FROM MAP TO JOURNEY: REPRESENTATIONS OF INTER-DIMENSIONAL TRANSFERS IN BOOK FORM

Jo-Chieh Yao

A thesis submitted in partial fulfilment of the requirements of the University of Brighton for the degree of Master of Philosophy

2013

The University of Brighton
Abstract
This research adopts the ‘embodied approach’ developed by philosophers such as George Lakoff and Evan Thompson, to the human experience of map using. The thesis proposes that an explanatory system incorporating a physical, tangible model can be used as an effective means of assisting thinking processes that involve both the first- and third-person viewpoint, alongside both an analytic and holistic approach, to achieve “thinking within experience”. The physical model used to explore such processes is in book form, designed to help to explain the four key aspects of transfers taking place in the map using experience: transfer between small and large, transfer between two-dimensional and three-dimensional, transfer between time and space, and transfer between symbol and object. The spatial arrangement of the book works inside a cubic box also reflects the relationships between each aspect and helps to explain a more complex issue by its relatively simple physicality. The thesis contends that the understanding of map-using, although raising issues of discontinuity in the process, can be better understood from a first-person point of view and hence through what Merleau-Ponty refers to as ‘bodily experience’. The thesis therefore aims to reflect upon the new opportunities for knowledge provided by an explicit consideration of the tensions that exist between how human beings perceive the world and the ways in which cognitive science seeks to understand our engagement with that world. In doing so it highlights the complexity of human interaction with maps, whilst illustrating the benefits of a system that self-consciously aids the thinking process while using them.
# Table of contents

Abstract | 2  
--- | ---  
Acknowledgements | 7  
Author’s declaration | 9  
**Introduction** | 10  
1 Starting point | 11  
2 The journey | 13  
1 **The science and philosophy of experience and the gap between them** | 19  
1.1 Research context and research questions | 20  
1.2 Understanding experience through cognition science and *embodied approach* | 22  
1.3 The gap between first- and third person perspective and how a holistic method can help | 28  
2 **Map-using experience and the book form as a physical model** | 36  
2.1 Map using experience as the case study | 37  
2.1.1 Why map using experience is relevant as the focus of this study | 38  
2.1.2 The system of map using | 42  
2.2 The introducing of physical element in this study | 44  
2.2.1 The importance of the involvement of physical elements in this study | 44  
2.2.2 The role of physical element in this research | 45  
2.3 The development of the physical element in book form | 48  
2.3.1 The medium of artists’ books | 48  
2.3.2 Developments of the book works in this research | 52
2.4 General rules of the book design in this research

2.4.1 Description and arrangement of the book works

2.4.2 Materials

2.4.3 Colour

2.4.4 General design rules shared by the books

2.5 Executing the process

3 Change of scale

3.1 Basics of scale

3.2 Flexibility of seeing and thinking of things changing in size

3.3 Scale, the body, and manageability

3.4 New discoveries through reducing or enlarging scale

3.5 Design of book works: The circle has changed size

3.5.1 Descriptions of book works

3.5.2 Relativity of the size of the circle

4 Flat and holographic experience

4.1 Flat and holographic view

4.2 A map as a flat surface containing spatial information

4.3 Flatland – a close look at the experiences considering ‘lower’ and ‘higher’ dimensions

4.4 Design of book works

4.4.1 Early experiments

4.4.2 General description of the pair of book works: A cuboid has penetrated and A cuboid that penetrates
4.4.3 Implications of the physical properties of the two books 101

5 Transfer between space and time 104

5.1 Translation between time and space 105

5.1.1 Explicit relationship between time and space 106
5.1.2 Ambiguity between spatial and temporal concepts 109
5.1.3 Journey-orientated maps and time 112

5.2 Relativity and the flexibility of thinking about time 116

5.3 Depiction of time: linear time and circular time 118

5.4 Design of book works: Expedition 119

6 Object and symbol 130

6.1 Symbols in maps 131

6.2 Reading and using visual depictions of objects 134

6.2.1 Recognition of actual objects 134
6.2.2 Association of the visual depiction with actual objects 138
6.2.3 Operation with symbols 141

6.3 Design of book works: A field guide of commonly mapped objects and Key to commonly mapped objects 146

7 The container and the integration of the four themes 154

7.1 The black box: its design and implications 155

7.1.1 The box 155
7.1.2 The cube 159
7.1.3 The black box and bodily experience: the bento box 162

7.2 The layered structure 163
7.3 Horizontal relationships between the four themes 167

8 Conclusion 172

8.1 Reflections upon book form based on the development of this research 173

8.1.1 Positive versus negative space of the book 173

8.1.2 The book work as the place for experience to take place 179

8.1.3 Considering the user’s experience 182

8.2 Re-thing experience from an integrated approach 187

8.3 Summary and future studies 189

Appendix: Feedbacks from users 193

Bibliography 208
Acknowledgements

This thesis could not have been accomplished without help from many people. First of all, I would like to express my gratitude to my three supervisors: in the initial stages of this study, Dr. Chris Mullen’s erudite knowledge in visual culture and his vigorous research style helped to extend the scope of this thesis and construct a good foundation using book works as the practical works in this study; his devotion to students I also admire. In the major development stage of this thesis, Chris Rose’s stimuli from cognitive science and its philosophical implications, and at a later stage about haptics and aesthetics has continuously helped me to sharpen my thinking process. Professor George Hardie’s keen eye and experience of book art has helped enormously in the developments of book works, and his suggestions to the manuscript have invariably enriched my written work. Any faults in this thesis remain my responsibility alone.

As for the skills and practical knowledge of bookbinding and box making, I am indebted to Peter Jones in the bookbinding classes held at the University of Brighton. Helen in the bookbinding workshop of the University has also provided valued insights about certain design decisions in earlier stage.

I wish to express my gratitude also to the University of Brighton for their financial support towards my attendance at several conferences, in particular Description and Creativity: Approaches to collaboration and value from anthropology, art, science and technology (University of Cambridge in 2005), and Rules of Engagement: Science and Art Conference (University of York, 2005).

My colleagues at the school of Arts and Communication have provided considerable support, ranging from research skills, debates on a variety of issues in the visual arts, discussions on the
development of this study to friendship and moral support: Pri-ying Wu, Ming-Chang Tien, Annie Wang, Chia-Mei Yang, Megha Rajguru, Faredah Al-Murrahem, Sandra Lim, Yung-Hsien Chen, Soon-Sun Hwang, Bruce Whatley, Jong-Jean Kang, Stephen Long, Brian Love, and the late Grahame White. Without them all, it would have been much harder for me, originally trained as a biologist, to be initiated into the world of the visual arts, and this postgraduate student’s life has been made much more rewarding through the enrichment of their friendships.

Last but not least I would like to express my thanks to my mother Fang-Mei Chen, who has encouraged me to expand my horizons by studying abroad. This research itself has been a long journey, and she has lovingly and patiently supported my wanderings on the other side of the planet all these years. This thesis is dedicated to my mother with love and gratitude.
Author's declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

Jo-chieh Yao
April 2013
Introduction:
Thinking within experience – a web of knowledge

1 Starting point
2 The journey
1 Starting point

This research is centred around experience and its relation to thinking. In some respects, experience and thinking represent two ends of the polarity of our relation to the world: experience represents the first person, intimate relation with things happen immediately around us, and thinking represents a more or less detached, usually not so spontaneous mode of interacting between ourselves and the world. However, in other respects, the relation between experience and thinking is never so simple: what we experience would definitely influence our thinking, and how and what we think would in return affect the way we experience and the content of such experience. This research seeks to better understand the complicated relationships between experience and thinking from available human knowledge, and by working on a case study, suggest a possibility of seeing the two ends of the polarity in a new way, namely "thinking within experience".

The case study that assists the understanding of experience is map using. From a practical perspective, this research started with a question upon observing myself and other people using a map to navigate in a physical space: setting aside the possibility of incorrectly mapped information, how are we able to absorb and digest the information on the map and somehow match the information with the environment, and then achieve the task of going from A to B?

On the surface, this question is about learning how to navigate in an actual space by using appropriate map. Even if the end result comes with different degree of success, it is certainly possible to teach people how to use a map. However, what I am more interested here is not the techniques that can be adopt in such teaching, but on the human faculties that allow map-using possible. In other words, the interest of research here is to find out what kind of human characteristics are responsible for achieving this rather complicated process of map using.
Furthermore, on a broader view, the case of map using provides an interesting example of depicting the relationship between the world and us: we interact with the physical world by referring to a medium that is a representation of the world. Here is a triangle relationship between the map user, the environment, and the map (see figure 2.2). The map using process involves our direct encounter to the environment as well as more detached mental activities of thinking and decision-making. It is also a continuous process that the new encounter and new decision are always happening. To be able to understand this process better would benefit the understanding of the quest about experience and thinking.

Looking more closely, the process of map using involves a lot of comparison of information on the flat surface (assuming the map is in a more traditional, two-dimensional format, whether it's on printed paper or a digital screen) with the actual environment. In appearance, the looks of map and the physical space are very different. To be able to comprehend, compare, translate and match them, there must be a lot going on in the map user's mind. There are four major aspects of comparison in the map-using process identified in this research, namely: the change of scale, flat versus holographic information, the involvement and translation between space and time, and object versus symbol. The detail examination of each aspect, or ‘theme’, constitutes the main body of this thesis through chapters 3 to 6, before an integration of the four themes is studied in chapter 7.

In order to explore these themes fully, the research went through available human knowledge in various disciplines in order to get a big picture with the subject of experience in mind. During this process, it became clearer to me that a multi-disciplinary approach is appropriate for the knowledge base of this research. Seemly independent traditions actually contribute to our understanding of experience in different ways, like fitting pieces of puzzles to
form a bigger picture. These traditions range from western philosophy, science, arts and craft, to oriental philosophy, particularly the basis of Chinese medicine. Thus a unique journey formed as this research taking shape.

In the next section, readers will be taken through a series of important ideas across a range of disciplines that are all essentials in this research. This should provide an overview of the whole research in an accessible way.

2 The journey through different disciplines

Anyone who wants to study experience can either observe, record and even experiment on tangible clues related to experience, or ask someone to describe their own specific experience. The first approach treats experience from the ‘outside’ and coincides with traditional scientific method. The second approach sees experience from a subjective realm and belongs to philosophical quests. In this thesis, I am going to call the first one ‘objective approach’ and the second one ‘subjective approach’, but only in a loose sense. This is because to be absolutely objective in itself is arguable both in essence and technically, even if one adopts scientific method. From the development of quantum mechanics in the early 20th century we have learned that the state of the observer would affect the result of the observation. In the practice of science, to decide which aspect to look at, which data to collect and how to interpret the findings are largely decided by contemporary ideologies and technologies related to the issue of study. Therefore, in this thesis, I use ‘objective approach’ to describe the method that access experience from “outside” of the subject of experience, and ‘subjective approach’ from ‘inside’.

Cognitive science is the discipline that seeks to understand how human mind works from an objective approach. In its early days in the late 19th century, long before the term ‘cognitive
science’ was coined by H. C. Longuet-Higgins in 1973, studies related to brain injuries already gave us various counter-intuitive accounts of how human brain works. With the development of available technologies in the second-half of 20th century, ways of studying the human brain and behaviour also developed. More data have added to our knowledge from neurology, psychology, computer science, evolution biology, linguistics, etc. New understandings also assist philosophical discussions on related issues. All the above can be broadly seen as the knowledge contributed by cognitive science. Details of how cognitive science helps us to understand the human mind is introduced and discussed in chapter 1 and mainly in section 1.2.

The subjective approach, or the approach of seeing from ‘inside’, is best studied in phenomenology. Briefly speaking, the philosophy of phenomenology concerns the structure of subjective experience and consciousness, or ‘how things appear to us’ in the first-person perspective. It was founded by Edmund Husserl in early 20th century and was centred in Germany before spreading to other parts of Europe and America. Among the successors and developers of phenomenology after Husserl, the French philosopher Merleau-Ponty who concerned ‘bodily experience’ in particular and his work is most relevant to this research. Because of the emphasis on body, the physical existence by which we can experience the world in a certain way, Merleau-Ponty’s work is welcoming not only in the disciplines closely related to the body itself, such as dance and theatre, but also in a more recent development related to cognitive science that considers the activities of mind from a point of view of our biological inheritances. This leads us to another cross disciplinary idea: embodied mind thesis.

A good example that extends the embodied mind thesis to a variety of aspects can be seen in George Lakoff and Mark Johnson’s book, *The Philosophy in the Flesh* (1999). The basic idea is that our bodily experience is the primal basis for everything we can mean, think, know, and
communicate. In other words, how we experience and interact with the world cannot be considered separately from our biological body which has been through Darwinian evolution in the past.

The embodied mind thesis provides an opportunity of seeing human experience in considering the existence of the body. This can be seen as a good beginning in dealing with the mind-body dichotomy inherited in western philosophy. However, in this research, I am going to take a step further and bring in a very different way of seeing the relationship of mind and body. It is a holistic approach behind Chinese medicine called Five Elements or Five Processes system. More about the ideology of Five Elements system will be introduced in section 1.3. In here it is sufficient to know that the Five Elements system is a holistic approach because it is more interested in the relationships between each element than the elements themselves. This approach puts elements in a dynamic system and always sees each element as part of the system.

To understand experience better and to assist the discussion between different individual readers, it is beneficial to let people discuss an experience that can be shared in some way, so that they are not only talking about knowledge that can be learned from scientific research or outside resources (objective approach) but also talking from their own experience (subjective approach). Thus a physical element was introduced to this research to serve as an provider of communal experience, and it took the form of a book: a medium that is portable, with a large opportunity of manipulating its form, and traditionally seen as a vehicle for knowledge transportation – that last point also resembles the role of map. By using a map, we are able to take actions even if the world around us is unknown or unfamiliar. In this sense, the physical element in book form in this research provides a comprehensive instance of ‘reflection while
doing’, which is also an essential property of craft. And as with craft, in this research users are requested to use their hands to handle and play with the physical objects. This brings us to the consideration of the haptic quality of objects that is also related to the bodily experience as introduced above.

‘Haptic’ is about the sense of touch, and ‘haptics’ is related to movement, behaviour, action, touch, etc. Movement considers both space and time. Although in most instances, normal people would perceive space as majorly visual, the aspect of time is not to be omitted. It is discussed in chapter 5 that in blind people’s cases, the perception of space is understood or translated in the sense of time and body movement. Is can be said that the body has more intelligence than people would normally perceive, and this intelligence also affect our behaviour in various ways. More discussion of this aspect is in section 1.2 and it enriches our understanding of the embodied mind thesis.

