, where we need to identify the logic that will simplify it considerably.

Typical answers in relation to words and phrases our students associate with complexity include:

- Something complicated.
- Many parts.
- Lots of relationships.
- Many people involved.
- An unknown relationship between cause and effect.
- Unpredictable.
- Chaotic.

In general, the majority of responses are seen to have potentially negative components, so that complex problems are seen as complicated and difficult. What we have noticed is that people in business are rarely influenced by the language of scientific complexity theory, which when studied leads to a very different understanding from those answers above. In the scientific conception of complexity, we begin to realise that complex systems often demonstrate resilience and stability, and through dynamic and non-linear relationships between the parts of the system, can exhibit both chaotic behaviour on one level, but ordered behaviour at a higher level. These concepts may seem strange if you have not studied complex systems before, and of course they will be examined more fully in Part Two.

David Baccarini, Associate Professor in Project Management at Curtin University, defines project complexity as 'consisting of many varied interrelated parts which can be operationalised in terms of differentiation and interdependency'.[9] In this definition, 'differentiation' refers to the number of varied elements, for example tasks, specialists and components; and 'interdependence' (or 'connectivity') refers to the degree of interrelatedness between these elements. If a project team has a framework for defining complexity, then it is in a position to be able to manage that complexity. Baccarini suggests that there are a number of dimensions which should be taken into account when classifying the complexity faced in large construction projects and which often result in the temporary creation of multi-organisational structures. These are: depth of hierarchical organisation, number of organisational units, task structure, technological complexity and organisational interdependencies.

Research from the construction industry suggests that there is still a considerable failure even to define complexity, with only 10% of those surveyed responding that their organisations do define it. From a related analysis of 31 in-depth interviews, only 41% of project managers replied that they were using any formal tools to define and manage complexity, and the majority of those related to risk assessment tools and techniques.[10] Figures 1.1 and 1.2 show the perceived sources of this complexity.[11]

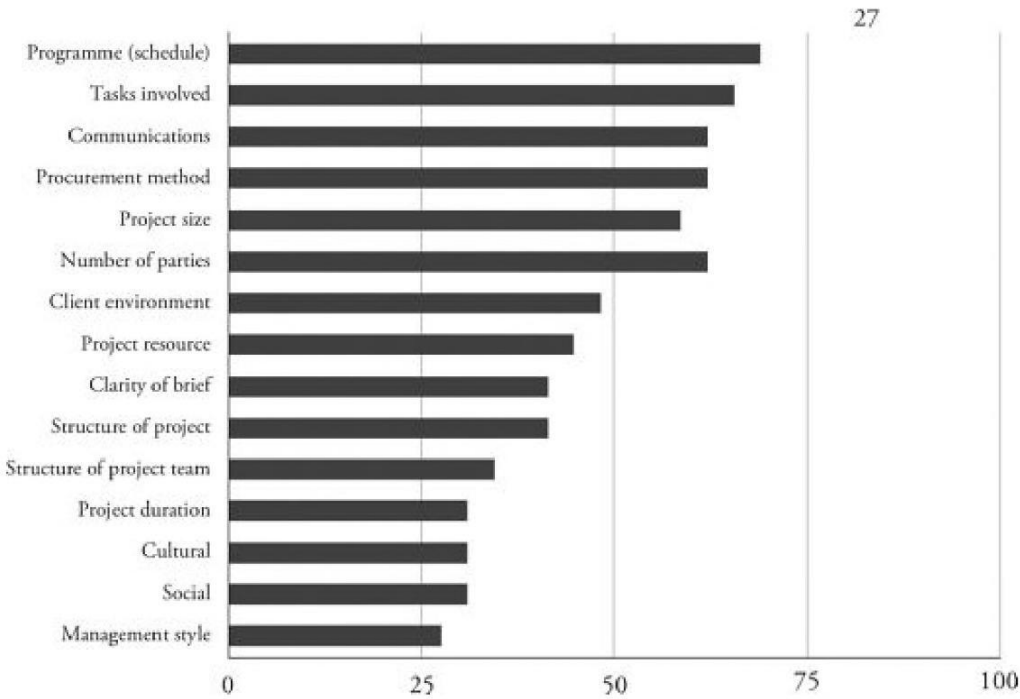

Figure 1.1. Responses regarding the identification of complexity in projects at company level.

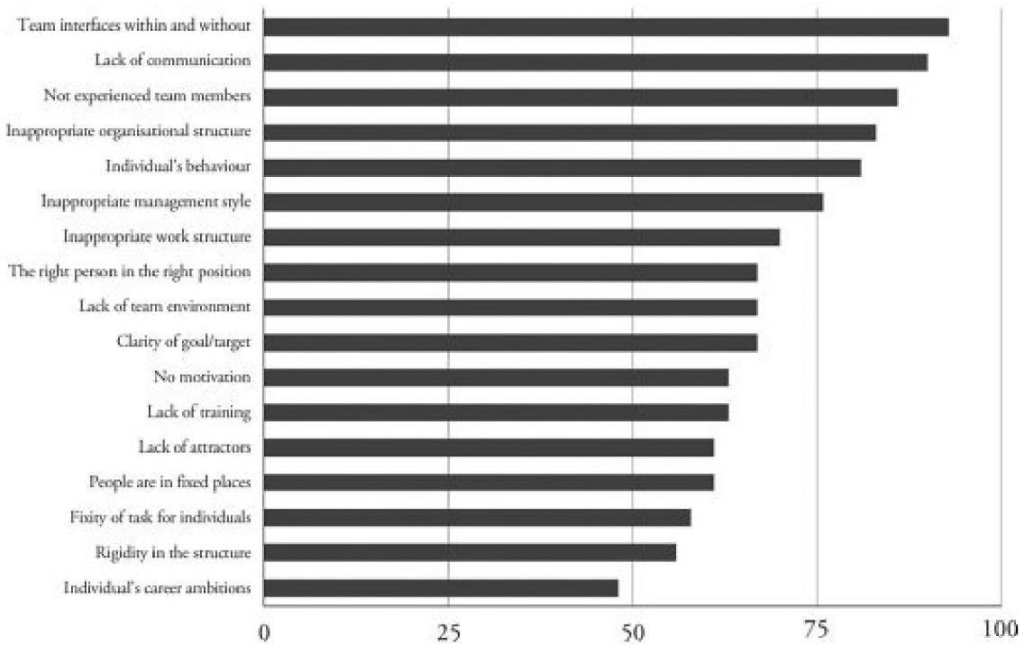

Figure 1.2. Factors identified by respondents as a source of complexity.

Dimitris Antoniadis, one of the analysts who carried out this research, believes that most research in organisational complexity has focused on the individual

elements, rather than attempting to understand how complexity can arise from the myriad interactions between these parts. He also suggests that there has been a general failure to pay attention to the socio-organisational aspects of complex interactions, and the impact of these on management style and project structuring.[12]

The Transition to Holonomic Thinking

In order to understand the many new varieties of business model being created and why they work, we have to study systems models, and the ones which this book focuses on come from the natural world. However, to understand these organic and natural systems, we have to move from a 'mechanistic' way of thinking, whereby we think of the world as functioning like clockwork, engines and computers, into an 'organic' way of thinking. To think organically, we first have to radically change our mental models of the world in order to be able to *see* organic systems whole.

Holonomic thinking, therefore, consists of three components: mental models, systems models and business models (Figure 1.3). The concept 'mental model' refers to the structures, paradigms, frameworks, concepts, ideas, assumptions and beliefs that we hold about the world and about reality. We can think of many outmoded mental models of reality in science, such as the Earth being flat, the Earth being at the centre of the universe, and more recently, continents always being static. When Alfred Wegener (1880–1930) suggested in 1912 that the world's continents were once one single land mass, he was roundly ridiculed, in an often hostile manner, since how could an entire continent possibly move? The first edition of *The Origin of Continents and Oceans*, outlining Wegener's theory, was published in 1915 but would not be widely accepted until the 1950s with the theory of plate tectonics.

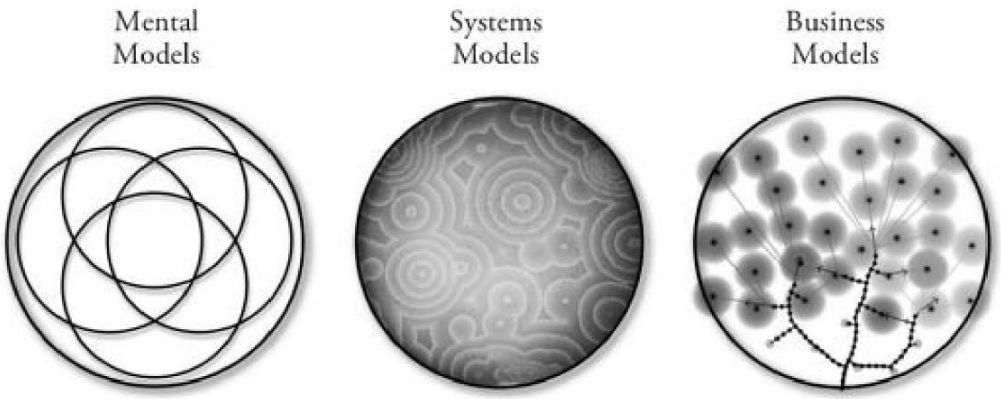

Figure 1.3. The three components of holonomic thinking.

Venkat Ramaswamy and Francis Gouillart offer an interesting example of

how mental models can restrict our creativity in business by comparing the move into retail outlets of Sony and Apple.[13] Sony has a far greater catalogue of products across a wider range of categories than Apple, and yet Apple has become a dominant retail force, with Sony receiving much criticism of its failure to engage customers emotionally. The difference is the mental models of the retailers, with one seeing the shop as a retail outlet, and the other, Apple, focusing on the retail environment as an opportunity to create a customer experience, where customers can play with the products as if they had already taken those products home with them.

Peter Senge has made a huge contribution to our understanding of systems in relation to learning in organisations. He defines 'systems thinking' as a discipline for seeing 'wholes', a set of general principles derived from the physical sciences, engineering, and management, and a set of tools and techniques originating in cybernetics and engineering theory.[14] In systems thinking, therefore, there is a movement from focusing on the nature of the parts of a problem to seeing the structures which underlie complex situations. The essence of systems thinking is therefore twofold:

1. Seeing interrelationships rather than linear cause and effect.
2. Seeing processes of change rather than snapshots.

Senge points out that while business strategies may well benefit from insights from systems thinking, these ideas never get put into practice, or, if they do, the results may fail to meet the expectations of what are brilliant ideas. The reason is that there is a conflict between systemic insights and our deeply ingrained mental models.[15] The ability to shift into systems thinking is a potentially vast source of competitive advantage for businesses, argues Senge, but, in order to truly master this discipline, organisations need to become learning organisations, necessitating the mastery of building shared visions, mental models, team learning and personal mastery.

In our daily lives we rarely think about how our mental models affect our *seeing*. The word 'seeing' is highlighted here because it is not being used it in a commonsense way. 'Naive empiricism' is very closely aligned to our everyday view of the world. In this world view, there is an external world consisting of separate objects (Figure 1.4). Through light and our eyes and nervous system, we are able to perceive images of this external world and thus know things about it, such as how fast objects fall due to gravity, their weights, and what things are made of.

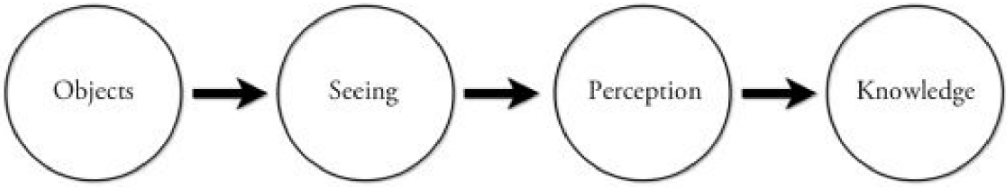

Figure 1.4. An ‘everyday’ view of the world.

It is only when we consciously move our attention from objects, or *what is seen*, to the *act of seeing* that we discover that our mental models have a major impact on how we see. If we come to accept this, then we can see how studying dynamic systems provides us with a new source of mental models, which then opens up to us a new way of seeing the world. Here then, is the first challenge – to move from ‘mechanistic thinking’ to ‘systems thinking’ (Figure 1.5). The trap here is that many people who are systems thinkers are still thinking in mechanistic terms. They still see the world in terms of fragmentation, parts and objects, even though they claim to be thinking in terms of ‘wholes’.

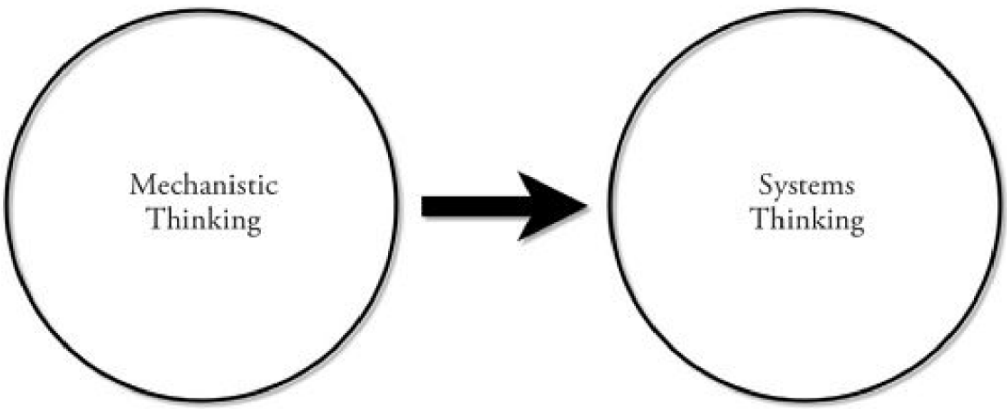

Figure 1.5. The first challenge to our way of thinking

In Figure 1.6 there is a dotted line which represents a wall, a barrier beyond which many systems thinkers do not go. It represents their inability to break out of their mechanistic world views; it is ‘the point of liminality’. Liminality can be thought of as a human type of singularity point in a black hole, a halfway point in transition, where existing structures have broken down but new ones have not yet been built. The word comes from Victor Turner’s anthropological work on rites of passage and rituals.[16]

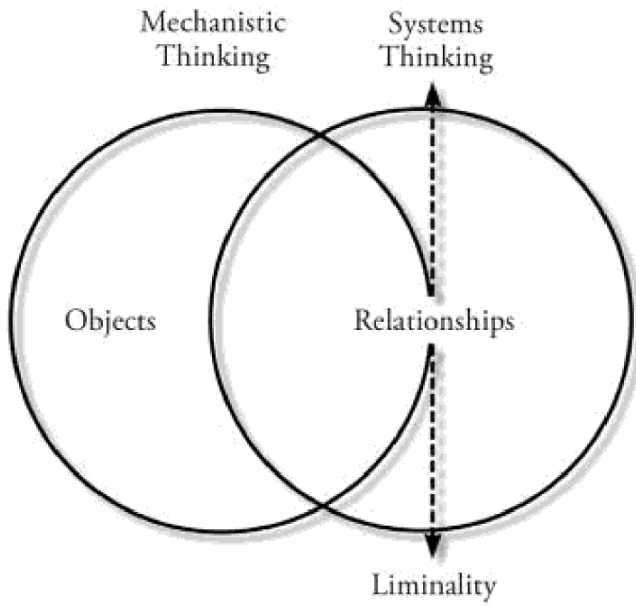

Figure 1.6. The 'point of liminality'.

In indigenous cultures, Turner identified three stages in a ritual process. The first is 'separation', where a youngster is taken from their familiar surroundings, their family, friends, and village, with a view to taking them out of all known cultural and social norms. The second phase is the 'liminal state', which has no attributes of either past or coming states. In the final phase of the rites of passage, the initiate achieves a new form of awareness, coming out of the ambiguous state to achieve a new sense of wholeness.

In first world countries – advanced technological countries – we have lost these ancient rites of passage, and unless we have gone through them, we cannot begin to understand the change of consciousness that they are designed to invoke. Instead, we may experience deep discomfort and frustration, and a lack of truly grasping the importance of what is being taught.

Unlike Figure 1.5, where mechanistic thinking is seen as separate from systems thinking, the intention is not for anyone to lose their mechanistic thinking. Holonomic thinking is a way of thinking in which our seeing and thinking is *expanded*. We do not move from one way of thinking to another way of thinking; we stay within the *act of seeing*, and go 'upstream' so that we are able to see the act of seeing itself (Figure 1.7). Most people are only able to focus on what is seen, the objects. The following chapters in Part One examine 'seeing' in its entirety, so that we can begin to understand how and why we see objects as we do.

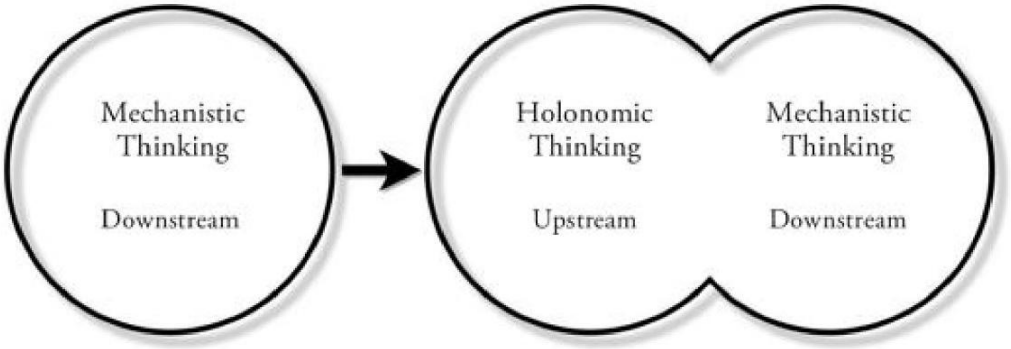

Figure 1.7. Expanding our seeing and thinking.