As previously stated, the physical element of this research took the shape of a book form. Books as a medium of artistic expression are called artists’ books. As many artists already demonstrated, the medium of artists’ books provides a huge range of possibilities on its physical form and the meaning it can convey. In this research, the interest lies on the three-dimensional quality of the book form and the possibility of communicating our ability of map-using experience. Therefore the set of book works in this research were designed according to four themes in map using and targeted at our cognitive ability related to those themes. The design of each book work can be seen throughout chapters 3 to 6, and the spatial arrangement of the set of book works and its implication is shown in chapter 7. Since the book works were designed as a tool for communication, testing with selected users were also conducted. The results of interviews with
readers are introduced and discussed in chapter 8 and mainly in section 8.1.3. Detail documentation of the interviews is in the appendix.

It is worth noting, although this research adopts book form as its physical, three-dimensional element, in a strict sense this physical form is different from artists' books (the introduction of artists' books is in section 2.3.1). The most important difference is that the work in this research is not intended to be a stand-alone piece for artistic expression. It is in a sense incomplete, because it is part of the explanatory system that works only in relation with the rest of the thesis. In some degree it is a ‘physical metaphor’, and because of its property of ‘interactiveness’, it provides a shared basis for discussion between different readers even when these readers are in different places. An additional point is that since the design of the physical element borrowed the book form and learned something from artists' books, some thoughts derived from the results of this research can be useful for the realm of artists' books. This is to be discussed in detail in section 8.1.

And a last point is about aesthetics: there are two directions in the consideration of aesthetics applicable in this thesis. One direction is the social-political ideas that related to taste and of applied complexity in art and objects. There is a long tradition of discussion on this direction in the western philosophy. However, there is another direction of aesthetics that is more directly related to the spirit of this thesis: the aesthetic perception of meaning. This is where the phenomena of a ‘gut response’ to complex challenges such as the visualisation of data plays a significant role in analysis and decision making in objective study of complex information (personal communication with Chris Rose). ‘Gut reaction’ is neither Rationality nor Irrationality. Part of the embodied mind thesis holds that even our largest abstract concepts are somehow based upon the biological and quantum-mechanical workings of the sensory apparatus available
to the human body and it provides a way of seeing ‘gut reaction’. Under this ideology, aesthetics
perception of meaning exhibits the taste of our biological makeup. To put this into the context of
this research: when users interact with the book works and display certain reactions in their
bodily movements, in some degree it also displays their gut reaction and gives us certain clues
for understanding our biological apparatus.

Because this research considers a wider range of knowledge, this introduction is intended to
provide a ‘map’ for the content of this thesis in the following chapters. If, during navigating
through the landscape of the thesis, there is uncertainty about the orientation, I hope readers will
be able to come back to this ‘map’ and re-identify their location in their journey.
Chapter 1 The science and philosophy of experience

1.1 Research context and research questions
1.2 Understanding experience through cognition science and embodied approach
1.3 The gap between first- and third-person perspective, and how a holistic method can help
1.1 Research context and research questions

*Experience* is at the core of this thesis. However, what is under consideration here is not the ontological investigation of what experience is, but the tangible ways to approach experience. This thesis is concerned with developing an embodied approach to the human experience of map using. The thesis aims to reflect upon new opportunities for knowledge provided by an explicit consideration of the tensions that exist between how human beings perceive the world and the ways in which cognitive science seeks to understand our engagement with that world. In doing so it highlights the complexity of human interaction with maps, whilst illustrating the benefits of a system that self-consciously aids the thinking process while using them.

A straightforward way of categorising ways of understanding experience is to categorise them into two groups: the subjective approach and the objective approach. Each approach can find a discipline to provide major conceptual understandings of experience: phenomenology for the subjective approach, and cognitive science for the objective approach, as phenomenology sees how things appears to the consciousness, and the cognitive science studies the function and workings of human mind in an empirical manner. Since around mid-20th century, each of the disciplines has provided abundant insights and knowledge into *experience* in its own way, and continues to do so today; however, even though the areas of concerns of the two disciplines are definitely overlapping, there seems to be an inevitable gap between the explanations provided by the two disciplines – after all, subjective and objective approaches are, in nature, quite opposite to each other.

So, is there a deeper-rooted reason for the existence of the gap between the two approaches? Is it possible to find an approach that allows us to think of experience in both subjective and objective manner? Evidences suggest that the difficulties of bridging the gap
between these two insightful approaches lie in the analytic nature of western philosophy and style of thinking, which is inherited from ancient Greek philosophy. This thesis argues that, by introducing a certain degree of holistic method which emphasises relationships rather than analysis and categorised properties, both subjective and objective approaches can find new ground to collaborate in the best interests of new knowledge. Later in this thesis, a physical book works model is developed to help to demonstrate the reasoning of this argument in the particular context of map use. The physical model takes form as a set of book works that provide both direct experience and conceptual elements for the reader. Thus, the physical model and this written component together form an explanatory system that allows the readers to experience as well as think about experience.

In this chapter, the background of the embodied mind approach and the gap between subjective and objective perspective are introduced, followed by a discussion of the holistic method by which relationships are operationalised. This will set a context for understanding the rationale behind the physical means, namely map use, by which I have addressed these issues which will be discussed in detail in Chapter Two.
1.2 Understanding experience through cognition science and the embodied approach

*Experience*, as a noun, can be seen as the content of human consciousness. Such content can be as fundamental as the colour we see – redness, greenness, for example – or as complex as a full process of learning how to drive or even of raising children that involve various mental and emotional aspects. As a verb, *to experience* refers to the situation in which the subject is present at that specific time frame when the subject's consciousness is at work – so the subject would have feelings or thoughts or combination of both during that time frame and afterwards. We would never describe someone as ‘experiencing a coma’ since a condition such as coma implies that the person’s consciousness is not at work.

The investigation of experience would inevitably concern consciousness, which, in turn, is one of the central issues of the philosophy of mind: what is the nature of consciousness or mental states? How can we have ‘consciousness’? What is the relation between mental states and the state of the physical body (particularly the brain)? The last question itself is a ‘mind-body problem’ and is worth more discussion here, as we will compare the question of the mind-body dichotomy with a different way of seeing the relationships between mind and body in the next section.

A *dualist* answer to the mind-body problem can be traced back to as early as Plato, and the representative figure is Descartes.⁷ The dualism school sees the mind and the body as independent entities, or at least the mind holds specific, independent properties that cannot be reduced to the brain. It is not sufficient to understand the mind just by understanding the body or the brain, even if they are closely related.

On the contrary, *monism*’s position is that the mind and the body are not distinct entities. Among several versions of monism, the most well received version since the 20th century holds
that the mind will eventually be explained by physical theory, as all other aspects of the natural world. Understandings of the brain and the body will eventually tell us what the mind is. At first glance this may be seen like a form of scientific reductionism – if certain phenomena can be explained by the simplest method, then it should not be explained by introducing more elements. However, as the scientific methods and knowledge progress, it has become increasingly clear that mental activities are not so independent from the body as my exploration of map use in this thesis seeks to demonstrate.

Cognitive science, in brief, is the empirical, scientific study of how the human mind works. Cognitive science as we know it today largely emerged in the 1970s, as many disciplines progressed and each of them gained insights into how the human mind works, and shed light on the philosophical quest of who we are and what the nature of human reasoning is. It has an interdisciplinary nature, and these disciplines include biology, computer science, artificial intelligence, linguistics, neuroscience, psychology, and the philosophy of mind. Take artificial intelligence for example: it is concerned with the nature of intelligence and works to achieve specific tasks by means of a computer. The term cognitive science has an intimate relation with artificial intelligence – it was coined by H. C. Longuet-Higgins in his 1973 commentary on the Lighthill Report, which concerned artificial intelligence research in its current state. Later, the journal Cognitive Science began publication from 1976, and the first conference on cognitive science was held at La Jolla, California in August, 1979, and has occurred annually since.

Before cognitive science was established as an academic discipline, of course, there existed scientific studies related to human mind. One earlier approach to understanding how the human mind works may appear surprisingly counter-intuitive, coming as it does from brain-injured patients. For example, neurologist and writer Oliver Sacks’ points out that,
Broca, in France, found that specific difficulties in the expressive use of speech, aphasia, consistently followed damage to a particular portion of the left hemisphere of the brain. By identifying the specific nature of the injury to the brain or neural system, and by comparing the behaviour of the patients in question with that of normal people (or the difference before and after the injury), we can at least deduce that certain parts of the brain are related to certain functions. The results are often quite counter-intuitive, too. For example there are many reports about a change of personality after a head injury – examples like this tell us that personality is not entirely nurtured by culture and discipline, but also has somatic – or bodily – roots. Readers can find many well-written stories from Sacks, in particular from his two famous anthologies, *The Man Who Mistook His Wife for a Hat* and *An Anthropologist on Mars*. To take an example: in one of the cases Sack observed, Virgil, who had been blind from infancy, regained his eyesight for a short period of time in his forties. Some other aspects of his story will also be introduced later in chapter 5; here we should consider how confusing to him were the shapes and movements of unfamiliar elements in his environment. After the surgery, for some period of time following his return home from the hospital, he had to walk along a line drawn on the floor – and complained that things ‘changed’ shape, and never looked the same when he walked, so it was very difficult for him to recognise the fridge as the fridge if he saw it from a new angle. Also, it was very difficult for him to recognise his cat by eyesight alone: it appeared very different each time he saw it, and only by touching or stroking it could he gain a sense of recognition. Sacks thus notes:

> When we open our eyes each morning, it is upon a world we have spent a lifetime learning to see. We are not given the world: we are given the world through incessant experience, categorization, memory, reconnection.
No adult remembers how difficult it was, as a newborn baby, to make sense of the world visually. How do we ‘know’ without thinking that the thing, when it presents itself to us from a different angle or distance, or partially obstructed, is still the same thing? How do we start to learn that our own hand is nearer than the ceiling? The developmental process of ‘making sense’ of what we see requires the incorporation of other bodily experiences, not merely visual ones. However, for most of us, who have normal eyesight for at least most of our lives, the world ‘seems’ readily available, as long as we open our eyes. No wonder vision is usually used as a metaphor or model to describe the superiority of certain abilities (to take an example from normal English usage: ‘I see’ can mean ‘I understand’). When vision is used as a model to comprehend human perception, cognition or reasoning, it is very easy to get a picture that is efficient, detached, and even omnipotent. Alva Noë in his *Action in Perception* (2004) proposes to use touch rather than vision as the model of considering human perception. In doing so, the process of perception is ‘slowed down’ and we will find many more body movements – actions – involved in it: we reach out our arm towards clothing, touching it with our fingers, and rubbing it between the fingers to gain more knowledge of the fabric. Perception is then achieved in a sequence of skilful body actions; it’s not superior, nor detached from the body; it has to take into consideration the relationship between the body and the environment. Noë argues that all perception is intrinsically active, and vision is not an exception. Indeed, in vision we also have actions (such as to move our body in order to get a better view), it’s just that it all happens so fast that we are not normally aware of it.

Perhaps it’s not surprising that, as with the increase in knowledge of how the human cognitive system works, at the same time more people would consider that consciousness and reasoning play only a small part in our life – or at least smaller than people thought before.
relationship between conscious thought and the body is not that the former is the superior governor to the body and uses the body as a tool to execute its intention, rather, the consciousness is constantly shaped, influenced and informed by the body. As George Lakoff and Mark Johnson put it: reason uses and grows out of bodily capacities such as perception and movement.\(^\text{10}\)

In the fields of robotics and artificial intelligence, we see a similar ideology shift, as materialised in Rodney Brooks’ robots Allen and Herbert.\(^\text{11}\) Brooks’ work ran counter to the prevailing mainstream thought in the artificial intelligence world which held that the intelligence taking place in the brain – or a computer – where a well-defined problem is given, solved, and then the result, or output, is sent to the environment, or the programme designer. He argues that this kind of ‘intelligence’ is isolated from the world. His approach is from Darwinian evolution’s point of view that all intelligence behaviour displayed by animals (including human beings) has been shaped in the real world with a long evolutionary history, and is a result of directly interacting with the environment. So a better model for understanding intelligence is to allow robots directly to interact with the world, where they can display appropriate responses to the situations they encounter, even showing some degree of adaptation – that is to say, can cope with actual, dynamic situations in the real environment, not pre-defined by human programme designers. Stemming from this ideology, Brooks’ robots are equipped with sensors and motors that constitute a small yet complete *layer*, as Brooks names it, which can perform one particular skill such as ‘avoid hitting objects’ or ‘wander about’. Different layers also have certain rules to interact with each other to assure coordinated and safe modes of behaviour. But there is no centralised agency or government determining what behaviour is appropriate, or stipulating which layer should work and which should not. Under this methodology, Allen can wander freely in the
corridors of Brooks’ office building in MIT while Herbert not only wanders around but also collects cola cans, bring them back to its point of departure.

What we can learn from Allen and Herbert, Brooks notes, is that intelligence is situated and embodied. Situated means the intelligent agent constantly confronts the real world and, to use Brooks’ own words, responds to the real world “in a timely fashion”. Embodied means the intelligence is composed of the body, and is not a set of algorithms that deals with abstract tasks. Together it depicts an agent that can act in the real world intelligently, without detailed representation of the world (as previous mainstream artificial intelligent studies had tended to assume). The need for memory is surprisingly low; it doesn’t need symbolic reasoning; the overall ‘cost’ is much lower than a sophisticated brain (computer), but the end result is more successful.

These robots’ level of intelligence is still far away from that of human beings, and Brooks indeed states that his intention is not to produce a replica of a human being but to show an agent with intelligent behaviour. But in essence this approach is progressing very well, given its relatively short history, and considering that our own body as a product has been constantly shaped by Darwinian evolution. How the human mind works cannot be considered independently from its physical structure and its biological history. Furthermore, all aspects of human cognition, such as thought, reason, concept awareness, etc., are all inseparable with and shaped by the body. In their seminal work, Philosophy in the Flesh (1999), Lakoff and Johnson reassess western philosophy based on discoveries in cognitive science and promote a philosophy that is also embodied and can respond to empirical studies; that our bodily experience is the primal basis for everything we can mean, think, know, and communicate. (Discussions of specific cases in their work will be seen in chapter 6.)
1.3 The gap between first- and third-person perspectives and how a holistic method can help

Findings from cognitive science have inspired us to see our own mind and body in a more integrated manner. A high degree of continuity is shown between the mind and the biological body, which, in turn, is a product of Darwinian evolution. Darwinian evolution explains living beings to the world by physical mechanism; the method itself suggests continuity between physical, inorganic world and the organic world. Eventually, everything – including human consciousness – will be explained by physical theory. However, this line of argument does not guarantee the triumph of monism in the mind-body problem as described in the beginning of section 1.2.