If we can somehow expand our way of seeing, we are then given a choice as to how we see a system (Figure 1.8). Do we see it in terms of its parts, which of course we often need to, or can we see the system 'whole'? This is not the same thing as seeing the whole system, where we simply try to increase the number of parts or dimensions that we wish to model, describe, or understand in order to get a better picture of the system.

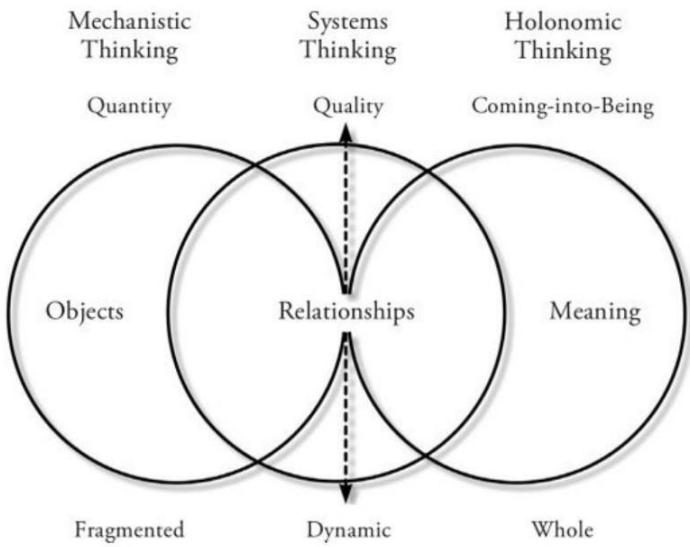

Figure 1.8. Choices as to how we see a system.

Ultimately, then, what we are describing is a movement in thinking – a restructuring of consciousness – to give us the ability to see a complex system whole. As is becoming clear in many scientific disciplines, true understanding can only be achieved through one's *intuition*, and not just via rational thinking. We also need to rethink what we mean by a 'whole'. The aim is to help you to be able to see both the *intrinsic* as well as *extrinsic* dimensions of complex systems. Only when you have been able to see 'authentic wholes' – the processes, dynamics and meaning of living systems – will you then yourself be transformed

by the system, reaching a deeper understanding of both the world and your place in it.[17]

Throughout this book we will be examining case studies from businesses which have all been inspired by nature, having a deep reverence for nature, and a connection to nature, people and our planet; a reverence which does not just come through an intellectual understanding where nature is viewed as some kind of object separate from us. Although we have now moved from the industrial age into what is now referred to as the age of the knowledge economy, it is remarkable how little attention companies and organisations are giving to the process of thought, and how developing new ways of thinking can be a source of competitive advantage which can lead to new creative business models, processes, products and solutions.

Luckily, we do not have to undergo intense ritualistic initiations to attain this new way of thinking. We simply need to reacquaint ourselves with nature, and this book has many practical suggestions and exercises to show how this can be done. There is perhaps no more successful business consultant than nature, which has already developed solutions to the problems that we humans now face, in terms of constructing resilient and sustainable organisational structures which have survived for many millions of years. When we let nature be our teacher, and enter her non-linear world, we are shown the secrets of her business models, and that consultancy is priceless.

Notes

1. Figures for Q4 2011 show Apple's smartphone division generated $24.4 billion of revenue compared to the whole of Microsoft which generated $20.9 billion. See for example http://parislemon.com/post/16997124721/size-matters.
2. Heinrich Rudolf Hertz (1894) *Die Prinzipien Der Mechanik In Neuem Zusammenhange Dargestellt*. In the original German version, we find the term holonome Systeme which is translated nowadays as '*holonomic system*'. In the 1899 English translation, *The Principles of Mechanics: Presented in a New Form*, we find the term translated as 'holonomous system' with the word 'holonomic' not yet appearing.
3. Herbert Simon (1962) 'The Architecture of Complexity', *Proceedings of the American Philosophical Society*, Vol. 106, No. 6, pp.467–482.
4. Arthur Koestler, *The Ghost in the Machine* (London: Pan Piper, 1970), p.64.
5. A 'holonic network' is fully described as 'a set of companies that acts integratedly and organically; it is constantly re-configured to manage each business opportunity a customer presents. Each company in the network provides a different process capability and is called a holon'. Patrick McHugh, Giorgio Merli & William Wheeler, *Beyond Business Process Reengineering: Towards the Holonic Enterprise*, (Chichester: Wiley, 1995), p.4.
6. *Ibid*. p.14.
7. IBM, *Capitalizing on Complexity*, May 2010, http://www-935.ibm.com/services/us/ceo/ceostudy2010/index.html.
8. KPMG International, *Confronting Complexity: Research Findings and Insights*,

May 2011, http://www.kpmg.com/ca/en/issuesandinsights/articlespublications/pages/confronting-complexity-research-findings-and-insights.aspx.
9. David Baccarini (1996) 'The concept of project complexity – a review', *International Journal of Project Management*, Vol. 14, No. 4, pp.201–204.
10. Dimitris Antoniadis, 'Managing Complexity of Interactions in Projects: A Framework for Decision Making' in *Global Perspectives and the Strategic Agenda to 2025: The Task Force Report*, International Centre for Complex Project Management, September 2011, pp.105–122.
11. Dimitris N. Antoniadis (2009) *Managing Complexity in Project Teams*, (PhD Thesis), Loughborough University, UK.
12. Dimitris Antoniadis, 'Managing Complexity of Interactions in Projects: A Framework for Decision Making', in *Global Perspectives and the Strategic Agenda to 2025: The Task Force Report*, International Centre for Complex Project Management, September 2011, pp.105–122.
13. Venkat Ramaswamy & Francis Gouillart, *The Power of Co-Creation: Build It with Them to Boost Growth, Productivity, and Profits*, (New York: Free Press, 2010), pp.46–50.
14. Peter Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (Second Edition), (London: Random House, 2006), p.68.
15. *Ibid*. p.8.
16. Victor Turner, *The Ritual Process: Structure and Anti-Structure (Foundations of Human Behavior)*, (Piscataway, NJ: AldineTransaction, 1995).
17. This section on the transition to holonomic thinking has, in part, been inspired by the teachings on holistic science and complexity by Philip Franses at Schumacher College. Complexity can be approached from three different perspectives: (i) Systems theory, where the 'whole remains as an isolated system; rearranged mechanisation with limited reference to context', (ii) Complexity, where the 'whole appears as long term order underlying the connective structure' and (iii) Fundamental, where 'whole meaning is beheld in the context of its transformational potential'. Holistic science 'explores the world to seek renewal through its innate wholeness' and therefore demands a re-conceptualisation of the concept of wholeness (Lectures in Transition

2. Knowing

Complexity and Consciousness

While business leaders identified complexity as the greatest challenge they face today, Otto Scharmer identifies leadership failure as the key issue of our times, with most organisations being unable to release themselves from the grip of 'pathologic patterns of destruction'.[1] Scharmer identifies three types of complexity which impact on the challenges of leaders: dynamic, social and emerging. 'Dynamic complexity' refers to the systemic nature of a system, where there are delays or distance between cause and effect. 'Social complexity' is a result of the different world views, mental models, attitudes and opinions of people, and this is very much reflected in the type of complex problems that business leaders in the KPMG study (see Chapter 1, Endnote 8) reported that they were trying to solve. Scharmer defines the third form of complexity – 'emergent complexity' – as being 'disruptive change'.[2] This is where:

1. The solution to the problem is unknown.
2. The problem statement itself is still unfolding.
3. It is not clear who the key stakeholders are.

Scharmer has developed a process to help leaders free themselves from being stuck in the patterns of their past experiences, in order to optimise their decision making and creativity. He calls this the 'U Process', by which leaders can learn to shift their attention in relation to the 'source' that they are operating from. One of the greatest problems that Scharmer identifies in people, organisations and societies is their blind spot, which refers to the fact that most are not aware of where they are operating from.

One of the key elements of the U Process is helping leaders to solve problems by helping them to see in a new way. This was famously articulated by Albert Einstein in 1946, when he was looking to raise money to help develop an awareness campaign regarding both the good and evil uses of nuclear power:

> A new type of thinking is essential if mankind is to survive and move toward higher levels.[3]

It seems almost trivial to say that in order to solve problems we need to change our thinking. In what ways can we change our thinking? If we are stuck in one way of thinking, how are we meant to be able to recognise new ways of thinking? Which new ways of thinking are likely to lead to improved results? Einstein's famous quotation has also been paraphrased by other people in a number of ways, one of them being: 'No problem can be solved from the same level of consciousness that created it'.

This last statement, while seemingly the same as Einstein's, introduces an interesting problem of interpretation. What exactly is meant by 'consciousness' and what is meant by a 'level' of consciousness? It is only in the last twenty to thirty years or so that science has begun to fully engage with the mystery of explaining how we as human beings can be sentient and have awareness of ourselves resulting from the interactions of unconscious matter, that is, the chemical and electrical activity in the neurones in our brains. The reason for this can be traced back to the paper published by John B. Watson in 1913 in which he proclaimed:

> The time has come when psychology must discard all reference to consciousness … Its sole task is the prediction and control of behaviour; and introspection can form no part of its method.[4]

His motivation was to attack the practice of introspection, a practice decried as unscientific and an invalid method for developing insights into mental processes. Behaviourism became the dominant school of psychology in the US and Europe, greatly popularised by Burrhus Frederic Skinner (1904–1990). Behaviourism became dominant, despite its near farcical contortions in explaining scientific discovery and artistic behaviour without reference to mind or imagination. Complex human behaviour, including language, was reduced to stimulus-response theory, a position expertly dismantled by Arthur Koestler, who saw behaviourism as merely 'reducing behaviour to salivating and bar pressing', referring to the experiments which were mostly conducted with dogs and rats.[5]

Every year books are published on new business methodologies, many of which are extremely successful, such as ‘triple bottom line’, ‘co-creation’, and ‘double-loop learning’, to name just three. These methodologies refer to processes which people are normally able to take on board if they have the right attitude and motivation to understand them and how they can be deployed. But, as Richard LeVitt of Hewlett Packard told Scharmer, the next basis for competitive advantage that they are focusing on is ‘how managers can improve their quality of thought and their *deep perception of customers* and the experiences customers should have with us’.[6]

Ecologist Stephan Harding refers to Carl Jung’s four ways of knowing as ‘the Jungian mandala’,[7] and this can help us better explore what is meant by ‘quality of thought’. Jung did not propose this as a psychological model (Figure 2.1). He used it more as a framework for viewing the dominant mode of thinking in people. In diagnosing his patients, Jung came to see the ways of knowing as opposites, with ‘thinking’ opposite ‘feeling’ and ‘intuition’ opposite ‘sensing’. These are seen as opposites since, in order to help a patient return to a more balanced way of thinking, it would often be the opposite characteristic that would be the hardest for the patient to acquire.

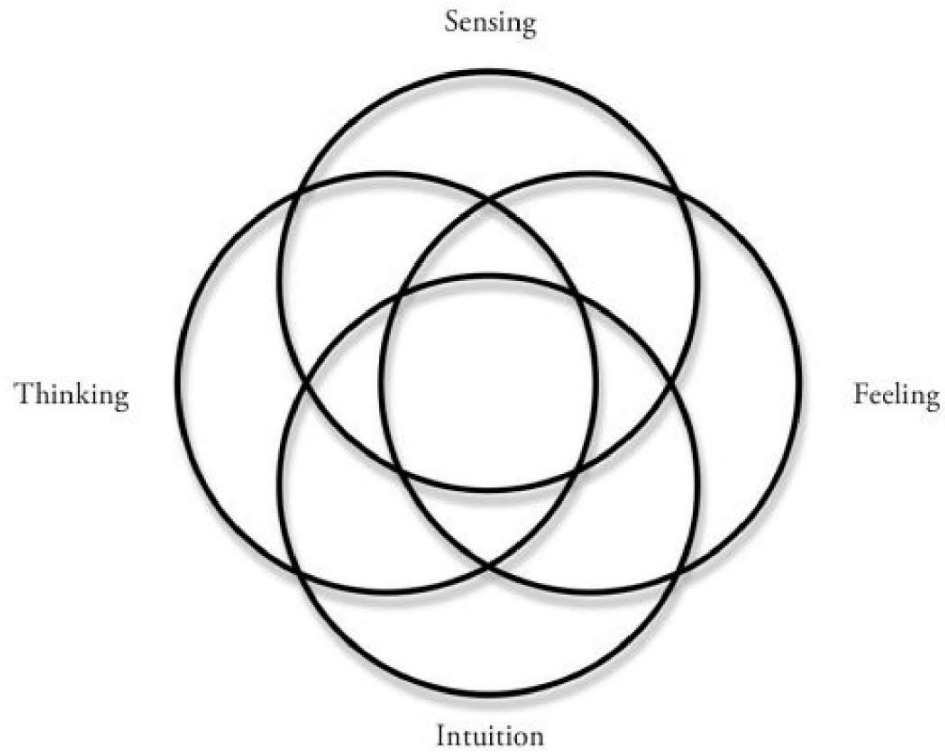

Figure 2.1. Jung's four ways of knowing.

'Thinking' in the mandala refers to a verbal, analytical, conceptual and abstract form of thinking, which dominates western societies. This way of knowing is dominant in the extreme, whereby the ability to manipulate abstract symbols is valued far above all other ways of knowing, to the point where scientists either explicitly reject or ignore the other ways of knowing as legitimate forms of enquiry. However, it is interesting to read a study of eminent mathematicians undertaken in 1945 by Jacques Hadamard. One of his interviewees was Einstein, who answered:

> The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be "voluntarily" reproduced and combined … The above mentioned elements are, in my case, of visual and some muscular type. Conventional words or other signs have to be sought for laboriously only in a secondary stage … It seems to me that what you call full consciousness is a

> limit case which can never be fully accomplished because consciousness is a narrow thing.[8]

So for Einstein, a description of consciousness should not be limited just to ‘thinking’. The mandala can be used to explore both the strengths and weaknesses of the different ways of ‘knowing’. If we start with ‘thinking’, from the perspective of the last ten thousand years of humanity, it is quite astonishing just how accelerated the more recent technological achievements of humanity have been, seemingly almost logarithmic in development. However, these achievements have been based on our ability to think in logical and abstract terms. In many ways, this type of thinking divorces us, or separates us, in our awareness from the sensual world, seeing abstract categories rather than the things in themselves.

Perhaps the destruction of the world we see today is a result of both this and our desensitising and lack of affinity with our fellow humans, animals, plants and planet. In an extreme form of this thinking, everything is separation – atomised, so to speak. We are able to act the way we do, develop weapons of mass destruction and wreak havoc on a global scale, because we have simply lost all feeling, or sense of connection, to those whose lives we affect.

On the other dimension, ‘intuition’ is opposite ‘sensing’, our knowing which comes from our senses. We will be examining the concept of ‘seeing’ in more detail, as, quite literally, ‘there is more to seeing than meets the eye’. Our mental models, ideas and concepts are more directly linked to the act of seeing than we suppose. If we can train ourselves to develop our faculties of perception, we can gain better insights into problems than if we were to simply ‘think’ about them with mistaken ideas about what it is that we are seeing.

A good example of this comes from Peter Senge, who, in the mid 1980s joined a group of executives from the car industry in Detroit who were travelling to Japan for their first factory visits. When visiting a Toyota production line, the executives were not able to see what it was – a new method of production for the maximum personalisation of products with minimal stock held. Their mental models were so restricting, so stuck in their ways of thinking, that they literally could not see this new production process and assumed that it was all a charade, a confidence trick put on for their benefit.[9]

It is interesting to read how Walter Isaacson, the biographer of Steve

Jobs, describes him. He points out that, whereas Bill Gates was ‘super smart’, Steve Jobs was ‘super ingenious’. The key differentiating factor was how Jobs was not an analyser of data nor a number-cruncher, and that his ingenuity and ‘experiential wisdom’ in part depended on his intuiting the relationships between different things.[10]

In many spheres of life we often hear calls for a ‘paradigm shift’ in order to find solutions to the many complex problems we face, be they economic, social or ecological. Fritjof Capra, building on the work of Thomas Kuhn’s studies of scientific revolutions, defines a social paradigm as ‘a constellation of concepts, values, perceptions, and practices shared by a community, which forms a particular vision of reality that is the basis of the way the community organises itself’.[11] The element of this definition is ‘vision of reality’. What makes true communication in organisations so difficult at times is that, more often than not, they are unable to recognise that people’s ideas and concepts are actually based on very different realities.

Communication skills are one of the most valuable sets of skills we can possess, and yet so few organisations devote any amount of significant resources to developing new ways of thinking by their employees. One powerful way to develop new ways of thinking is to study how scientists throughout history have managed to do so, since in science we can find genuine paradigm shifts, one such being the shift from a quantitative, mechanistic thinking to a more qualitative, organic way of comprehending, which we will now explore.

The Whole and the Parts

When we study the history of science, we find that, in each era, scientists and philosophers have struggled to take on board new conceptual ways of thinking. Eventually, though, these new ways of thinking are adopted, perhaps only after a previous generation of scientists in prominent positions have either retired or died, enabling a new generation of younger scientists, unencumbered with the old ways of thinking, to make their mark.

The business world, though, can still be seen to be stuck in a mechanistic clockwork world. When we study the history of science, by understanding the thinking processes of the scientists (and not just the actual science), we can gain a lot by learning how to develop powerful

new ways of thinking. This is something that business leaders almost never do. While new ideas and methodologies are published each year, very few challenge us to really examine in a profound way our ways of thinking.

However, this is a double-edged sword, in that while science is in one way exemplary in its ability to think creatively and intuitively, when we study the history of science we find many surprising aspects. We begin to understand that the greatest influence on most of our thinking comes from ancient Greece, from Plato and Aristotle – or, rather, misconceptions by teachers and experts of what they thought Plato and Aristotle were teaching.[12] Science is never quite as objectively pure as perhaps its practitioners would like us to imagine, with the social and economic orders of the times impacting on the world view and mental models of the scientist. Science is often more like politics in terms of it being based on building consensus at the expense of truly gifted thinkers with new insights, and the need to stay within the prevailing *status quo* in order not to rock the boat that funds the scientific establishments.