One of the difficulties in scientific, empirical studies about human cognition is how it can relate to our own subjective experience. This can be seen as a sister of the body-mind problem and is called the ‘hard problem of consciousness’, as coined by David Chalmers in his 1995 paper Facing Up to the Problem of Consciousness.¹⁴ Researchers who are concerned with this question don’t consider human beings as merely agents performing input-output functions; they recognise consciousness as we experience it. However, standard scientific language is strictly objective and speaks from the third-person perspective. There is an innate difficulty in putting this language into the first-person voice, and indeed it also causes some people to feel ‘alienated’ and become merely a ‘subject’ when they confront scientific studies directly. On the other hand, the philosophy of phenomenology – the studies concerning ‘how things appear to us’ in the first-person perspective – and in particular French philosopher Merleau-Ponty’s work that emphasises bodily experience,¹⁵ is welcome to the researchers holding embodied mind thesis. Here we can
see the researchers’ effort in linking the objective, third-person’s point of view with the subjective, first person’s point of view. It is interesting to note that Lakoff and Johnson in *The Philosophy in the Flesh* have explicitly ‘honoured’ Merleau-Ponty as a philosopher of the embodied mind.\(^\text{16}\) In *Action in Perception*, Alva Noë proposes that all perception is like touch, and recognises the touch-like character of vision playing an important role in Merleau-Ponty’s philosophical writing.\(^\text{17}\) In Noë’s ‘sensorimotor’ account of visual perception, he notes,

> You aren’t given the visual world all at once. You are *in* the world, and through skilful visual probing – what Merleau-Ponty called “palpation with the eyes” – you bring yourself into contact with it.\(^\text{18}\)

Evan Thompson devotes his book *Mind in Life: Biology, Phenomenology, and the Sciences of Mind* (2007)\(^\text{19}\) to deal specifically with the continuity of life and mind, by extensively investigating what is shared between embodied approach of cognitive science and phenomenology, as well as the explanatory gap between them.

Indeed, there are still debates about the extent to which phenomenology can inform scientific studies (some scientists find that ideas from phenomenology cannot help them to design better and meaningful experiments), and there are disagreements about the relationship between philosophy and natural science (some philosophers are more strictly against ‘naturalising’ phenomenology). However, in this MPhil study, I use practical work to *access* experience while bearing in mind the knowledge from the embodied approach. Further discussion of this aspect of experience can be seen in section 8.2.
There is another way of seeing the conflict between a first- and third-person perspective. By looking at the mind-body problem from a different perspective, new insights can be gained. It is worth notice that the mind-body dichotomy is not a universal problem shared by every culture. Chinese medicine, for example, doesn’t draw a clear line between ‘mind’ and ‘body’. Different emotional states are seen to influence specific organs of the body, and the healthy or unhealthy states of the organs would also reflect the person’s temperament. In the first Chinese medicine classic, *Neijing*,

Anger is harmful to the liver; excitement is harmful to the heart; contemplation is harmful to the spleen; grief is harmful to the lung; fear is harmful to the kidney.

Take anger and the liver as an example: in Chinese medicinal practice, if a person is prone to anger, then the condition of this person’s liver would be affected and he would be expected to become less healthy. The less healthy state of the person’s liver would in turn make the person even more prone to anger, thus forming a vicious circle. If treated properly, not only the liver, but the temperament of the person will both improve to a healthier state. Medicine itself is an empirical discipline, and what it concerns most is whether a person can be restored from a less healthy state (or kept in a healthy state). To Chinese medicinal practitioners, the patients can provide clues from both physical conditions such as the colour of the skin or the quality of the pulses as well as the person’s disposition and self-image. So an unhealthy state is not treated as either a physical problem or an emotional problem; both aspects could be seen as one problem, and both aspects are treated at the same time.

The principle behind this practice is a world-view that sees the *relationships* of how different elements influence each other as the force that governs the world (and ourselves) and this issue
is key to this thesis. The representative theory is the system of Five Elements, or Five Processes, which is actually incorporated into the understanding of the working of human body, and study of Chinese medicine has been based on this foundation.

The Five Elements are wood, fire, earth, metal and water, which are considered to be the basic properties embodied in every aspect of the physical world. As early as the West-Zhou period (1111-771 BC), an earlier version of this idea was recorded in literature, for example in *Shangshu*. One basic aspect of this five-element system is that there are ‘encouraging’ and ‘discouraging’ relationships between the five elements. The diagram in figure 1.1 depicts these relationships. For example, if the element of metal is in a strong position, water would be encouraged, but wood would be discouraged. However, since water also encourages wood, the net result of wood would become more complicated, and most likely has to take fire and earth into consideration, too. In short, it is a dynamic system with each element constantly shaping others and being shaped by others. This doesn’t mean we are not able to observe and make sense of the physical world; it’s just that we should always bear these dynamic properties in mind and be aware of the fact that things change along the line of time.

The above type of system is certainly very different from the contemporary western style of thinking, which places much more interest on ‘grouping’ and ‘categorised properties’, as pointed out by psychologist Nisbett: “learning that one object belonging to a category has a particular property means that one can assume that other objects belong to the category also have the property.” The following experiment provides a clearer picture of the difference between ‘category’ thinking and ‘relationship’ thinking. Developmental psychologist Liang-hwang Chiu showed a set of three images in an illustration to American and Chinese children and asked them to group the two of them together. The images consisted of a chicken, a cow, and grass. Chiu

---

**Figure 1.1** The Chinese *five-element system*, showing the encouraging and discouraging relationships between the five elements. Diagram adapted by the author from Chinese to English.
found that the American children preferred to group objects together by a form of ‘taxonomic’
categorisation – chicken and cow are grouped together because they were animals. Chinese
children preferred to group objects on the basis of relationships, so that they would be more likely
to group the grass and cow together because “the cow eats the grass.”

This contrast of ‘category’ and ‘relationship’ thinking also reflects on the interaction between
people and their view of seeing the relationship between ‘self’ and the ‘world’. Developmental
psychologists Fernald and Morikawa visited homes of Japanese and Americans who had infants
either 6, 12, or 19 months old, and observed the how the mothers play the toys with their babies.
They found significant differences in the behaviours of mothers even with their youngest children.
American mothers used twice as many object labels as Japanese mothers, while Japanese
mother engaged in twice as many social routines of teaching politeness norms. American
children are learning that the world is mostly a place with objects; Japanese children are learning
that the world is mostly about relationships.

Furthermore, as Nisbett also pointed out, categories are denoted by nouns, while
relationships involve (tacitly or explicitly) a verb. Nouns provide labels for objects to be easier
stored away, while verbs is comparatively vague, and learning the meanings of a transitive verb
usually involves noticing two objects and some kind of action that connects them in some way.
A world constructed by categories tends to be stable, and a world constructed by relationships is
prone to change.

Here we can see why the mind-body dichotomy is not a problem in a system that is
interested in relationships rather than categories: in a world of relationships, the elements are
subjects to be influenced and changed, and there is no urgent need to identify those properties
that define the specific elements. On the contrary, in the western style of thinking, to decide what
properties belong to an element is essential because the understanding of elements contributes to the understanding of the world. It implies that the world can be understood by the basic elements. Actually, the word ‘analytic’ from Greek involves the meaning of ‘division into elements or principles’. Under this approach, ‘mind’ and ‘body’ have to be two separated entities that defined by different set of properties. Therefore they cannot be explained by each other. Dualism must win the debate on the mind-body problem. This tendency could be a dead end for understanding the content of consciousness, or experience – since mental activities and body conditions do influence each other, as empirical studies continues to discover. If, however, when ‘influences’ and ‘relationships’ are seen more essential than defining the elements, a holistic picture emerges that allows us to exam experience in a broader context that involves empirical evidence about human cognition and the first-person perspective about experience itself.

In this thesis, the introducing of holistic thinking is further demonstrated by examining a specific example of experience: the experience of map using. The rationale is discussed in the next chapter. This thesis also adopts a set of physical models as part of the explanatory system. This reflects a commitment to the potential of practice-based as a means of illuminating questions of experience and particularly those related to map using which I will explore in more depth in the following chapter.
Chapter 1 The science and philosophy of experience

S
1 Studies about Descartes are abundant. Here this example is given because it analyses Descartes’ ideology against the recent understanding about human mind based on the development of cognitive science. Damasio, Antonio. Descartes’ Error: Emotion, Reason and the Human Brain. London: Vintage, 2006.


5 Ibid.


8 Ibid, p.108.


15 The important work to understand Merleau-Ponty’s phenomenology is Phenomenology of Perception, first published in French in 1945 as Phénoménologie de la Perception.

16 In their acknowledgements of Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought.
Chapter 1 The science and philosophy of experience

18 Ibid, p.73.
20 Neijing, or Huangdi neijing, is the earliest literature of Chinese medicine. The actual author and written date is still disputed, but most scholars believe it was written in the East-Zhou period (770-256 BC), while others believe it to be written in a slightly later date.
21 Shangshu is believed to be the oldest classic of history in ancient China. The author is unknown. Its commentary, Shangshu-chuan, was written in West-Han dynasty (202 BC - 9AD).
Chapter 2 Map-using experience and the book form as a physical model

2.1 Map-using experience as the case study
   2.1.1 Why the map-using experience is relevant as the focus of this study
   2.1.2 The system of map using

2.2 The introduction of a physical element in this study
   2.2.1 The importance of the involvement of physical elements in this study
   2.2.2 The role of physical element in this research

2.3 The development of the physical element in book form
   2.3.1 The medium of artists’ books
   2.3.2 Developments of the book works in this research

2.4 General rules of the book design in this research
   2.4.1 Description and arrangement of the book works
   2.4.2 Materials
   2.4.3 Colour
   2.4.4 General design rules shared by the book works

2.5 Executing the process
In this chapter, we examine how the map using experience is a suitable case for the purpose of understanding human experience. Then the importance of the physical element of this study – book works – is discussed, particularly in respect of the role it plays together with the relevant background knowledge of the medium of artists’ books. Following this is the development and general rules adopted by the book works in this thesis. In the last section of this chapter, a framework of the following four chapters is provided in order to prepare readers for further navigation into the details of this thesis.

2.1 Map-using experience as the case study
As I pointed out in Chapter One, ‘experience’ has the properties of both a noun and a verb. As a verb, it implies the subject’s conscious engagement with the situation at a particular time. The best case study for this research would involve body actions and be easy for wider audience to relate to their own experience. It should also be the kind of experience that has a certain degree of complexity, so that both analytic and holistic methods can be adopted when dealing with this subject.

Map using experience fits into the above three criteria: action-involved, familiarity and complexity. Furthermore, it is closely related to human cognition – as the sense of orientation, space and time, body movement and visual recognition all play an important part in the process. On the one hand, this subject leads us to further knowledge of cognitive science, of which the development in the past four to five decades often brings us counter-intuitive insights on how human mind works (as introduced in Chapter One). On the other hand, it lends us the opportunity to compare scientific knowledge with our own subjective experience and can induce insights into the relationships between objective and subjective points of view.
This section is divided into two subsections: first, I take consider the benefits of map using process to understand why it might provide a suitable case for this study. Second, the map using process is analysed as a system with a certain degree of complexity worthy of further discussion in the later chapters.

2.1.1 Why the map-using experience is relevant as the focus of this study

Reading the map and navigating an environment is an action involving the conscious study of information as well as the bodily experience that may not be obviously conscious to the map user. Information here can be understood as any cue from the outside of the map user that reaches the map user's sensory system, such as shapes and colours in the environment and on the map. The bodily experience involves any action taken, from the handling of the map to the movement of the body in the environment. This situation allows us to re-investigate the whole activity by subjective observation (the phenomenology approach) as well as objective knowledge (the cognitive science approach). Questions related to subjective observation can be: how do I recognise the shape of the land as this area on the map? Do I find rotating the map and/or my body makes it easier to navigate? Do I prefer to use subjective language such as left, right, etc. or objective language such as east, west, etc. to help myself to navigate? Questions from the scientific approach can be: how does human mind recognise an object as an object? What is the difference between seeing a three-dimensional object and seeing its two-dimensional projection, such as a photograph or drawing? How does the sense of direction work, and is it gender dependent? Is it learned or born with?

Although there is a long history of maps and map using, the experience of using a map is familiar to most people today and is cross-cultural. Maps for outdoor activities such as hiking,
mountain climbing and orienteering are targeted at more specific audiences. In many urban settings, maps are also universally provided for public transport, museums and exhibitions, interior space of buildings, parks or streets, etc. The format of the maps is varied: they can occupy a large surface on the wall, can be printed in a book, as a leaflet that is folded and can be put in the pocket, or occupy only a small area of a business card. This subject provides a basis for a wide audience to relate to their own existing experience of map using while reading this thesis and interacting with its physical elements.

The fact that maps and map using involves multi-dimensional aspects can be seen reflected in different types of maps that exist. In detailed discussions in later chapters, examples from some historical maps or different types of map will be given when necessary. However, in most cases, the maps referred to in this thesis are modern, paper and print-based maps in a scale that is most relevant to our bodily experience and screen-based maps, such as SAT NAV, are excluded in this study. The working definition of ‘map’ in this study is indeed, as follows: a two-dimensional, size-reduced graphical representation of the surface of the environment, one that can reliably assist the user’s navigation. These are relatively large-scale maps that show only a tiny portion of the earth’s surface and convey the shape and pattern of the landscape, as it “lies within one’s own direct experience” as Paul D. A. Harvey said on the subject.¹ Or, in the case of the urban environment where the natural landscape is less significant, the shape and pattern of roads, streets and buildings is emphasised instead – these also “lie within one’s own direct experience” in the same sense as Harvey suggests. They are not fictional maps, decorative maps, maps that skilfully deceive the reader (this is a notorious yet fascinating topic related to maps²); they are not related to discussion focussed on political power or cultural influences, nor those diagrams that represent events and statistical data related to geographical regions. Where
very occasionally these maps are mentioned, they are only to provide examples to illustrate some specific point about maps. Other map-related words such as atlas and plan are also referred in the same manner. For an example of what types and genres of maps are mainly referred to in this study, please see figure 2.1.

Figure 2.1 A selection of examples showing the variety and extent of maps referred in this study. (Detail continued next page.)
Chapter 2 Map-using experience and the book form as a physical model

Figure 2.1 (Continued.) 1. Ordnance Survey Explorer Map, scale 1:25000, with detailed contour lines and selected leisure information, most suited for the walker or cyclist. 2. Ordnance Survey Travel Map, scale 1: 250000, with emphasis on motorways, roads and towns, most suitable for the motorist or cross-country traveller. 3. A street map of inner London from a Michelin guidebook: Great Britain. 4. A ‘How to get to Bluebell Railway’ map on a leaflet, showing its location against neighbouring motorways, most useful for visitors coming by car. 5. A ‘How to Find Us’ map of Leighton House Museum, London, printed on the back of their introductory booklet, showing the neighbouring streets, significant buildings and the underground station. It efficiently guides visitors when they are already nearby and probably find their way on foot. 6. A floor plan provided on the guidebook accompanied the exhibition Joseph Beuys: Actions, Vitrines, Environments in Tate Modern in 2005. The blocks are drawn according to the shape of the rooms and numbered to indicate the direction of exhibition. 7. A street map of Cambridge, available from the tourist information centre, indicating sites of interest. 8. ‘Key bus route and tourist attractions in central London’; the map is not drawn to scale nor proportion, however it clearly indicates the bus routes and the sites of interest along the bus routes. 9. A map with suggested routes for cyclists in the Lewes area. The map itself is extracted from an Ordnance Survey map, however with the suggested routes highlighted. The contour lines are clearly shown to indicate the slopes, essential for cyclists. 10. A map for leisure walking in “Bus Walks” series in Brighton and Hove area, to encourage the general public to take public transport for their leisure activities. The map is an extract from an Ordnance Survey map. 11. A street map of Brighton and Hove in the collection of maps of neighbouring area; the series is called ‘Super Red Book’ and is sourced from Ordnance Survey. 12. A folded map of Rail Services around London and the South East, showing the routes and names of the stations (not to scale or proportion).
As for the historical scope of maps referred to in this study, as can be seen in figure 2.1, most are contemporary, while in some occasions when it is necessary, historical examples are also included. Geographically, almost all examples are based in Europe and in particular the UK. This is because the map itself is a massive subject for study, and it is simply impossible to include every type of map in the world in this thesis. As the focus is on how people achieve a successful map-using experience, rather than the map itself, and as contemporary map-making convention in the UK is very well developed (Ordnance Survey maps are fine examples), a selection of maps from the UK provides sufficient examples.

2.1.2 The system of map using

When discussing map use, three elements can be recognised immediately (see figure 2.2): the map user – the person who reads the map and navigates through the environment; the map – the man-made object that is intended to give spatial information about the environment on a two-dimensional surface; the environment – where the navigation takes place. Each point in this triangular system has certain relationships with the other two. For example, the map user holds the map and compares the information on the map with his surroundings. The map travels with the map user while it depicts information of a specific area that is larger than the map user’s immediate surroundings. The environment is the space that physically contains the map user and the map.

As my focus is on the experience of map using, the map user can be seen to be at the centre of the system since he or she is the subject who experiences the map-using process. This process requires the map user to be able to recognise, compare and sometimes translate the

Figure 2.2 Front cover of an Ordnance Survey “One-Inch” Map, 1937, illustrating the relationship between the map, the map user, and the environment. Illustration: Ellis Martin.
information from both the map and the environment, make judgements on what actions to take, and make actual body movements according to those judgements. Once the movement is made, the information from the environment changes in relation to the map user, and the proper information from the map at that moment shall be reassessed, so a new comparison and translation between the map and the environment and new judgement shall be made, and so on.

This comparison and translation of information involves a lot of contrast between the environment and map. Take the author’s own experience as shown in figure 2.3, for example. The map consists of clear lines and patches with even colours, and there are words, numbers and symbolic pictorial images dispersed here and there. None of these have similarities with the actual landscape which are shown in the photo. However, a map user can identify the route on the map with the route in the actual environment. The general shape and bending of the two maybe similar, but the actual sizes are very different – the route on the map can be held within two hands, the actual route is much larger than the map user and only a small part of it can be seen at a time. The image on the map is on the flat surface as if the landscape is seen from above, but the environment is seen mostly from a very low angle. The view of the environment is constantly changing as the map user moves around, however the map doesn’t explicitly show the change that the map user will experience along the axis of time.

There are effectively four problems, or themes, that this thesis identifies as characteristic aspects in the map using process: small versus large (scale), flat versus holographic, time, and symbol versus object. Each of these four aspects will be analysed in detail in the following chapters (chapters 3-6). Later, a further discussion (chapter 7) will show how the map using system can be seen holistically.

Figure 2.3 This map is included in a leaflet produced for the Ouse Valley Project by the Environment Agency and the Sussex Down Conservation Board, 1999 (publication No. SD L19/2). The photo dated 15/05/2002 was taken by the author whilst taking the upper-left walk in the map: near point 4 facing northeast. Together they mark the beginning of the author’s exploration of South Downs and the map-using process.
2.2 The introduction a of physical element in this study
When we ask questions about the nature of human experience, it is invaluable to develop the capacity for thinking within the experience, in other words being self-aware in real time. In this thesis, a practice-based physical element is adopted in order to assist the development of this capacity. This section explains why a physical element is essential and what role the physical element plays in this study.

2.2.1 The importance of the involvement of physical elements in this study
As cognitive science tells us, and as introduced in chapter one, our perception of the environment and interaction with the world do not solely depend on the calculation of the rational mind. The body plays an indispensable part in this process. From a very early age, the body starts to learn to relate itself to itself and to the environment. The coordination of muscles is gradually mastered in the process of all kinds of body movements such as grasping, crawling, walking and running. When someone throws a ball to us and we can move our body and hands purposefully to catch the ball, it is because the body ‘knows’ the trajectory created by the thrower, the ball and gravity. If we try to calculate, the trajectory is arrived at only through a rather complex system. However our body can perform the task almost intuitively.

The involvement of bodily experience is also widely adopted in the education system. For example, in science related subjects such as biology and chemistry and physics, the experiment is a common element of the students’ learning process. The purpose of such an experiment is not to search for new scientific discoveries, but to replicate what has been discovered. Students familiarise themselves with the process and operation of equipment and observe the conditions and changes in their subjects. They may have learnt the scientific principles and explanations
behind the experiments via textbooks and from the teacher, but it is the activity of experiment that really helps students to integrate and assimilate the knowledge as their own. Physical models also serve similar purpose: the model of a molecule or the solar system helps student to gain concrete understanding of the structure and spatial relationships of the particles. Playing with the model involves touching, handling and rotating the model with the student’s hands as well as the change of spatial position of the models in relation to the student’s body. It may not be conscious, but the involvement of the body’s action assists the learning process considerably.

In this research, the purpose of adopting the physical element is to provide the reader the opportunity of acting as well as reading. The physical element provides the reader a locus for experience to take place. It is an interactive node at the multi-dimensional interface, and a forum for the empirical study and examination of our experience. Through the combination of texts and the physical element, the thesis seeks to explore the potential of a more thorough, multi-dimensional explanatory system that cannot be achieved by either of the elements alone.

2.2.2 The role of the physical element in this research
The ideal balance of the written component and the practice-based part, as intended from the onset of this research project, is that both parts should construct the argument in a symbiotic way so that each part cannot be understood separately – this also coincides with the central argument of the thesis that both analytic and holistic methods should be employed at the same time in dealing with a more complex issue.

Although it may seem natural that the final thesis adopts the book form as its practical element, this was not an abiding principle from the beginning. For most practice-based research, the researcher usually comes from a particular artistic discipline, such as photography, painting,
illustration, dance, video art and suchlike. This type of research, to quote from Graeme Sullivan’s systematic study on ‘art practice as research’, can be described as ‘…some of the ways that visual artists respond to the challenge of using their art practice to undertake creative and critical research’. It is only appropriate for this kind of researcher to utilise a medium they are already familiar with to further explore relevant issues. However in this research the situation is very different. In the very early stages of this project, the author explored different practical options before settling on the book form, including board games and ‘three-dimensional diagrams’ (figure 2.4). All of them served as a physical, explanatory ‘aids’ for an abstract concept. After exploration the book form became the most satisfactory candidate because it bears suitable physical as well as analogical properties for this project (more discussion is provided in the next section, 2.3.1.)

With the evolution of possible physical forms in mind, the intention of ‘using physical objects to help to explain abstract concept’ remained the same from the early stage of this project. The physical element, i.e. the evolving book works, presented in the final thesis should be considered from this angle.

The role of the physical element in this thesis also has a particular ambition that is different from many other practice-based research projects. For art-oriented practice-based research, it is not unusual to produce stand-alone work in the end, often exhibited to the public, accompanied by some extensive statement. The statement is usually designed to assist the audience to understand the works without actually reading the written component of the thesis. This is reasonable since the works are intended to communicate to their audience in the way that artwork in a gallery normally does.
The situation in this research is quite different, as the physical element is part of the thesis and is not intended as a stand-alone artwork. The emphasis here is on the role of the practice to aid the communication of the concept embedded in the written component. The author sought for possible examples and analogies for what the modes of the practical works could be, and scientific illustrations, charts, physical models or aids became the most appropriate analogy because of their primary emphasis on the functional rather than the aesthetic. Of course, scientific illustrations or models still involve the quest for effective communication, which in turn challenges the image and model maker’s sense of design and aesthetics. Nonetheless, the scientific images and models should be read in the context of the appropriate scientific concepts and not solely according to their value as an artistic item. The same, of course, applies to the physical element of this thesis. The purpose of the physical objects is to assist the communication of concepts that are developed and discussed in this written component. This also helps to explain why I refer to the physical objects presented in this thesis as ‘book works’ instead of artist’s books even though they share some properties in common with artists’ books as an art-practice medium. How the physical element in this thesis can be seen in relation to artists’ books practice, and how artists’ books as an art-practice medium informs this physical element, will be discussed in detail in the next section.

2.3 The development of the physical element in book form

In this section, we will look at how and why the physical element finally appeared in book form, and how artists’ books inform the development of the book works presented in the final thesis.
2.3.1 The medium of artists’ books

Figure 2.4 shows several early experiments on the physical element related to this research. From left to right in the figure, they include a physical model in pop-up format to show how the principle of perspective works, a three-dimensional board-game, a conceptual cube to represent concept of map-using in three axes, and a collection of four paper-based objects that use a variety of structural combination to achieve the same appearance. There are two important characteristics shared by these four examples: first, their physical size is relatively similar in relation to human body, and second, these objects all engaged the audience in a physical and interactive way.

It is not difficult to see that books also share the above two characteristics. However, there are many further aspects of the book form that make it suitable for the physical element of this study. The following aspects of book form are of particular interest in the context of this study:

- The physical characteristics of books, such as their shape, size, format and material, lend them to interact with our body in a way that is very similar to a map as a form of navigation. To be more specific, the prevalent style of both maps and books is that printed information is provided on the surface of paper, and the paper is folded or bound in specific ways to achieve portability and for the user’s easy handling.

- As an object, a book is closer to sculpture in the sense that it provides haptic physical properties that can be manipulated in order to create space-related variations relevant to the map-using experience.

- An essential aspect of book is that it involves sequence on its surface. The sequence is related to both space and time, and a comparison can be made with a map user’s navigating in the environment that also incorporate the factors of space and time.
A book provides information and knowledge of the world and allows its reader to relate to the world. At a metaphorical level, the same can be said of a map.

There exists a genre of art practice that utilises book form as a medium for artistic expression, namely artists' books. Almost all aspects of the book form have been explored. There are abundant examples from the world of artists' books that efficiently provide active and multi-sensory physical contact with the reader, compared with the relatively passive bodily experiences of viewing a painting, video, or film. Thus, book form is perfectly suited for this study in respect of providing ‘multi-dimensional experiences’ to the reader.

Artists' books, seen as a genre or art form, is a mainly twentieth century medium which is still flourishing today. Of course, the appreciation of the book as a piece of art can be said to have a history as ancient as the history of book itself. Indeed, ‘book arts’ refers to anything aesthetically related to the book, including the method of binding, materials used, or decorative elements added in traditional types of books. In contrast, artists’ books are generally considered to be a medium displaying the control of the artists and exhibiting their ideology: a medium for artistic self-expression. There are two essential periods that are important to the development of artists’ books. The first is the growth of ‘fine press’ around the early twentieth century, examples include Paris-based publisher and collector Ambroise Vollard and William Morris in the UK. Apart from finely produced books that showed publishers’ looking after the detail, essentially, fine press considered artists’ works were as important as writers’. The growth of the fine press inspired artists to publish their own books to gain better control of the presentation of their own works. Later, books also became a medium that artists, particularly those with political views, adopted to express and spread their ideas. This led to the second period that is more directly related to the
artists’ books as of today: the development of post-war movements such as Fluxus, Pop art, Conceptualism, Minimalism, etc. Fluxus artist Dick Higgins coined the term *intermedia* to describe the forms and activities that are interdisciplinary and cannot be clearly defined in traditional genre; he also suggested that book is a form of intermedia. From the period of these movements (the 1960s and 70s) onwards, book as an art form as well as a means of interrogation of itself has been very much developed and flourished. To book artists, books are not only seen as a medium that provides flat surface for printed matter, but more importantly, as a conceptual space that allow them to operate with their ideas. The late 20th century also sees a further flourish of artists’ books since the development of technology on desktop publishing, digital software and digital publishing.

One note to make here is about the terminology of artists’ books. Although most people who know about the artists’ books share a rough picture of what this term means, most would also agree that it is difficult to provide an all-inclusive definition and difficult to decide what terminology to use to describe the art form. Here are some examples that certainly help in this regard (emphasises in bold texts are added by the author):

“*A zone of activity* […] the zone is made at the intersection of a number of different disciplines, fields, and ideas – rather than at their limits.” (Johanna Drucker, *The Century of Artists’ Books* (2004), page 1.)

“Of course we wanted each piece to reflect the heart and mind of its maker through its materials, media, and production values. But ultimately, in order to qualify, a piece had to demonstrate what we called “*bookness*”, meaning that it had to operate like a book, opening up and presenting a sequence or potential sequence of images, words, or ideas. By this definition, a sculpture that looked like a book would not make
Chapter 2 Map-using experience and the book form as a physical model

the grade. Not would a diptych that opened up and presented a painting or drawing." (Steve Miller, Juror of 500 Handmade Books: Inspiring Interpretations of a Timeless Form (2008), page 6.)

“The book format can be considered a blank canvas to make a one-off or a large edition of text- or image-based artwork.” (Sarah Bodman, Creating Artists' Books (2005), page 4.)

“An artist's book is a book produced under the direction of an artist. The word “artist” is used broadly: the artist may be a visual artist or a text-based conceptual artist; he or she may normally work with other media or they may be an artist solely on the basis of their work as a “book artist”. An artist's book may be produced by a fine press but also as easily by the artist or by an associated studio, gallery or collective.” (British Library's Help for Researchers webpage on Fine Presses, Artists’ Books, and Book Arts. http://www.bl.uk/reshelp/findhelpsubject/artarchperf/art/finepressesartistsbooksandbookarts/finepresses.html)

“Artists' books are books made or conceived by artists. There are fine artists who make books and book artists who produce work exclusively in that medium, as well as illustrators, typographers, writers, poets, book binders, printers and many others who work collaboratively or alone to produce artists' books.” (Victoria and Albert Museum’s website-introduction to Artists’ books. http://www.vam.ac.uk/content/articles/a/books-artists/)

While the term ‘artists’ books’ may still incur some disagreement among different people, I use the plural form of ‘artists’ with apostrophe to indicate artists' books as a genre and medium. In contrast, when the physical element – the four pairs of books in this study – are referred to, they are referred to as book works, to indicate that they are physical objects taking the form of books, and distinguish them from the medium with heavy artistic emphasis. In the title of the
thesis, it also uses the term ‘book form’ as a neutral description for the ‘form’ of the object. This decision was for the purpose of distinguishing between the works made for this study and other artists’ books in general, and is not intended for the argument of which terminology should be more authentic than others.