But a surprising discovery when studying the history of science is the battle that philosopher scientists have had in understanding the relationship between the parts and the whole. One of the first accounts was written by Plato, in *Parmenides*, one of his final works. In this dialogue, Plato is attempting to solve some problems that he himself created in his earlier writings, having understood that many people had not comprehended his philosophy, which was now seen as dualistic. While some have questioned why Plato chose to critique his own thinking in this work, other people such as Hans-Georg Gadamer have seen it as Plato's attempt to help people understand where they misunderstood his concepts of the parts and the whole,[13] or in Plato's language, 'the One':

> The one itself, then, having been broken up into parts by being, is many and infinite?
>
> True.
>
> Then not only the one which has being is many, but the one itself distributed by being, must also be many?
>
> Certainly.

> Further, inasmuch as the parts are parts of a whole, the one, as a whole, will be limited; for are not the parts contained by the whole?
>
> Certainly.
>
> And that which contains, is a limit?
>
> Of course.
>
> Then the one if it has being is one and many, whole and parts, having limits and yet unlimited in number?
>
> Clearly.[14]

There are a number of ways of referring to a whole. Plato used the concept of 'the One'. The word 'holism' was coined by Jan Smuts, a South African philosopher, who became President of South Africa. He defined it as 'the fundamental factor operative towards the creation of wholes in the universe'.[15] For Smuts, both an animal or a plant could be taken as a type of whole, whose functioning could only be understood holistically, the whole being in the parts and the parts in the whole. Interestingly, Smuts had been influenced by Einstein, and although Einstein would later endorse Smuts' work in correspondence between them, the term was not generally adopted.[16]

The word 'holistic' was introduced in the early 1970s, in California, in the work of Roger Sperry, winner of a Nobel prize for his work in brain physiology and the processes involved in thinking. The term was popularised by his colleague Robert E. Ornstein, in his book *The Psychology of Consciousness*. While this was interesting, the work was perhaps hijacked by the New Age movement, where the right brain (emotion) was seen as holistic and feminine, and the left side (rationality) was analytical and male. The word 'holistic' was also absorbed into New Age philosophies relating to mind, body and spirit, and because of this it now has negative connotations for many in the scientific community.

While many neuroscientists have given up talking about the divided brain, psychiatrist Iain McGilchrist provides an important and revitalised analysis.[17] He has reviewed the evolution of the brain in birds, animals and humans, and feels that there is something extremely significant in the asymmetrical divisions in the brain, particularly in the corpus callosum,

whose most important function could well be to keep the two sides of the brain separate.

McGilchrist argues that it is our frontal lobes which separate humans from birds and animals, the function of which is to inhibit the rest of the brain. This results in an ability to distance ourselves from the world, to take a step back from reality, thus enabling two things. On the one hand it can lead to Machiavellian thoughts and actions, where we can determine the thoughts and intentions of others, and so allow us to deceive. But, on the other hand, it can also lead us to empathise with others too, seeing them as people who might turn out to share the same interests, values and feelings as ourselves. We do need to manipulate the world, to be able to grasp, hold and use tools, but the trap for us is that this form of attention leads to a restricted view of reality, where we only utilise that information which is of use to us in the tasks we are carrying out.

The world as comprehended by the right hemisphere is entirely different. It sees things in context and understands implicit meaning, metaphor, body language, and emotional expression in the face. As McGilchrist puts it, the right hemisphere 'has a disposition for the living', unlike the left hemisphere, which is dependent on denotative language and abstraction, yielding clarity, and the power to manipulate things which are 'known, fixed, static, isolated, decontextualised, explicit, general in nature, but ultimately lifeless'.[18] The problem for humanity, as McGilchrist sees it, is that society has become dominated by the left hemisphere's mode of conceiving the world, and this has led to us living lives of great paradox, where, in our pursuit of happiness, we have become deeply unhappy. Our pursuit of freedom in western societies has led us to lives of intense intrusion and surveillance, lives dominated by obscure and complex rules and laws. We have information coming out of our ears, but we are less and less able to use it, having lost all sight of wisdom, awareness and knowledge of the whole.

Thus, in McGilchrist's view, we are victims of the feedback loops in the left hemisphere's way of thinking and knowing. It throws out any information that does not appear to fit into its world view. It can be likened to a corrupt military-industrial complex, controlling the media, which has shut out the voices and gentle animistic wisdom of our indigenous people from society. The left hemisphere is vocal, whereas the right hemisphere lacks a voice; and so our modern society, McGilchrist suggests, is a perfect reflection of the world according to the

left hemisphere alone.[19]

Michael C. Jackson introduced the term ‘creative holism’ to refer to the use of different types of holistic thinking and practices in organisations. He classifies holistic approaches into four main types: those improving goal seeking and viability, those exploring purposes, those ensuring fairness, and those systems approaches for promoting diversity.[20] However, his definition of holism is not one that we will be adopting in this book. The reason is that Jackson places the whole before the parts, and suggests that organisations do not need to be broken down into parts in order to understand them:

> Holism puts the study of wholes before that of the parts. It does not try to break down organisations into parts in order to understand them and intervene in them. It concentrates its attention instead at the organisational level and on ensuring that the parts are functioning and are related properly together so that they *serve the purposes of the whole* (emphasis added).[21]

This is not holonomic thinking, where neither the whole nor the parts have primacy. Like Jackson, we will be exploring mental models and how they affect out thinking. Whereas Jackson’s approach is to build on metaphors and paradigms, we will be suggesting that new paradigms may well hinder the intuitive understanding of organic systems. In a holonomic mode of thinking, problems are not only addressed via the thinking, analytical mind, but from a more holistic consciousness which fully utilises the Jungian mandala. In order to help understand and appreciate why, we have to examine what Henri Bortoft described as ‘the unnoticed revolution’, the biggest European philosophical movement of the twentieth century – phenomenology.

Phenomenology

Phenomenology is a philosophical movement the aim of which is to enquire into the nature of ‘lived experience’. This definition immediately raises the problem of what is *lived experience*, since it can be interpreted both in the present tense – experience as it is lived in the now – or interpreted in the past tense, where the word ‘lived’ suggests experience

which has already been lived. Phenomenology began with Edmund Husserl (1859–1938) at the very start of the twentieth century, and was then developed by Martin Heidegger (1889–1976), culminating in his work *Being and Time*. It was also developed in France by existentialist philosopher Jean-Paul Sartre (1905–1980) and Maurice Merleau-Ponty (1908–1961), who was interested in the role the body played in cognition, perception and human experience.[22]

Phenomenology should not be confused with the previous century's introspection which was attempting to explain cognition and thinking. The main insight from phenomenology is that lived experience – our experience of life as it is lived in our consciousness – escapes from both our commonsense understanding of experience and scientific understandings of experience. Both of these are based in our deeply rooted mental models of the world, and the way in which we think about perception. As Francisco Varela said, 'The blind spot of contemporary science is experience'.[23]

The work of phenomenologist Henri Bortoft deserves a special mention. He is best known for his teachings on the scientific consciousness of Johann Wolfgang von Goethe,[24] and his concept of 'authentic wholeness' which Henri felt countered a form of 'counterfeit wholeness' found in General Systems Theory.[25] Henri built on these themes with his final work on phenomenology and hermeneutics, *Taking Appearance Seriously*, which was written in such a way as to lead the reader into what he termed 'the dynamic way of seeing'.[26] The importance of Henri's work on the dynamics of seeing in management and economics has been acknowledged by a number of authors such as Otto Scharmer in *Theory U*, by Peter Senge and colleagues in the book *Presence: Exploring Profound Change in People, Organisations and Society*, and by H. Thomas Johnson and Anders Bröms in *Profit Beyond Measure*. Henri's influence can also be found in the phenomenological approach to the environment and architecture in the work of Ingrid Stefanovic [27] and David Seamon.[28]

In the 1950s, Henri worked on the problem of wholeness in quantum physics as a PhD student under David Bohm at Birkbeck College, who first introduced Henri to new ways of thinking about wholeness. Henri also worked with J.G. Bennett, who in the 1960s created ISERG (Integral Science Research Group), of which Henri was a member. Much of this work consisted in developing the new discipline of systems theory, and in 1971 Bennett inaugurated the International Academy for

Continuous Education, where Henri was invited to teach.

Having begun his career in quantum physics, Henri was now applying this new way of thinking in organisations, focusing on discovering new educational methods in business. It was Bohm's interest in the hologram that would inspire Henri's work on the perception of wholeness in organisations. The laser had been invented in the 1950s, so in the 1960s holograms were new. Although holograms today are manufactured using a different process, they were originally created using holographic plates. The key characteristic of these types of plate was that if they were broken into parts, the holographic image as seen by a person was still whole. For example, if the image was that of a horse, and the plate was broken in two, you would still be able to see the original and whole horse on both plates. This led Henri and a few other researchers to begin to contemplate the perceptions of organisations in a holographic manner, and not via that of the General Systems Theory, a methodology which Henri described as leading to concepts of 'counterfeit wholeness', an incorrect perception of what exactly the whole organisation is.