Although the role played by the set of book works in this thesis is different from artistic expression, artists’ books as a genre already provide an intensive ground of knowledge and explorations on how a physical form can interact with our body in a creative manner. This is discussed in the next section.

2.3.2 Developments of the book works in this research

As this research adopts book form primarily because of its physical possibilities, not all but some of the properties of artists’ books are inspected more closely than others. Key words or phrases of these properties include haptic, ‘beyond flat surface’, sense of space, and ‘interactiveness’.

One early example of the author’s exploration of the haptic possibility in book form can be seen in The Real Princess (or Prince) Test Book (figure 2.5). The book uses a stack of toilet tissue embossed with pattern to mimic layers of quilt, and a random selection of one pea or bean is attached to the last page of the book behind these toilet tissues. The story of Anderson’s The Princess and the Pea is introduced at the beginning of the book and the reader is invited to guess what kind of pea or bean is at the back of the book by placing their finger on the page which is on the top of the stack of tissue. The sense of touch is explicitly invited for the task of identifying the bean-shape hard object underneath the pages, but not the texture of the flat surface of the paper. For people with normal eyesight, the texture of a flat surface is often perceived by the combination of visual and haptic clues. However, The Real Princess (or Prince)
Test Book requests the reader to use their sense of touch without the aid of vision, thus achieves the emphasis on the haptic character embodied in this book. It is also because of the task, the reader is invited to interact with the book – the physical object.

Ron King and Kenneth White (poet)'s In the Sand Parishes (Circle Press, 1989-1990) (figure 2.6) provides an interesting comparison with the above book work in terms of the sense of touch; taking the form of a folded piece of paper with colourless, blind-embossing image of map from Canada attached to the opposite side of the poem on the same spread. To fully appreciate the map, the reader is invited to unfold the map and use the hand to touch the relief of the map. The map is not only composed of the landscape but also texts for the name of the places. Therefore, there are images and texts to be read by eyes and hands, or even by hands alone – as the artist described that it could be a map for the blind people (personal communication with the artist). The reason that the sense of touch is invited by the blind-embossing image can be because for normal sighted people the colourless image implies a sense of ‘not enough’ and, at the same time, the relief implies that it can be compensated by the sense of touch.

In the earlier developmental stage of this research, it became clear to the author that a multiple number of book works would be needed for the communication of the more complex ideas in this research. One earlier attempt of adopting more than one volumes in a set of book works is Twin (2004) (figure 2.7). There are two volumes of Twin in this set, each volume contents an image collection of objects that are usually seen in pairs, and only one of the pair appears in each volume. If each volume is seen separately, only one individual of the twins is seen. Only when the two volumes are read against each other, in the way shown in figure 2.7, the twins become complete. In this way the arrangement of the images on the page helps the
audience to arrange the two volumes in a specific way physically, thus inviting the audience to perform physical actions that deviate from normal reading postures.

It is worth noticing that while this research considers map-using experience as a case study, the focuses of the issue are on different approaches towards the experience involved in map using, but not on the map itself. Therefore, although there exist abundant examples of artists’ books focus on maps or journeys, those examples are of less concern for the purpose of this research, unless they are related to the themes discussed in this thesis.

Throughout chapters Three to Six, in the descriptions of the development of book works in each theme, there will be further examples of how the book works are influenced or inspired by other people’s works. Those works are not confined to examples from artists’ books but will also include sculptures and installation arts, as the themes discussed in this research largely concerns about body movements in the environment. Documentation of the development of individual book work, such as experiments on various formats and alternative designs, are also included under each theme throughout chapter three to six, so that the trajectory of the developments towards the final presentation of book works are explained in a clearer way. Later in chapter eight, section 8.1, there will be more integrated discussions on the characteristics of the set of book works against a broader context of artists’ books as a genre, as after the book works are examined individually, it will become clearer that there are essential characters shared by the book works that also reflect the central issues discussed in this research.

In a later stage, after the final presentation of the book works was settled, tests were conducted in order to understand whether the book works achieve basic level of communication and whether they have potential to assist more complex discussion about human experience. Four cases were selected to present in this thesis, and the documentation of individual cases is

Figure 2.7 Two example spreads from Twin (2004) by the author.
provided in Appendix. The users were chosen according to their professional background and include a book artist, an experienced map user, an art director who works closely with commercially published books and a researcher/craftsperson concerned with the function of human hand. The results from the test assist more discussions into the designs and roles of the book works and can be seen in chapter 8, section 8.1.3.

2.4 General rules of the book design in this research

In this section, the general rules of design applied to the book works in this study will be considered in order to prepare readers to proceed to following chapters, which consider individual issues through chapters 3 to 6 and their integration into Chapter Seven.

2.4.1 Description and arrangement of the book works

When the lid of the black box is opened, the reader finds a set of book works. The set of work comprises eight book works arranged in two layers within two black, cubic boxes, which are also layered. When the lid of the outer box is open, the first layer is revealed, showing the edge of four books, arranged at ninety-degree angles to each other, in other words framing the four edges of the opening of the box. The inside of the frame shows the top of the inner box as a black square.

The four books of the first layer can be taken out of the box easily. The dimension of each book is 19 x 16 x 2.75cm. Once the four books have been removed, the inner cubic box is easy to remove from the outer box.

Similarly, once the lid of the inner box is opened, the second layer is revealed, showing the edge of the four books, arranged like the first layer. The order of titles arranged is the same as
the first layer, at least after the author arranged the books and close the box, and before the intervention from the reader. In the middle is another black square. This time it is also the top of a smaller cube, but this cube is sealed and is not a box.

The dimension of the smaller books of the second layer is 12.25 x 9.25 x 2.75cm. From the text printed on the cover and the physical characters, the two books of different size can be easily paired, to form four pairs of books. This will also be discussed in section 2.4.3.

2.4.2 Materials
The material of the surface of the cover and the inner pages of the book works is Printspeed Paper in white. The same paper is used for the cover and the inner pages, to achieve the homogeneous colour and texture of the whole book, and this is intended when the box first opened and the books’ edges are revealed.

The surface texture of Printspeed Paper is smooth but not glossy. The smoothness is intended to reduce the attention that reader may put on the surface texture. Because the information it gives in terms of texture is neutral, it is suitable for for the intentions of a physical model. The printed images and texts also gain a cleaner finish on smoother paper. The weight and stiffness is needed for supporting the books’ own physical structure. For example, the cut-off circles of “The circle has changed size” would not be expected to lose their shape, and “Expedition” should be able to stand on its side. A sturdier structure also allows the handling and interaction for the users. Whether the paper should be acid-free, archival paper is less of the concern here, as long as the printed images and texts can sustain a reasonable period of time – like the requirements for copies of thesis that store in libraries – it should be considered acceptable.
2.4.3 Colour

In a previous version of the set of book works, colour was adopted in order to separate the four themes – four pairs of book works – in a more efficient way. However, after a more careful consideration of the role of the book works in this research, colour was discarded and a white surface was chosen instead. The whiteness reinforces the idea that these books serve as an illustrative tool in the thesis instead of providing a means of exploring the aesthetic dimension of artists’ books. White, three-dimensional objects can be associated with architectural models or prototypes of industrial products. The elimination of colours from previous versions reduces the variation between different pairs of books, so that they become closer to standardised, controlled objects used in scientific experiments: only the property that is to be tested has variation, and all other properties and conditions should be the same. Since this project focuses on the human perception to spatial properties and physical shapes (cut-out circles and squares, etc.) rather than colours and surface textures, to eliminate the variation in colours should make the point clearer.

In the previous version, the main reason for adopting colours was to assist the reader to pair the large and small books easily. However, the shapes, titles, images and sequences in the book are sufficient to suggest that these books work as pairs: The title, *The circle has changed size* is shared by two books, so is *Expedition; A cuboid has penetrated* and *A cuboid that penetrates* both bear the word “cuboid”; *A field guide of commonly mapped objects* and *Key to commonly mapped objects* also share some words in common. In terms of other visual clues, The two books of “The circle has changed size” are the only two that bear large cut through circular shape among all the books; *A cuboid that penetrates* can literally go through *A cuboid has penetrated*;
both books of Expedition have an array of ants on the cover; Key to commonly mapped objects can physically fit into A field guide of commonly mapped objects. Although the lack of colour variation may cause the pairing system to become less obvious at the first sight, the process of pairing could become more interesting with the reader experiencing solving a puzzle.

In the previous design, the use of coloured sugar paper’s light-sensitive property gave an element of time to the project. Because the colour of sugar paper fades easily when exposed to light, and because the books are stored in a black box, the degree of the fading of colours represents the time when these books were removed from the box and handled by readers. However, this element is not immediately essential to the project, for two reasons: first, since the set of book works serves as an explanatory model for the concepts in the thesis, it does not require the reader to come back to the books again and again once the purpose has been fulfilled. It is most likely that the very same reader will ever witness the change of colours of the paper. Second, among the four themes, the books Expedition are especially devoted to the theme of time, which means the time element is already dealt with. This should be sufficient to assist the discussion of time without further manipulation of materials.

2.4.4 General design rules shared by the book works
The eight book works comprise four pairs, each pair focussing on a particular theme. Certain rules apply to the books in pairs; another set of rules applies to the themes.

- General rules applicable to the pairs of books
  
  The books that share the same theme are always in a pair of one large book with one small book, with the larger one revealed in the first layer of the cubic box, before the smaller one
appears in the second layer. This arrangement naturally forms a temporal sequence of the two books, making them resemble volumes one and two of one story. Therefore the contents in each volume have to take this property into consideration, i.e. the contents of volume two is a logical sequel to volume one, even though each of the two can be stand-alone.

The two books also share distinct three-dimensional elements that suggest they are a pair. Although the colour and texts on the cover already suggest so, these three-dimensional elements provide further tight links between the two books. These elements may be the unique shape that has been cut out (as the books *The circle has changed size*, the big circles show on both books), or alternatively that the shape of the books complement each other and may be fitted together physically: in the pair *A cuboid has penetrated* and *A cuboid that penetrates*, the smaller book can be put into the cut-out rectangular shape in the larger book; in *Expedition*, a cut-out circular shape on the spine of the larger book can match the relief circle on the spine of the smaller book; in the other pair, the large cut-out area of the larger book, *A field guide of commonly mapped objects*, suggests the smaller book, *Key to commonly mapped object*, can be fitted in and the two books can be aligned at the spine. These elements should also encourage the reader to physically ‘play’ with the two books and explore the possible range of interactions between them.

• General rules applicable to the four themes

This study sees the medium of artists’ books as three-dimensional objects more than books in a traditional sense – bound pages that provide a lot of printable surface to convey information in texts or images. Thus the three-dimensional possibilities are always considered and explored in the design process. Comparatively, images and texts are less emphasised.
By emphasising the three-dimensional properties, the structure and form of books should also give out information as images and texts do. Which means the three-dimensional elements of the book are not constructed merely for the purpose of variety and aesthetic reasons, but more importantly, they play a full part in telling the story.

The relationships between the books reflect the schematic model of the concept in this thesis. On the one hand, each theme discusses one subsection of our experience of using a map, and each subsection is decided through analytical and classification process. On the other hand, there is the holistic aspect of this experience: some elements cannot be clearly cut to fit into only one subsection, so some elements found in one pair of books can also be found in other pairs of books. This is mostly done through three-dimensional elements: the cutting out of some parts of the books, for example, may be seen in more than one pair of books. The detail of these shared elements is discussed in Chapter Eight, section 8.1.3.

2.5 Executing the process

In this thesis, the embodied approach is applied to map-using experience. The method is to objectively scrutinise the map-using experience through the knowledge of cognitive science, by dissecting the experience into four aspects and then provide physical models to allow the reader create their own first-person experience. Both objective and subjective approaches are provided in this method.

Through Chapters Three to Six, the four different themes will be examined with assistance from a pair of book works. The pair consists of one larger and one smaller book, with eight books
comprising four pairs. The formation of each book work from its very inception is itself a journey, and I will introduce related considerations to each theme, demonstrating how these are incorporated into the formation of each book. Ideally, the four themes should not be considered as having a particular pre-ordained linear order: when the black box in which the thesis is presented is first opened up, and the first layer of four book works revealed, the books may be picked up in any order; the reader enjoys freedom in this regard, beyond the control of the author. The written component, by contrast, possesses a linear, sequential order that is inevitable. The reader of this thesis may bear in mind that the four themes are of equal importance, and, later in chapter seven, a schema of relationships between these four themes will be expounded in detail.

Change of scale is the theme for chapter three. A map is a graphical representation of a large area of the surface of the ground. Transfer between small and large raises issues such as the comprehensible area related to our cognitive capacity and the manageability of a map in relation to the size of our body. Our flexibility of thinking about things not in their original size opens up new dimensions for discovery. Jonathan Swift’s *Gulliver’s Travels* (1726), for example, illustrates a popular readiness toward an imaginative and playful flexibility of thinking about things not in their original size, and this flexibility opens up new dimensions for discovery.

Chapter four deals with the fact that a map is a two-dimensional projection of a three-dimensional environment. Edwin A. Abbott’s *Flatland* (1884), for example, offers insights into just how polarised these two worlds are. It might be assumed that to project three-dimensional information into a two-dimensional surface, as a process of compression, would inevitably cause loss of information. However, the benefits from the sometimes unexpected characteristics of such a conversion are examined in this chapter.

Chapter five investigates the relationship between space and time involved in the process of
map using. A journey always takes time, and a depiction of time can occupy space. There is a range of methods by which time can be depicted graphically, and a map can also be transformed into a time-oriented graphic form. The interchange between space and time will be examined in detail.

Chapter six discusses the symbols used as components in a map, and the relation between coded information and the actual environment. The style of these little graphic images ranges from relatively realistic pictorial images, easy to associate with the feature they represent, to more abstract symbols that bear no apparent resemblance whatsoever. However they all provide the same efficiency of quick reference for map users, and this is related to human’s innate ability of recognising objects and using of language. The above chapters will provide a means of highlighting the complexity of human interaction with maps, whilst illustrating the benefits of a system that self-consciously aids the thinking process while using them.

---

5 In the first chapter of *The Century of Artists’ Books*, Johanna Drucker provides a comprehensive review of the history and background of artists’ books, while Sarah Bodman’s *Creating Artists’ Books* gives a more
concise account of the same topic. Here the author attempts to use only the most succinct examples to outline this part of the history.


7 As Stefan Klima points out, a most confusing aspect of the debate is the spelling of the term. Its first appearance in 1973, came from an exhibition title in the Moore College of Art in Philadelphia, omitted the apostrophe and spelt as ‘artists books’. Later usage of the term is sometimes with and sometimes without the apostrophe, without obvious reason. As more recent literatures seem to come with the apostrophe more often than not, ‘artists’ books’ is used in this study when referred as an art form or medium. For Klima’s account of the term, see Klima, Stefan. Artists Books: A Critical Survey of the Literature. New York: Granary Books, 1998, pp.10-11.

8 In Johanna Drucker’s more recent and comprehensive survey of artists’ books, The Century of Artists’ Books, although the terminology is not discussed in detail, an apostrophe is always adopted. Whether it’s in plural form or not, however, entirely depends on the context. See Drucker, Johanna. The Century of Artists’ Books. New York: Granary Books, 2004 (1994).


Chapter 3  Change of scale

3.1 Basics of scale
3.2 Flexibility of seeing and thinking of things changing in size
3.3 Scale, the body, and manageability
3.4 New discoveries through reducing or enlarging scale
3.5 Design of book works: *The circle has changed size*
   3.5.1 Descriptions of book works
   3.5.2 Relativity of the size of the circle
Scale is one of the key aspects people encounter when they use a map. In this chapter, by scrutinising various examples, I will demonstrate that our sense of size of objects is very flexible, and the power of manipulating the size of objects in our imagination is boundless. Because of this freedom, we are able to create new works simply by reducing or enlarging the size of an object, and seeing them before our eyes provides a new dimension of discovery. Later in the chapter I will discuss how these ideas are incorporated into the design of the corresponding book works, *The circle has changed size*, and I will discuss how book works help the reader to be more aware of their sense of size and scale.

### 3.1 Basics of scale

One of the basic features of a map is that it’s a graphic representation of the spatial information of a certain area on a relatively small surface – this representation will inevitably be smaller than the actual area it represents. But how much smaller is the representation? How do people translate the distance on the map for their use in the actual environment? The concept of scale has to be introduced in order to tell the map-user exactly what distance is indicated on a map. With a clearly represented scale, the map can provide spatial information, such as distance and directions, between landmarks, and every element on the map finds its precise equivalent in the environment. Think of those fantasy maps that accompany great fiction: when they come with a scale, they provide a sense of credibility. *The Map* by prolific sci-fi novelist Ni Kuang from Hong Kong\(^1\) has at the centre of its plot a treasure map; a map which remains misread for most of the story, largely because it fails to provide a scale. Only toward the end of the story is it revealed that the map depicts the garden of the hero’s wealthy explorer friend, rather than the forests, lakes and plains of some remote country, as had been assumed.
To give a more precise definition, *scale* is the relationship between distances measured on a map and the distances they represent on the ground – the surface of the earth that the map depicts. In general, the scale on a map can be expressed in three ways: by ratio (1:50000, for example), by simple statement (2 centimetres to 1 kilometre), or by means of a linear scale, as shown in figure 3.1.

A 1:25000 scale, as used in Ordnance Survey's *Explorer Map*, is a larger scale compared to a 1:250000 scale, as used in Ordnance Survey’s *Travel Map* (examples of both maps can be seen in figure 1.4). The 1:25000 Explorer Map is often referred to as a large-scale map; it shows details of the features on the ground to a degree that is sufficient for a country stroll.

One could learn the concept and application of scale through explicit descriptions, such as the following:

A scale of 1:25,000 means that 1 centimetre (or 1 inch, or one ‘anything’) on the Explorer map represents 25,000 centimetres (or inches, or ‘anything) on the ground.
A description like this is straightforward and easy to grasp. Similar descriptions may also be found in children’s maps and guides, which suggest that the ability of relating smaller areas of a graphical image to a larger environment is not a difficult principle to apprehend, even for young children.

3.2 Flexibility of seeing and thinking of things changing in size
The ability to reach beyond an object’s physical size in one’s imagination is one of the universal abilities performed by people in their daily lives. Take the author’s childhood fantasies, for example:

On the wall there are some irregular patterns – possibly water marks or old stains. When staring at those patterns, in a child’s mind they are transformed into an imaginary world composed of lands and seas, in particular if this child has seen a map before. An imaginary ship might sail from port to port, through a channel, or just set sail into the open seas; as the ship draws alongside the shore, a little expedition team might get off and subsequently travel across the continent. During this expedition, they may encounter lakes and mountains before eventually reaching the bay at the far side of the continent.

Similar flights of fancy may be applied to the patterning of wooden grain on the surface of a wooden wardrobe – together the curvy lines formed a labyrinth, and a little person trapped in it may find his or her way towards freedom. At other times the imagination may be applied to the floral pattern of wallpaper or a flower vase. The vine could be seen as a passage or a stair, the flower as a room or a flat. Then little inhabitants would travel through those vines and visit each other.
This kind of imaginative vision is open to anyone, although perhaps children are particularly prone to such flights of fancy; objects which were never constrained by their actual physical, original size, now apprehended as the desired object, the projected object, the imagined object. On the one hand, this is similar to the projection of slides on a wall: they can be enlarged or reduced easily, without changing their meaning to the viewer. If you see a film in the cinema and later see it on TV, you wouldn’t consider they are different films only because they are shown on the screen of different size. The viewers can always grasp what is essentially the same, adjusting themselves to the change of size. On the other hand, when the overall shape is more essential than other details, people can easily relate objects of similar shape but which vary considerably in their original size. Thus the shapes of clouds in the sky may be identified with animal forms; stains on a wall can be associated with patterns on a map; and a printed triangle may be identified with a photograph of an Egyptian pyramid, or indeed with the physical Egyptian pyramid itself.

This sense of transposition and flexibility can be extended much further, to the extent that we can create brilliant stories teeming with outsized creatures. Two celebrated examples from English literature are Jonathan Swift’s *Gulliver’s Travels* (1726) and Lewis Carroll’s *Alice’s Adventures in Wonderland* (1865). In the former, Gulliver visits Lilliput, a country full of small people, and Brobdingnag, where he finds himself viewed as tiny in the eye of those giant inhabitants. In Alice’s case, she finds herself under the influence of magic potions changed in size both proportionally as well as disproportionally. The following is how Gulliver describes his sensation when he first stands up on the land of Lilliput:

> When I found myself on my Feet, I looked about me, and must confess I never beheld a more entertaining Prospect. The Country round appeared like a continued Garden; and the enclosed Fields,
which were generally Forty Foot square, resembled so many Beds of Flowers. These Fields were intermingled with Woods of half a Stang, and the tallest Trees, as I could judge, appeared to be seven Foot high. I viewed the Town on my left Hand, which looked like the painted Scene of a City in a Theatre.⁵

Whilst enjoying these stories, or perhaps in order to enjoy these stories, the reader suspends their disbelief, and in that forgiving state are unlikely to complain about the plausibility of whether such creatures actually exist – not, at least, until biologist J. B. S. Haldane published his essay On Being the Right Size (1926):⁶

Let us take the most obvious of possible cases, and consider a giant man sixty feet high — about the height of Giant Pope and Giant Pagan in the illustrated Pilgrim’s Progress of my childhood. These monsters were not only ten times as high as Christian, but ten times as wide and ten times as thick, so that their total weight was a thousand times his, or about eighty to ninety tons. Unfortunately the cross sections of their bones were only a hundred times those of Christian, so that every square inch of giant bone had to support ten times the weight borne by a square inch of human bone. As the human thigh-bone breaks under about ten times the human weight, Pope and Pagan would have broken their thighs every time they took a step. This was doubtless why they were sitting down in the picture I remember. But it lessens one’s respect for Christian and Jack the Giant Killer.

The main principle behind Haldane’s essay is square-cube law, which is first demonstrated in Galileo’s Two New Sciences (1638). It can be summarised as stating that ‘when an object undergoes a proportional increase in size, its new volume is proportional to the cube of the multiplier and its new surface area is proportional to the square of the multiplier’. Biomechanics tells us that biological growth obeys the same law of nature.
However, the imagination of human beings allows for more freedom and creativities on the issue of size than the laws of nature would suggest. This subject will be discussed in further detail in section 3.4.

3.3 Scale, the body, and manageability

With their flexibility of imagination and the assistance of straightforward instruction, people understand the concept of scale, and use their road map relatively comfortably when needed. However, without special training – such as for people working in special professions, like military, navigation, architecture or cartography that need precise sense of scale – most people read the scale on the map only approximately, and try to supplement its information with other sources of input more familiar to them and suitable for their purpose. For example, when referring to a road map, people may translate the distance in miles into ‘driving time’ as measured in hours or minutes; when planning a walk with a map, people are not interested in the length of the route itself so much as how many hours it will take; and they plan accordingly to decide the best segments in an itinerary in order to have breaks at suitable spots. In the case of an art gallery or museum plan, quite often no scale is given at all – but few if any visitors will even notice, let alone complain. Why is that? It is partly because the scale of the plan is relatively large – that is to say, the area that a museum plan normally shows is of course much smaller compared with a map of an entire city. Since the spatial information of the plan in this example does not involve significant reduction in scale, visitors can follow the plan with relatively ease; and, what’s more, can easily compare several clues between the actual environment and the plan, such as the relative locations of the exhibits, the position of the doorway, or the shape of the room. There is little if any need for a scale indicating yards or metres for the visitors.
This last example reveals a further phenomenon: without special training, our estimates of length, distance or dimension are more accurate the shorter the distance in consideration. If you ask several people to give their estimate for the height of a book, for example, there is a good chance that the answers given will be within a narrow range, and not far from the actual answer. Beyond a certain range, however – for instance ‘how long is Oxford Street’ – the variation between different people’s estimates would increase, with a noticeable decrease in accuracy.

This brings us to an interesting issue in ecology. Many senses – not least ones awareness of relative distance – are most accurate when they are most relevant to an animal’s ecological niche. One example relates to vision. The human eye is capable of seeing wavelengths of light ranging from about 380 nanometres (for purple) to about 750 (red); most nocturnal insects and animals can sense light in longer wavelengths (infrared), while many diurnal insects can sense the light in shorter wavelengths (ultraviolet). Plants which rely largely on insects as pollinators co-evolve to display patterns on their flowers that only show up in the ultraviolet range, being clearly visible to a bee but invisible to the human eye.

If we regard the sense organs as providing essential channels by which the body interacts with the environment, then the size, shape and behavioural patterns of the whole body should be taken into account in determining how the animal interacts with its environment. Take the example of the relationship between body size and water. Here is another splendid description from Haldane:

A man coming out of a bath carries with him a film of water of about one-fiftieth of an inch in thickness. This weighs roughly a pound. A wet mouse has to carry about its own weight of water. A wet fly has to lift many times its own weight and, as everyone knows, a fly once wetted by water or any other liquid is in a very serious position indeed. An insect going for a drink is in as great
danger as a man leaning out over a precipice in search of food. If it once falls into the grip of the surface tension of the water—that is to say, gets wet—it is likely to remain so until it drowns.\footnote{7}

Another similar example concerns air. From fluid mechanics, a sub-discipline of physics dealing with liquids and gases in motion, we know that because of viscosity a thin sticky layer is often generated near to solid boundaries; in other words, when fluid passes through a space with solid boundaries, the speed of the part of the fluid next to the boundary is the slowest, and the part that is furthest away from the boundary is the fastest. In the case of air, this condition doesn't affect the performance of our body because it takes place on a very small scale. However, in the world of aphids and tiny insects, the air next to the plant's surface is very sticky, to such an extent that aphids or small insects have real difficulty breaking out from this zone before they can take off and fly freely.

To many animals, body size often plays a crucial role in matters of life or death, and even love. Take toads as an example. When a toad encounters an animal with a body size much smaller than its own, this smaller size signifies 'prey', and their consequent action is to attack quickly. On the contrary, when they encounter animals larger than themselves, this larger size denotes 'predator', and their immediate reaction is to flee. When a male toad encounters another animal of similar size, this comparable size indicates a potential mate, and courtship may ensue. As a result, a male toad could sometimes mount on another male toad, and later from other clues realises that this will not lead to reproduction and gives up this behaviour. In the long history of evolution, however, body size has been efficient enough for a toad to discriminate life and death information from its environment.

These examples from ecology take us to the consideration of the relationship between the body and the environment in the context of size and scale. Which elements of information are
meaningful, and which inessential? It is largely defined in terms relative to the size of the body. To worry about the stickiness of air next to the floor or the weight of water on my body surface after a bath is totally irrelevant to my experience. But to consider the weather condition such as wind, speed or the amount of precipitation close to ground level is very relevant because these are the conditions in a scale that my body confronts directly and almost constantly. It is no accident that we use words like foot, pace and step as measurement.

Similarly, a statement that “the tropical rainforest disappears at a speed of 15 million hectares per year” is meaningless to most people, because, even if people get the message that 15 million hectares is a huge area, it’s a distance of which we don’t have a direct concept in our own experience, for the most part. But if the same idea were expressed as “an area the size of a football pitch disappears every second”, suddenly it makes sense, or at least anyone who has ever seen a football pitch.

Thinking of a map, one of its most obvious features is that it’s a size-reduced image of the ground. A world atlas, for example, is an efficient way for us to perceive the shape of the continents, a landscape previously too large for our cognitive apparatus to perceive. The size-reduced representation in an atlas brings the county, country or continent itself before our eyes, thus making the vast area easy to comprehend. Whilst we know this reduced-size image has its real-size equivalent out there in real landscape, an atlas nonetheless makes a vast area more manageable and comfortable to us, at a size that we can hold in our hands.

This leads us to the topic of ergonomics, the discipline that takes measurements of various parts of human body and seeks to find the combination of dimension and weight of product design to interact optimally with the human body. The variety of sizes of maps is instructive here: a driver’s road atlas, for example, is usually much larger and heavier than a tourist’s street map,
since a car can more easily accommodate a larger and bulkier map than a tourist’s rucksack. A map should not be too small, however, since its information should be comfortably large enough to be legible to the human eye. Thus, we can always find the optimum size of a map, depending on the specific purpose for which it is needed. Long before the development of ergonomics, however, when maps were being invented independently in different countries and cultures, one factor remains consistent: a map is a smaller-than-real-size representation of the ground. It’s not only smaller in any size, but in a size that is manageable in relation to our body. It’s no surprise that in many cultures, a map is usually related to power, and political power in particular: among many other reasons, a map makes a relatively large area of ground seem able to be grasped visually and physically, thus it’s easily associated to the feeling of process and control.

3.4 New discoveries through reducing or enlarging scale

In the previous section, we looked at the issue of scale in relation to the size of our body. But human imagination needs not confine itself to normal physical size as indicated by natural law, as in *Gulliver’s Travel* and *Alice’s Adventures in Wonderland*. Indeed, over time, people still find enjoyment in popular culture around the theme of changing size, from the gigantic gorilla in the film *King Kong* to *Honey, I Shrunk the Kids*, among numerous examples, regardless of what biomechanics might have to say.