One of Henri's projects was to undertake an attitude survey in the company J. Lyons & Co., at the time a huge British food and restaurant chain, which in 1947 was the first company in the world to introduce computers, previously seen as tools only for scientists and not managers. Because of this prevalent view, they had been forced to create their own computer. The company now wanted to utilise computers as a management information tool across the entire company, and therefore Henri and his colleagues were asked to conduct an attitude survey to aid this project. Their key insight was based on their holographic thinking, seeing each person within the organisation as a part of the holographic plate, whereby, to some degree or other, the whole organisation 'came to presence' in each and every member of staff. That meant conducting surveys with people from every single department and level of the organisation, and then reporting the findings back in a matrix format.

In saying that the whole organisation 'comes to presence' in each person, we begin to realise that the concept of the whole organisation cannot be written down – it cannot be described in a diagram, and we can neither touch nor point to the whole organisation. It is not an object as we normally think of them, either solid or abstract. General Systems Theory views the organisation in terms of its separate parts. The analyst following this paradigm makes observations, and then describes the organisation in terms of a systems diagram, where the relationship

between each of the parts is formalised as an external relationship as perceived by the analyst. But, for Henri, the analyst has not captured the whole organisation. What they have described is a ‘counterfeit whole’. The reason for it being counterfeit is that what seems like a holistic methodology is in fact a subtle form of reductionism, and the system which has been described is counterfeit because the whole dominates the parts, a form of totalitarianism. The whole in this instance, because it has been articulated in a diagram, acts more like a ‘super-part’ to which all other parts are subordinate.

If we contemplate a hologram, we can begin to understand the relationship between the whole and the parts in a new way. In a hologram, neither the whole nor the parts dominate each other. You cannot analyse a hologram in either a bottom-up or a top-down manner. The whole is dependent on the parts in order to come to ‘presence’, and the parts depend on the whole in order to gain their identity as meaningful parts in a larger system.

However, you also need to consider another aspect of the hologram, which is the ability to be broken up into parts, but still remain whole. When we think of solid objects, our logic, or our commonsense way of thinking about the world, tells us that we cannot break up an object into parts, and it still remains whole. This is a contradiction. If we think about a photograph of a horse, which we were to then cut in two, we would end up with two pictures, each depicting half a horse, rather than a whole one. The trick with the hologram is that it is an aid that leads us to a new way of thinking; and when we think about the two holographic plates, and the fact that two images of horses can be seen on them, we realise that the images of the horses are one and the same.

So here we have an essential difference between Henri’s understanding of the whole and the parts, and the General Systems Theory view of the parts and the whole. With the systems theory, you take a step back in order to see the whole, whereas for Henri, you can gain an intuition or feeling of the whole by going into the parts, such as looking into the attitudes and opinions of each and every employee and recognising that they are embodied or expressed in some way by some aspect of the whole organisation.

In terms of the Jungian mandala, we can see how the introduction of the hologram in the 1960s helped Henri and his colleagues to develop new mental models – new conceptual ways of thinking and insights – which came from a holistic mode of consciousness, one that is concerned

more with relationships than discrete entities, as compared with the analytic, verbal and logical mode of consciousness, which favours a conception of reality based on solid objects.[29] They brought this new thinking into their ways of seeing the organisation, in this case holographically. Their research then gave them new insights that led to concrete recommendations and actions for the organisation, even though these were often based on intuitions and feelings for the organisation as a whole, which could not be easily expressed in language. So we can see here how we can begin to develop all four ways of knowing, so that they work together holistically, preventing us from getting stuck in just one way of knowing the world.

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3. Seeing

Visual Perception

In 1910, French eye surgeons Moreau and LePrince performed an operation on an eight year old boy who had been blind from birth due to cataracts. They had restored his eyes to perfect functioning, and so, on removing the bandages from the boy's eyes, asked him what he could see. 'I don't know', the boy replied, even when shown a moving hand. Only when he could actually touch the hand could he then realise that it was moving.[1] Learning to see as an adult is not easy, and in many cases where 'sight' has been restored to an adult, the efforts involved in subsequently seeing can be so traumatising and difficult that adults who have had the necessary operations go through a psychological crisis, eventually neglecting their sight entirely. As Moreau wrote, 'To give back sight to a congenitally blind person is more the work of an educator than of a surgeon'.[2]

That the act of seeing is not merely an act of receiving sense data into our eyes is a fact that is missed by scientists who refer to themselves as 'empirical objectivists'. This is often referred to by others as 'naive empirical objectivism', and is the belief that reality only presents itself to us from the outside; the role of the perceiver is to remain objectively detached from phenomena being observed, phenomena which come to us through our senses.[3] In this book we will take a very different approach, one in which the perceiver takes a dynamic and active role in the act of seeing.

Before we consider alternative ways of understanding the act of seeing, we first need to briefly review the mainstream or most common way of thinking about visual perception, and that is in terms of physiology and cognitive psychology. The story starts with a consideration of light, a form of electromagnetic radiation which is reflected from different surfaces and structures before arriving at the eye. In our eyes, the light passes through the cornea and lens, before arriving at the retina at the back of the eye, which is covered in light-sensitive photoreceptors in the form of rods and cones.

In terms of optimal vision for a person, there are two factors to take into account. The first is the ability to focus the image in order to achieve minimal blurring of that image. The second factor relates to the efficiency with which the pattern of light can then be transformed into electrical activity. These factors are influenced by the density of packing of receptors (hence falcons have a much higher acuity of vision than humans), and the intensity of light falling on the retina. In having two types of receptor – rods and cones – human vision is able to adapt to both daylight and night-time or low light conditions, although we lose our colour vision at night.

Colour vision is explained by humans having three types of cone receptors, which contain different pigments leading to the absorption of different wavelengths of light. The image which is captured by the retina is not then sent to part of the brain for processing. The processing of information begins in the eye itself, which then sends information *about* the image to the brain. It is worth mentioning at this point Vicki Bruce, Patrick Green and Mark Georgeson's statement about what we know about the next steps in the process:

> The ultimate aim of this approach is to understand how information important to an animal is detected by networks of nerve cells and represented in the patterns of neural activity. For all but the simplest animals, this is a distant goal indeed, and our knowledge does not yet extend beyond the early stages of neural transformation of patterns of light.[4]

The most recent research is still not conclusive about exactly what form of processing occurs in the eye, although we can think of the eye as acting as a filter. The signals from the eye are then transmitted to the brain along visual pathways. Evidence suggests that there is at least more than one visual pathway in the brain, so that there is no single area of the brain processing information about the image. There is, however, still a debate as to whether there are just two separate pathways or a network of pathways, and on top of this there are a number of theoretical models to explain these findings. As Bruce *et al*. note, 'The relationship between most of our visual experience and the functioning of the brain remains largely unknown'.[5]

In looking at cognitive psychological theories of perception, we can therefore see that there is an attempt to understand how our brains are

able to perceive the outside world of objects via representations of the world and via computational processes. This is by far the dominant paradigm. The whole problem of consciousness simply does not exist for cognitive psychologists, who refer to the concept of 'awareness', modelling the brain as a computer.

The insights from phenomenology which have led to a critique of modern cognitive psychology are not new. Henri Bortoft makes the point that the same movement in thinking – into lived experience – can also be found in the earlier scientific studies and methodology of Johann Wolfgang von Goethe (1749–1832).[6] This phrase 'movement of thinking' is central to Part One of this book. What it suggests is that we have the conscious ability to learn how to change into a new way of thinking and a new way of seeing, in order to enable us see more clearly and profoundly, which will lead to better observations, analysis and problem solving in our lives. So we will now turn to an examination of 'seeing' to help us better understand how we too can make this movement of thinking.

The Experience of Seeing

A wonderfully intriguing yet simple experiment carried out in Washington's L'Enfant Plaza metro station was designed to examine context, perception and priorities.[7] Joshua Bell, one of the finest classical musicians in the world, playing a $3.5 million violin handcrafted by Antonio Stradivari in 1713, would play six pieces of classical music incognito, to commuters in the subway. What would the reaction be, how much could he earn as an anonymous busker, and would anyone recognise him?

This experiment resulted in Bell earning a grand total of $32, which is a far cry from his concerts which sell out at $100 a seat. In the course of his performance, a total of 1,070 people walked past, of which just seven people stopped to take in the music and listen. The performance was videotaped, which made for uncomfortable viewing for journalist Gene Weingarten, who then asked the question whether Bell was not real to those who hurried past, not even glancing over to him, or whether it was the people who were not real, living a ghostly life with little conscious awareness of what was around them.[8]

This was obviously no scientific experiment, but it does beg this

question: if one of the world's greatest living musicians cannot distract the public, who or what could? The public here were perhaps not a typical cross-section of society, since the metro station in question lies right in the heart of federal Washington, and so the majority of them would have been government workers. But it is tempting to see in this example, especially when you watch the video, just how much are we so lost in our heads, our thinking minds, that we fail to take in the beauty of our surroundings. Like the commuters walking past Bell, we should ask ourselves just how much of nature's great beauty and *livingness* passes us by. Do we really ever truly encounter nature, or are there aspects of nature that we miss? As Ilya Prigogine and Isabelle Stengers put it: 'Nature speaks with a thousand voices, and we have only begun to listen'.[9]

Examining certain types of picture helps us to think about the act of seeing. It should be said that phenomenologists make great use of many types of ambiguous figures, since in these situations we can notice aspects of seeing that we would not do normally. The first picture to consider is very well known – the Necker Cube – consisting of twelve straight lines (Figure 3.1). Most people will see a three-dimensional cube, and perhaps with a little effort will be able to make it switch to another three-dimensional cube, as seen from a different perspective. From one angle it is as if we are looking at the cube from one of its sides, and from the other perspective it is as if we are looking at it from above. Many people tend to see one angle as the default, and have to make an effort to actively see the cube in the other perspective. Without this continued effort it seems to snap back to the original angle.

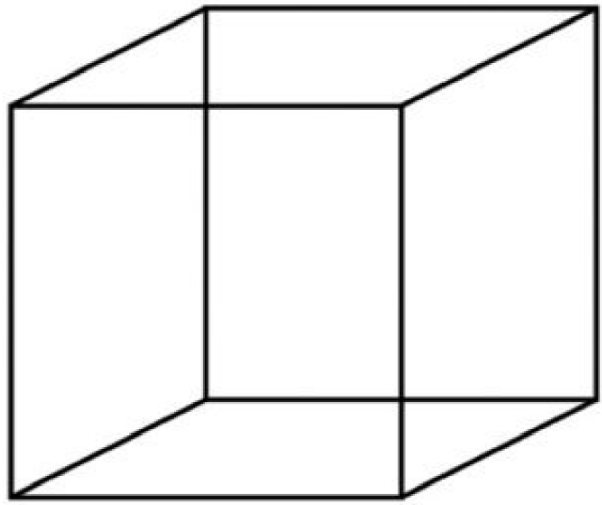

Figure 3.1. The Necker Cube.

The interesting thing about this example is that it is almost as if we see the cube making the change. But what exactly is changing? If we think about the visual field, or the sensory field that meets our eyes, nothing has changed. So where exactly is the change? It is neither in the sensory field, and neither is it in our heads. From the perspective of phenomenology, the change is in the act of seeing itself. But what exactly does this mean? If we are to go upstream into the 'lived experience', we can catch seeing in the act. We have to go into 'the seeing of what is seen'.[10] 'Seeing' is an act of perception; it is not something that happens to us passively. We can explore this further by examining Figure 3.2. Stop reading at this point, and see if you can determine what the hidden image in the picture is.

Figure 3.2.

You may be able to spot the hidden image in the figure immediately, or it may take you a few short moments. We have done this exercise with classes of between twenty and thirty students, and it is normal for two or three to put their hands up immediately to show that they have seen the image. Perhaps a minute later, a few more students will have managed to see it, and then following a few clues from us, more and more will see the shape. Every so often there are one or two students who simply cannot see what is there, and in that instance we show a photograph of the image to reveal exactly what is hidden. If you still cannot see the image, the answer is that it is the head of a giraffe. An additional question we ask our students after they have seen the giraffe is: 'Can you no longer see the giraffe?' We want to know if students can see the figure as they did before they spotted the giraffe. The answer is, inevitably, 'no'.

So what does it mean when you say that you are seeing a giraffe? Are you seeing an abstract figure, and then adding something on? Where is the giraffe? The answer Henri gives as a phenomenologist is not the same as the answer that a cognitive psychologist would give.[11] A cognitive psychologist could only answer this question in terms of mental representations in the brain. But Henri answers this by saying that 'the giraffe is in the seeing.' You are not attributing meaning; you are seeing meaning.[12] Another way of putting this is that you are having a direct experience of meaning.

Contemplating this figure allows us to better understand what Henri means when he discusses ‘going back upstream into the act of seeing’ (Figure 1.7). It can help us to understand that moment when objects appear to us which have always been there, or phenomena such as medical disorders. We have to stop focusing on the end objects, and move our attention to the way in which objects appear to us through the act of distinction (discussed in Chapter 4). When we look at the figure, we see a giraffe on the page, but the giraffe is not there; it is in the act of seeing. This suggests that in order to see a giraffe, we first have to have an idea of giraffe before we have the sensory experience. This goes counter not only to our commonsense notions of perception, but also to the philosophy of empiricism, which interprets experience to mean sensory experience. But if we now think about the phrase ‘lived experience’, we can begin to see how the phenomenological understanding of the phrase now differs, in that ‘lived experience’ is the seeing of ‘meaning’. Could it be that pure empiricism has a fundamental flaw, in believing that our fundamental knowledge of the world comes directly through our senses?

Theory-Driven Seeing

There are many examples of theory-driven seeing in the history of science. If we go all the way back to Ptolemy, an astronomer born *c*. AD 90, we can see how the social order of his time greatly affected the science of that era. Here, the overriding mental model or world view was one where everything on Earth was said to be imperfect, and everything in the heavens was said to be perfect, so that the orbits of the planets, being in the heavens, were assumed to be perfectly circular. When observations showed that this was not the case, Ptolemy created ever more elaborate mathematical models of cycles within cycles, so as to make the observations fit the order of celestial perfection.

Another striking theory of theory-driven ‘seeing’ is in medieval concepts of trajectories (Figure 3.3). Albert of Saxony (c. 1320–1390) conceived motion as consisting of three distinct phases – where a projectile such as a cannonball first travels in a straight line, then begins to lose its impetus, and then falls straight down, having lost all impetus. This idea of motion extended as far back as Aristotle, and is an example of a mental model being so strong as to affect what is actually seen.

While we may laugh at this, Anne Prescott and Michael Mitchelmore have shown that there are still many misconceptions in school students today, with year 11 and year 12 Australian students drawing projectiles incorrectly.[13]

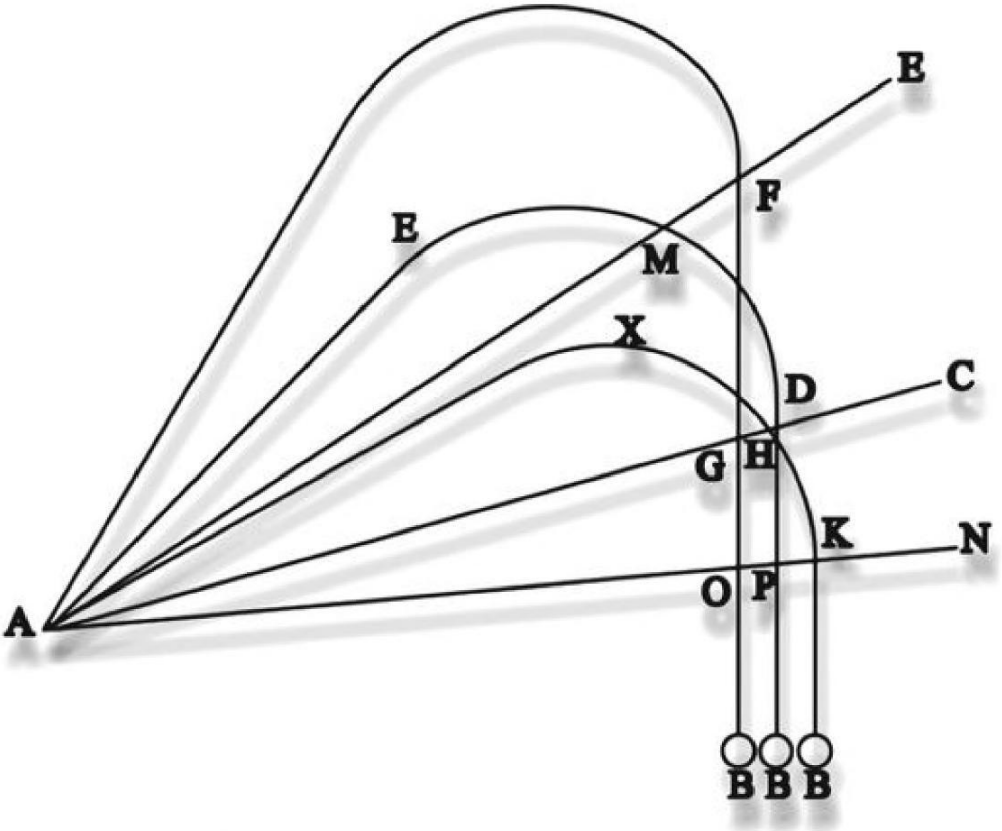

Figure 3.3. Trajectories of Albert of Saxony.