In this section, I would like to further demonstrate that the freedom of thinking of objects independent from their original sizes actually opens up new areas of discovery that provide us with abundant amusements and insights.

People may be amused simply by seeing reduced or enlarged objects, as an entire industry of children’s toys testifies. Dolls houses and miniature worlds not only provide the potential of
manageability which can be related to mapping; furthermore, with most of the details retained and reduced proportionally, they also provide a sense of comfort and delicacy.

Another example from a different area can be seen in the realistic human figures made by the Australian sculptor Ron Mueck (figure 3.2). Mueck used to work in the film industry and is capable of making hyper-realistic human models. When it comes to creating his own art works, one significant step he took is to simply reduce or enlarge the realistic human figures. In the case of enlargement, all the details of the skin, including hairs, wrinkles, coloured blood veins beneath the surface of the skin are also enlarged. The audience are amused by the skill of the sculptor, and deeply impressed by the abundance of details that were never before revealed to them, thus they look at the human body with a fresh eye.

It is interesting to note that, while audiences appreciate exquisiteness or newly revealed details of reduced or enlarged objects or human figures, at the same time they also gain a new awareness of their own body. As Swift’s readers identify with Gulliver in Lilliput or Brobdinghag, the size of his or her own familiar body suddenly becomes less familiar. They are not only amused by the small or large figures, but also amused by the fresh sense of their own bodies. When the author was a child enjoying the transposition of patterns on the walls into lands and seas, the sense of size of the self is at the same time ambiguous. Am I large or am I small? The size at which I identify myself becomes fluid, as does the world around me. The scale of space, in which our human body occupies in the universe, is such a fundamental feature that few of us are aware of it. However, once we are aware of the freedom of thinking about it differently, our relationship with the world would also gain a degree of new freedom.

There is another category of flexibility about scale that is worth mentioning. It is the ability to see the similarity between things originally in very different size. One example mentioned
previously is a printed triangle, a photograph of pyramid, and an actual pyramid: they all share the common feature of the triangle and can be associated one with another. The same situation can apply to the structure of the solar system or an atom. They both have orbiting objects at the outer layer and a centre with huge mass. Generations of people find it intriguing that the universe seems to repeat itself on different scales, thus making people wonder whether human beings really only occupy the one specific realm within the infinite universe.

Some natural phenomena actually present themselves with the same pattern regardless of scale, as their mathematical properties suggest. The most famous example is the fractal, discovered by mathematician Benoit Mandelbrot in 1967. A fractal has the property of self-similarity, which means the shape is always the same no matter in what scale we see it. The shape of the coastline is one well-known example – the same wiggling outline can be seen regardless of the scale – and was the origin of this mathematical body of study.

Now that we have considered various examples of change of scale, readers might find the ‘un-change’ of scale amusing. In the short story by J. Borges, *On Exactitude in Science*[^10], there is this map of an empire “whose size was that of the Empire, and which coincided point for point with it”. Since a map in real life is always a reduced size image of the ground, this story gives us an impact from an opposite direction of thinking about scale related to maps.

[^10]: J. Borges, *On Exactitude in Science*
3.5 Design of book works: *The circle has changed size*

3.5.1 Descriptions of book works

Book works at the centre of this chapter are the two volumes both entitled *The circle has changed size*. The most obvious physical characteristics in this pair of books is the circle that cuts through all the pages, thus forming a circular hole throughout each book (figure 3.3). Inside each volume, on each of the right hand side pages, there is an image of an object with a short horizontal line serving as a scale to indicate the size of the object. For the convenience and ease of the reader reading the scale, the length of the short horizontal line is the same as the diameter
of the circle, and the number that indicates the size of the image is simply the actual diameter of the circle in the image.

In the first, larger book, the sequence of eight images depicted are: the eye of a tropical storm; the London Eye; Notre Dame de Paris; the Clock Tower, Palace of Westminster, London; a traffic sign; a bicycle; a washing machine; and a hole on paper. Each image contains a circular shape, and is aligned so that the cut-out circle precisely cuts through these circular shapes. On the last page, the content of each page is presented as a list.

In the second volume, with the same layout, the sequence of the eight images comprises: a hole on paper; a camera lens; a hole in a CD; a pattern on an iron plate; a hole of a key; the pupil of a human eye; a hole in a button; a full stop in a printed Chinese text. Once again, the last page of the book contains a list of contents.

The principle of image selection in these two books is as follows: the object is a well known structure or a familiar object that contains a circular shape as a main feature, so that the reader’s own experience or knowledge of the object can also provide a sense of scale when they see the image. However, because the circle is cut-out from the page, this object shall remain recognisable when the content inside the circular shape is missing, in other words, the most recognisable feature of the object is adjacent to the circle, not inside the circle. By contrast, the top view of a tin can is not a good candidate, since when the circular shape is cut-out, there is nothing remained that can be recognised visually.

3.5.2 Relativity of the size of the circle

The title of the books, *The circle has changed size*, is a statement that creates ambiguity about what exactly has changed size and what hasn’t. In the sequences of both books, the scale
accompanying each image suggests that each successive image is at a larger scale, so that the size of cut-out circles, suggested by the scale, should become smaller and smaller. However, it must be obvious at first sight – even before the book has been opened – that these cut-out circles are all physically identical in diameter.

It is even more interesting when the second volume is revealed and compared with the first volume. The cut-out circle is the same size as the first volume. Readers can ascertain this by physically putting the two volumes against each other and aligning the circles. However, when the two volumes are seen side by side, as in figure 3.3, an optical illusion is created whereby the circles, being shown against the ‘background’ (the book cover), looks as if there were of different sizes – the circle on the smaller book looks larger than on the larger book. Therefore, to the reader’s eyes, the circle does change its size, as the title suggests.

The goal of this pair of books is to encourage readers to think about the issue of scale. So the origin of the design was to generate a sequence of images that changes in scale successively, and the successive change in scale shall carry on not only in one volume, but in both volumes.

An earlier version of the same project involved a ‘book within a book’ structure (see figure 3.5). The first few pages of the larger book were to reveal an extract of a map, with the same map image increasing in scale over successive pages. Readers would then find a second, smaller book in the centre of the first book, showing the same map image, but at even larger scale. Thus readers would be able to see that the page of the inner book had a larger image compared with the image which framed it, in the outer book.
This design threw up a serious technical problem relating to the structure of book. Ideally, the two books should be able to be read together – with the pages of the inner and outer books turning smoothly and concurrently. However, in a rejected version, the spine of the inner book always interfered with the connection with the outer book, meaning that the inner and outer pages could not be turned and read together easily. Also, the enlargement of the image itself failed to provide a meaningful message to readers other than to show that a map can change its scale. So this concept was eventually discarded.

The central idea of the current design is to retain some element constant in its size, within a sequence of progressively enlarged images. A fixed and printed scale was considered; but in the end the cut-out circle was chosen, being a most obvious way for readers to grasp that it hasn’t changed in size. Cutting-out is also an ideal method for playing with the physical structure of the paper and book. Furthermore, the relationship between the cut-out part and the image makes the cut-out area an area to be read consciously. Normally, we would consider where ‘missing paper’ means ‘missing information’, such as a part of a book absent through insect activity, fragments of a page destroyed by fire, and so forth. However, here the missing part of paper itself plays a role in the reading of the whole book in this design. Readers will find echoes of this idea in other pairs of book works in this project, and a thorough discussion of this issue is provided in chapter 8, section 8.1.

The current design may recall the 1977 film *Powers of Ten* by Charles and Ray Eames. This film used the ‘power law’ to reveal to the audience the relative size of things from the cosmic to the microscopic. It is composed of a sequence of still images in quick succession, with each new successive image a ten-time reduction or enlargement of its previous image. The whole
sequence starts from the image of a man in a Chicago park to the outer limits of the universe directly above him, and back down into the microscopic world contained in the man’s hand, to the degree of the world inside an atom. Ray Eames has the following comment about the film:

The idea of exponential series was a favorite tool of Charles Eames, as an architect who loved the art of estimation. [...] The idea of scale – of what is appropriate at different scales, and the relationships of each to each – is very important to architects. [...] With a constant time unit for each power of ten, an unchanging centre point, and a steady photographic move, we could show “the effect of adding another zero” to any number.\[12\]

In terms of successive images that change in scale, the pair of book works indeed is similar in style. However, in *Powers of Ten*, the sequence is more like a journey that takes the viewer down to the microscopic world without ‘looking back’ during the journey. The viewer is directed by the fascination of the forward journey, without the need or opportunity to reflect consciously on the scale of the image relative to other images viewed, since a film has not haptic quality or interactivity. The major attraction of this film is to reveal a new view of the world in each new scale that we normally are not able to see. In the design of these books, however, a conscious play on scale is itself the central theme. The information of scale next to each image suggests the reader to reflect upon the size of the object. For example, the diameter of the clock face of the Clock Tower of Palace of Westminster is 7 meters, maybe larger than most people’s expectation when they try to visualise a length of 7 meters in their mind. Readers may also make comparison between different images in the books, and imagine how much the object has to be reduced or enlarged from its original size in order to fit to the cut-out circle. All these possibilities suggested by the design of the books cause readers to reflect upon the issues related to scale.
7 Ibid.
8 *King Kong*, the classic black-and-white monster film made by RKO Pictures in 1933.
9 *Honey, I Shrunk the Kids*, released through Walt Disney Picture in 1989.
Chapter 4  Flat and holographic experience

4.1  Flat and holographic view
4.2  A map as a flat surface containing spatial information
4.3  *Flatland* – a close look at the experiences considering ‘lower’ and ‘higher’ dimensions
4.4  Design of book works
   4.4.1  Early experiments
   4.4.2  General description of the pair of book works: *A cuboid has penetrated* and *A cuboid that penetrates*
   4.4.3  Implications of the physical properties of the two books
Chapter 4 Flat and holographic experience

4.1 Flat and holographic view

A map is normally depicted on a two-dimensional surface. Even with the advance of technology today, people can now refer to a map from their portable devices, such as a mobile phone, the information is still shown on a two-dimensional screen. To represent the environment on a flat surface is in some degree a task of transferring the three-dimensional information into the two-dimensional; however, even in pure spatial terms (without considering the element of time, for example), for the map user on a journey there is more than a simple transfer between two- and three-dimensional information, therefore in this study the word ‘holographic’ is used to contrast with flat (two-dimensional) view or experience.

The word holography originates from the Greek, combining the elements of ‘whole’ and ‘writing or drawing’, and in contemporary usage it refers to a specific kind of picture that changes when viewed from different angles. It creates a sense of depth on a two-dimensional surface; in some more sophisticated cases, to the viewer it mimics quite successfully the experience of looking at actual objects in space. It is interesting to compare a similar usage of language in English and in Mandarin. In English, people use the words ‘flat’, ‘two-dimensional’, or ‘without depth’ to describe the unsuccessful depiction of characters in stories, and use ‘three-dimensional’ to describe vivid and successfully rendered characters. In Mandarin, ‘flat’ (ping mian) can be used in the same way, but for the contrasting description, three-dimensional (li ti) and holographic (quan mian) are both used. Quan mian literally means (to see or act) ‘from every aspect’. This is a way of looking at the spatial experience of using a map, and is another reason the word holographic is used for the discussion here.

This chapter will discuss one of the significant characteristics of a map as ‘seen from above’ and its relation to our bodily experience. I will use the 1880s story Flatland by Edwin A. Abbott as
4.2 A map as a flat surface containing spatial information

An over simplified yet very intuitive way to describe a map is to say it is ‘a bird’s eye view’, ‘seen from above’, or ‘looking down’ on an area of land. Actually, some children’s books about maps just explain maps in this fashion. Here are some examples:

“[…] a street map is always drawn from above, giving the view that a bird has as it flies overhead.” (Map Book, 1995.)¹

“Maps are drawings of places, seen from above.” (In the first page from Maps and Globes, to answer the question “What are maps?” 1996.)²

“A picture or drawing that shows a place from above is called a bird’s-eye view or a plan.” (Maps and Symbols, 2001.)³

However, considering the matter more closely, it is easy to see that a map’s view is not equal to a bird’s eye view. The geographical information a map depicts is not from a single viewpoint like the bird or plan in the sky, but evenly, ‘omnipresently’ above ground. From the perspective of a bird, or a passenger in an aeroplane, the objects on the ground are seen according to perspective, so that only the point directly beneath the viewer would in fact be seen from above, all other objects in the field of vision would be presented at more or less of an oblique angle. On the contrary, in a map, the side of objects is not supposed to be shown for its spatial information; every point on the map is, as it were, seen from straight above, and the

---

² Maps and Globes, 1996.
distance between the imagined viewer and the ground is disregarded. Whereas in the case that
important hills or buildings are depicted as seen from a side angle, as seen in many old maps or
in some maps for leisure activity, it is to assist easy understanding of the information, but it is not
depicted according to perspective.

Aerial and satellite photos would be most close to the simplified description of map, yet
anyone can tell immediately that these images don’t really serve as map – they tell us what the
surface of the ground looks like and, while the colours can be more realistic, it’s actually harder to
distinguish between the types of the road or building, or whether a certain area is enclosed or
open to access. To the untrained eye, these images are actually more difficult to read. The
situation of comparing realistic with stylised images is discussed in detail in chapter 6. Here the
focus is on the spatial relationship and the issue of projection is considered.

To describe it in mathematical terms, the physical environment we live in and travel across is
a three-dimensional world; a map is an image on a two-dimensional surface, without depth or
thickness. In essence, any attempt to depict the environment onto a two-dimensional surface is
an act of projection. Not only in mapping, but also in drawing, painting and photography: all are
related to projection in one way or another.

This kind of projection poses a particular kind of problems: from three-dimensional to two-
dimensional, some information will inevitably be lost or distorted; from the two-dimensional to the
three-dimensional, some extra effort of interpretation is needed.

The most notorious example of distortion from projection in cartography is the world map.
To present the surface of the globe onto a flat surface there are several methods of projection,
and each one distorts the final results in a different way – there is just no perfect way to draw a
world map without compromise (figure 4.2). The loss of information also poses a problem. If we
simply 'press' the three-dimensional environment to become flat, just like the aerial and satellite photos do, it is very difficult to tell how tall a building is or how steep the hill is. It is also difficult to tell the exact structure of a multi-layered city such as Edinburgh, with its dramatic changes of height from the castle to the streets at the foot of the hill. (Although, to a trained eye, shadows cast by the sun can sometimes provide clues to interpreting the vertical information.)

Of course, on many occasions, a simple, flat projection of a three-dimensional situation can be quite useful: take a simple example such as a snapshot of a party one Saturday night – it can serve as a reminder for anyone who was there. There is no need to worry about the exact three-dimensional setting presented in the snapshot, since people at that party had their own experience related to that space. However, the situation of using a map to navigate is a different matter: it usually deals with an unfamiliar space, so the map user has to have the ability to interpret and relate the two-dimensional information in an environment.