The sun was eventually placed in the centre of our universe by Copernicus (1473–1543), when he published *De revolutionibus orbium coelestium* (On the Revolutions of the Heavenly Spheres) shortly before his death in 1543. What is interesting about this discovery is that it is by no means obvious at all that the sun is at the centre of the universe. All of us commonly think about the sun as it moves across the sky and we rarely conceive of ourselves on Earth as moving around the sun. This, therefore, is a good example of scientific discovery not being a discovery of new facts out there in an objective world, but a new conceptualisation of existing facts, the creation of a new mental model, or what Henri has called the ‘organising idea’.[14]

A final example is the well-known story of Galileo (1564–1642) looking through his telescope which he had just invented, to see mountains on the Moon. Reading Galileo's *Sidereus Nuncius* (1610) shows that, at first, he was not at all sure what he was seeing:

> Now let us review the observations made during the past two months, once more inviting the attention of all who are eager for true philosophy to the first steps of such important contemplations. Let us speak first of that surface of the moon which faces us. For greater clarity I distinguish two parts of this surface, a lighter and a darker; the lighter part seems to surround and to pervade the whole hemisphere, while the darker part discolours the moon's surface like a kind of cloud, and makes it appear covered with spots. Now those spots which are fairly dark and rather large are plain to everyone and have been seen throughout the ages; these I shall call the 'large' or 'ancient' spots, distinguishing them from others that are smaller in size but so numerous as to occur all over the lunar surface, and especially the lighter part. The latter spots had never been seen by anyone before me. From observations of these spots repeated many times I have been led to the opinion and conviction that the surface of the moon is not smooth, uniform, and precisely spherical as a great number of philosophers believe it (and the other heavenly bodies) to be, but is uneven, rough, and full of cavities and prominences, being not unlike the face of the earth, relieved by chains of mountains and deep valleys.[15]

Galileo did not immediately see mountains on the Moon, at that very instant when he looked through the telescope for the very first time, and neither did others who also first looked. The discovery of the mountains on the Moon was, in fact, again a new organising idea, whereby Galileo was eventually able to give meaning to what he was perceiving. Once Galileo had described the Moon accurately, the mountains were there for everyone else to then see.

The Anatomy of Judgement

The Anatomy of Judgement was first published in 1960 and summarises Jane Abercrombie's research.[16] Abercrombie taught students how to think scientifically and objectively, based on the then recent branches of study in visual perception and group psychotherapy, helping them to develop their observational skills in order to be better able to obtain accurate information from specific situations. In her book she described her ten years' work with medical students, and how her unorthodox methods of teaching via free discussion groups led them to better understand the hidden assumptions and unconscious factors that influenced their decision-making when analysing radiographs (X-rays) of patients.

Abercrombie's background was zoology, and she had observed how, when dissecting an animal or looking into a microscope, university students would often not be able to distinguish between what was actually there and what they had been taught to expect, what 'ought' to be there. Her hypothesis was simple, in that she expected that people would be able to make better judgements if they could be taught to pay attention to the process of observing and thinking, and to become more aware of the factors that can influence our judgements. However, what is so interesting is that her book contains many extracts from conversations between her students, and these are extremely revealing in terms of the differences between students, their attitudes to the discussion groups, and just how uncomfortable many of them were.

Abercrombie uses the term 'schemata' which she defines as the 'tools which help us to see, evaluate and respond'.[17] As well as referring to Porter's famous picture puzzle 'The Hidden Man' (Figure 3.4), in which a man is hidden using black and white shapes, she also refers to many other well known illusions to demonstrate the point that 'the relation between the inner and outer worlds – in this case, between the picture and what we see – is a complex one'.[18]

Figure 3.4. The Hidden Man (after Porter 1954).

While Abercrombie cites many well known optical illusions, it is interesting to note her observations of how certain illusions can fail. A great example of her research relating to the 'distorted room' was created by Adelbert Ames. When viewed through a hole in a wall some distance from the room, it looks perfectly normal, and yet if two people stand at opposite sides, they appear dramatically different in size. We (the authors) have both had the opportunity to play in an Ames room in an art gallery in São Paulo, as did many other visitors to their great hilarity. Abercrombie notes how one woman saw all people as distorted apart from her husband, who she saw as normal and the room as distorted. Further research showed that this is true for many newly wedded couples. Her hypothesis is that for people who have recently wed, there is an anxiety that their spouse should remain the same. People, therefore, can be seen to interpret their sensory stimulus not only in part on experiences, but also on present and future needs.

The second part of Abercrombie's study describes how her course of free group discussions, which she facilitated, helped medical students to uncover their previously unrecognised assumptions or schemata, by testing them against those of their colleagues. These were all students between eighteen and twenty years old, and they were at that point in their lives where they were being forced to move out of their educational comfort zones from school, where the teacher was perceived as the

authority who could impart objective and value-free facts to the students. Abercrombie noted how all of the students had a 'nineteenth century' schemata of science and the external world, whereby they assumed that they were passive receivers of information from the outside world through their senses.[19]

As it becomes clear when reading the transcripts from the discussions, many students felt uncomfortable to the point of fear, having to face the fact that their visual perceptions were so loaded with subjective aspects. These fears would more often than not translate into direct and explicit hostility towards Abercrombie. The actual discussions consisted of the following tasks:

- Observe the differences between the radiographs of two hands (one being that of a seven-year old and the other that of a 'normal' adult).
- Discuss the meaning of the word 'normal'.
- Discuss the process of classification and categorisation in science.
- Evaluate evidence.

When examining the difference between the two hands, students would often go beyond that which they could 'see' and would describe inferences, an inference being a conclusion that cannot be derived simply from the evidence available in the X-rays. Some students expressed these as 'facts', something undeniably true, whereas others would consciously describe their inference as a 'conclusion'. Students selected information from the X-rays and ignored that information which did not fit the ordained pattern expected, an example being the counting of the number of bones, where the actual images were ambiguous and where bones visually distinct from each other could not actually be seen. Students were therefore not able to keep alternative hypotheses open while they observed.

The second task that Abercrombie set her students was to read a short text by a technical author about anatomy, and to write down their own interpretations of what the author meant by the word 'normal'. This seemingly simple task showed just how much confusion there was amongst students in their understanding of this deceptively simple term. Abercrombie identified six different uses of the term ranging from informal to statistical definitions. It was not just the students who

discovered confusion over this term, because Abercrombie noted the same confusions in biological scientific texts published by expert authors, not just around the word ‘normal’, but many others as well, such as ‘primitive’, ‘fundamental’, ‘environmental’ and ‘inherited’.

An interesting example is also provided, whereby a doctor who is struggling to diagnose a patient asks him if his diet has been normal. The patient replies ‘yes’, but some days later the doctor learns that for three years the patient has only been eating bread, margarine and treacle. This then allows him to properly diagnose the patient as suffering from scurvy, which is a result of a deficiency in vitamin C. Here the doctor uses the term ‘normal’ to indicate suitability of diet, but the patient is using the term to indicate that there had been no change recently. While issues such as this can be overcome by being aware of the ambiguity of terms, other confusions can still remain due to the fact that the meanings of words such as ‘normal’ can overlap.

It is clear that many of the students found the format of free discussion far more useful in helping them to realise that the receipt of information involves the same kind of processes of selection and interpretation as does the receipt of information from a visual pattern; at the end of the course they were able to use language with greater effectiveness. In designing the free discussion groups the way she did, Abercrombie’s objective could be seen not as imparting new knowledge or ‘packets of facts’, but to facilitate change in the students by helping them to reassess and rearrange what was already in their minds. This process, though, turned out to be not only an intellectual exercise. It is clear why Abercrombie also looked to group psychotherapeutic methodologies, since many students reacted with extremely negative emotions when their deep held convictions were challenged.

The task set for the students before they discussed classifications was to write a short essay on their thoughts on this subject. What was interesting here was that, while most students recognised the man-made arbitrary nature of most systems of classification, many of them also stated that there had to be an ‘absolute’ system of classification – one which ‘does not depend on human convenience, which exists apart from man’s conceptions, and is perfect, permanent and unchanging’.[20] Students expressed this in the following manner:

> … in certain fields at any rate, there is a fundamental classification … which always has existed and doesn’t really

> depend on how you split it up, it's not purely a man-made thing.
>
> I think that in chemistry there is a fundamental order of things and … perhaps in biology one might be discovered.
>
> I do insist that there must be an absolute classification, which is absolutely invariable, and is a product of the order of things.[21]

Abercrombie noted that these opinions were the 'nineteenth century view', where the emphasis in science is discovering an external and objective nature, which is distinct from our own subjective world of illusions, and where universal laws of nature are deductible by reason. These views on how the world 'must' be fixed and eternally stable appeared to strongly affect the ways in which students received information from their course, and, as we will see, how they would react emotionally.

A slightly cruel but interesting experiment by Jerome Bruner and Leo Postman from 1949 highlights just how much our perceptions can be affected by our conceptual way of seeing and just how passive it can sometimes be.[22] They showed to students participating in the experiment a series of playing cards which were projected on to a screen, each one for just a fraction of a second, but some of the cards did not in fact exist – for example, a black ten of hearts, or a red seven of spades. At a certain speed of viewing, the students were only seeing what they expected to see, and not what was actually there. When the speed of showing the cards was slowed down, they began to get slightly disturbed, but they could not articulate why. When the speed of projection was slowed down further, they began to see the actual fantasy cards, and many became extremely disturbed and upset. The effects of this experiment were so strong that some students even panicked as they thought that their minds were being interfered with.

This experiment shows just how directly we see categories, and in many ways this is a useful ability to have, stopping us from becoming overwhelmed by our sensory experience. While we may emphasise and value this mode of thinking in academia and business, for artists, such as a painter or sculptor, often the opposite case is true. Ronald Brady discusses this point in relation to the sculptor Constantin Brancusi's

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