One way of considering this issue is to look at our brain’s ability to read flat images as three-dimensional. Let’s take the Ponzo Illusion (see figure 4.3), for example. The Ponzo illusion is an optical illusion firstly demonstrated in 1913 by the Italian psychologist Mario Ponzo (1882-1960). He suggested that the human mind judges an object's size based on its background. So, against two diagonal and converging lines like the rails extended towards the horizon, the horizontal lines with exactly the same length appear longer at upper part of the image and shorter at lower part. Our brain interprets the two converging lines according to perspective, thus the upper part of the image would be seen as more distant and the lower part as nearer. It is interesting to note that the so-called 'background', the two converging lines, is nothing realistic but simply two lines, yet the brain interprets it as being three-dimensional. It shows at least some two-dimensional images register as three-dimensional to our brain.

Figure 4.2 Three ways of projecting a globe’s surface onto a flat surface. In the cylindrical projection, the cylinder of paper wrapped around the globe, the parallels and meridians are projected as straight lines intersecting at 90°. The areas towards the top and bottom enlarge considerably. An azimuthal projection is formed when a plane surface is tangential to the globe at any point. Direction is always true from the central point. A conical projection is formed if a paper cone is placed over the globe, touching the globe along a parallel. Distances are correct along the parallel touching the cone; away from it the scale becomes increasingly distorted along both meridians and parallels. Illustration from Hodgkiss, Understanding Maps: a systematic history of their use and development, 1981.
Another example of the optical illusion can be seen in Necker Cube⁴ (figure 4.4) — a kind of isometric illusion, which indicates images that build-up through same-length lines — because it can’t indicate relative direction to the viewer, the image would sometimes be interpreted by the brain as ‘seen from above’ and sometimes as ‘seen from below’, and normal people’s perception would see it constantly flipping from one to another. Again, isometric illusion images are just a combination of simple lines, and they are not even constructed according to perspective, yet the brain registers them as three-dimensional. Isometric images have an advantage of showing correct dimension if a reality is to be built, even though perspective and realism are sacrificed.

However, more careful examination reveals that we are not born with this ability, but that it develops alongside our early visual experience.

It is reported that people who regain eyesight after a long period of blindness do not experience these visual illusions, as Richard Gregory observes on his patient S. B.⁵ Neurologist Oliver Sacks also observes that his patient Virgil, who regained his eyesight for a short period of time following surgery after having been blind for more than forty years since his infancy, has no faculty of recognition of still pictures:

[…]. When we tried him […] on still pictures, pictures in magazines, he had no success at all. He could not see people, could not see objects — did not comprehend the idea of representation.⁶

It suggests that, although we do have the latent capacity of recognising, or seeing, people or buildings in a flat representation, it’s not a basic function of our visual system. It’s not that we open our eyes and everything is given. We must somehow gain the relevant experience and develop this ability in day-to-day life — even though this training process starts very early on in life.
and we do not remember it. Furthermore, it suggests that the technique of perspective
discovered by the masters in the Renaissance works because our brain is ready for it – already
trained with the ability of seeing the three-dimensional space on a two-dimensional surface.

Now it seems that the following method for children to relate to maps and the environment is
plausible: in Mapstart (the book designed for young children in Key Stages 1 and 2 under the
National Curriculum Geography), a series of steps is introduced to teach children what a map is:
“looking down at the ground”, “looking down at furniture”, “looking down at a classroom”, “looking
down at an area”. These steps help to link the first person experience with the map-like images in
a progressive way, with smaller, easy to comprehend area at the beginning, and gradually a
larger area of ground is covered. Under this principle, once the relationship between a plan and a
visible area is built, it can apply to much larger and less familiar areas, and eventually to any
surface we want to address. Here there is a consideration that relates to scale: there is a limit to
how large an area of ground people can actually see in person. But with the assistance of a map,
even a very large area would become comprehensible and thus give people the reassuring
sense of being in control (see section 3.3).

Back to the beginning of how a map is naively described as ‘seen from above’, now it is
understandable that why this description is still helpful – it reminds people of their own memory of
seeing a much larger area of ground from a tall building or aeroplane, and thus it is easier to
connect it with their first-hand experience.

**4.3 Flatland – a close look at the experiences considering ‘lower’ and ‘higher’ dimensions**

Edwin A. Abbott’s *Flatland: A Romance of Many Dimensions,* first published in 1884, remains to
this day a frequently introduced reference for students of physics or mathematics. It offers a vivid
and interesting resource for studying the relationship between two- and three-dimensional worlds and for imagining what the spatial shape beyond three-dimensions may be.

The story is written in the first person by ‘A. Square’, an inhabitant of Flatland, to the readers in *Spaceland*, or the three-dimensional world. Since the readers are not familiar with two-dimensional world, A. Square devotes considerable space at the beginning of the story explaining what the nature and people in Flatland are like. For example, A. Square explains that although they have inhabitants in the shape of triangles, squares, circles, etc, from their point of view they can only see straight lines. To assist understanding, he demonstrates as follows:

Place a penny on the middle of one of your tables in Space; and leaning over it, look down upon it. It will appear as a circle.

But now, drawing back to the edge of the table, gradually lower your eyes (thus bringing yourself more and more into the condition of the inhabitants of Flatland), and you will find the penny becoming more and more oval to your view; and at last when you have placed your eye exactly on the edge of the table [...] the penny will then have ceased to appear oval at all, and will have become, so far as you can see, a straight line.9

In addition, to demonstrate that the same situation applies to any shape like a triangle or square, he provides this illustration:

All the inhabitants in Flatland are certain kind of geometric shape. And since all of them would only seen as a straight line in other inhabitants’ eye, they have developed other methods for recognizing each other, such as the faculties of hearing and touching. Moreover, they also have the ability of recognising by seeing – for there is the help from thick fog in their world almost all year round. The following is how they, with education and practice, can achieve recognising by sight (figure 4.6):

---

9 Figure 4.5 Illustration from *Flatland* (1884) to demonstrate that any shape would look like a straight line when seen from the side.
Chapter 4 Flat and holographic experience

Now in the case of (1) [...] I shall see a straight DAE, in which the middle point (A) will be very bright because it is nearest to me; but on either side the line will shade away rapidly into dimness, because the sides AC and AB recede rapidly into the fog and what appear to me as the [...] extremities, viz. D and E, will be very dim indeed.

On the other hand in the case of (2) [...], though I shall here also see a line (D’A’E’) with a bright centre (A’), yet it will shade away less rapidly into dimness, because the sides (A’C’, A’B’) recede less rapidly into the fog: and [...] D’ and E’ will be not so dim as [in case (1)]

Through in-depth introductions like this and accompanied by illustrations, Square brings the readers into their two-dimensional world to a degree that we are able to not only sympathise with their way of talking, thinking and living, and can even imagine what it would be like to live there. Thus, when Square is visited unexpectedly by Sphere from the three-dimensional world, his reaction at seeing a circle, being completely unable to understand what the Sphere means in spatial terms, is totally understandable. In the process of letting Square understand that he is not a circle, this is what happens (figure 4.7):

‘[...] See now, I will rise; and the effect upon your eye with be that my Circle will become smaller and smaller till it dwindles to a point and finally vanishes.’

There was no ‘rising’ that I could see; but he diminished and finally vanished. I winked once or twice to make sure that I was not dreaming. But it was no dream. For from the depths of nowhere came forth a hollow voice – close to my heart it seemed – ‘Am I quite gone? Are you convinced now?’
Because there is no way Square would understand what a sphere means where he comes from, Sphere finally decides to take Square into the three-dimensional world. Suddenly, Square realises everything in a three-dimensional way and the experience proves to be extraordinary. He can see not only the sides of his fellow Flatlanders, but also their ‘insides’. And he also realises that his equivalent in Spaceland is Cube. However, at the beginning, when his vision has not fully adapted to the world of three dimensions, he admits to some difficulty in seeing a cube; it looks to him more like an irregular hexagon, as shown in the illustration in figure 4.8.

This interesting incident recollects the observations about recovery of sight of people who were blind from a very early age. Virgil told Oliver Sacks that, in the first moment after the surgery, “he had no idea of what he was seeing. There was light, there was movement, there was colour, all mixed up, all meaningless, a blur”. It’s only after a voice came out from that blur, then he finally realized that “this chaos of light and shadow was a face – and, indeed, the face of his surgeon”. In the case of Square’s interpretation of a cube as a hexagon, there is no way we can be certain that whether Abbott had been inspired by the cases of people who regain their eyesight, but he surely was thoughtful about human perception.

Later in the story, Square feels very enlightened by his experience in Spaceland, and is eager to see worlds in four dimensions, or even more. The Sphere is not able to answer his request because it’s beyond his ability; however, he is also inspired by the idea of Square. The latter goes back to his homeland, haunted for his whole life by what he has seen. The reader is left wondering: what would it be like to see a space in four or more dimensions? Since we have had to learn how a three-dimensional objects casts its shape on a two-dimensional surface, what would it look like for a four-dimensional object to cast its shape on our three-dimensional world?
Flatland provides a very good analogy for abstract concepts (the fourth dimension, and beyond) by relating it to the familiar and tangible realm (two and three dimensions). Abbott’s detailed description of Flatland helps us to associate ourselves from the comprehensible ground, and then move to unfamiliar land – similar to the example of teaching children to understand maps as mentioned in section 4.2. The whole story itself offers a fine exercise for pondering the relationship between the worlds of two and higher dimensions, which will prepare us to consider the design of book works in the next section.

4.4 Design of book works

4.4.1 Early experiments

Before this thesis developed to the stage that each theme required a pair of books, I explored the relationship between two- and higher dimensions in several different ways. A selection of prototype examples from my design of book works is introduced and explained.

• The Fish Tank (see figure 4.9)

This board book was designed in 2004. Its subtitle gives a hint to the reader before it’s opened: “Bring you from the top to the bottom of the fish tank”. The content of the book constitutes images of cross sections of an empty fish tank arranged in sequence, beginning with the top view of the fish tank, and ending with the bottom view of the fish tank. The ‘back cover’ of the book looks very similar to the front cover, only with the altered subtitle: “Bring you from the bottom to the top of the fish tank”, and the fish tank image on the cover is upside down. Therefore the reader can

Figure 4.9
An earlier design of the book work by the author. Top: front cover; middle: back cover; bottom: displaying the structure and inner pages of the book.
start this book all over again from the ‘back cover’, only this time the sequence is from the bottom
to the top of the fish tank.

This book can be seen as a collection of sliced cross-sections of the fish tank. Because
these sections are arranged in the correct order, the book can also be said to be a compressed
version of a three-dimensional fish tank. From the author’s observations and conversations with
trial readers, it is clear that they do feel they are turning a fish tank over and over again, even
though they may not automatically assume they are handling slices of cross-section of the fish
tank while turning the pages. Thus the book has become more ‘three-dimensional’, even if its
physical structure is quite conventional.

- **Experiments on existed forms related to three-dimensional structure built-up by paper**

  This is a selection of initial experiments for exploring ‘how to make three-dimensional structure
  (such as a mountain) out of flat paper’. Existing forms are made to check their potential to
  become a book.

  The ‘Christmas tree’ is often seen as a variation for a Christmas card and for the restaurant
  information or menu that can stand freely on the tables. It consists of two flat sheets of stiff paper
  or cardboard, each one having a line cutting up along the vertical central line, with one cut from
  the top to the middle and the other from the bottom to the middle. When the cardboard is not very
  thick, this structure can be flattened like an un-opened book. When it’s open, it has to ‘stand up’
  and occupies part of the supporting surface (such as table top) and displayed like a little
  sculpture. This structure has similarity with books in terms of the hinges and ‘opened and closed
  states’. The fact that it doesn’t necessarily have a cover or specific ‘starting point’ for reading
  provides potential for circular narratives on the pages. However, its ‘open state’ always forms a
vertical relationship with the supporting surface. The ‘Triangle’ version (figure 4.11) works in a similar way, but it has more flexibility considering the vertical relationship with the support and may be easier for normal reading gestures.

Figure 4.12 shows a traditional origami paper balloon. It uses the pliability of thin papers so that the bag-like structure can become swollen like a balloon. Its flattened state also provides page-like surface for information to be written on, and the revealed surfaces when in the ‘balloon’ state can be seen as opened pages.

The major drawback of these simple forms of book works, for the purpose of this study, is that they don’t provide enough layers for more information to be revealed page by page. Although they do display some interesting relationships between flat and three-dimensional structure, their opened and closed states are very straightforward, and thus leave fewer variations to be played with.

- More experiments on three-dimensional structures related to map
  This group of experiments explores further the square book form related to the idea of contour line. Contour lines on a map are lines to show the relief on the ground. Each line indicates the equal elevation (or height) related to sea level. So if a person walks along the route indicated by a single contour line, it would feel like walking on the horizontal flat ground without any up- or down- slope.
If, however, a person crosses more than one contour line, the up- or down-slope would be experienced. If the person walks across more lines, it also means the elevation of the person changes more. If the contour lines are very dense, it means the slope of the corresponding area is very steep.

The first two designs, Lake and Hill, are closer to The Fish Tank book in the way of using correctly arranged images on each page slicing through contours to create a compressed version of a three-dimensional structure.

Lake (figure 4.13) exploits the properties of piled papers that, when an upper one is cut through to create a hole, the surface of the next page would reveal. When the book is first opened, the lake is revealed in the form of contour lines similar to what can be seen on a map (in this example, there is no value of height assigned to each line). However, the book also gives a sense of three-dimensional depth of this lake, since the ‘lines’ are actually the edge of the cut-out shape, not the printed line on the paper. When readers turn to the following pages, it reveals that each page contains a cut-through shape, and the area on each page reduces as the sequence progresses, until the bottom of the lake, where there is no cut-through hole at all. Each page in this book is like a thin slice of the earth or a cross-section of the lake. The contour lines represented by the edge of the paper also have an additional appealing visual and aesthetic quality formed by the light and shadow.

Hill in figure 4.14 uses contour lines in the same way as Lake – each ‘page’ physically represents the thin slice of the earth – with the difference that this time it tries to create a hill rather than a lake. Naturally, this structure cannot be bound on one edge like a conventional book if the hill is to be presented in correct shape; the solution here is to use strings to go through each disc (page) and make each disc to attach to the strings at a fixed position. From the cover...
(outside) of the book there is no hint of what the structure actually is. When readers first open the book, the movements would be limited by the strings, and they would also realise that as there is no binding at the side of the front and back covers, they can adjust the position of the front cover to become parallel to the back cover and form the correct shape of the secret hill. In this design, there is an apparent interaction between the book and the reader's hand: the hand has to work against the gravity in order to make the book remain in its 'opened state'. The book would naturally close once the hand is no longer holding the front cover.

The design of the *Spiral* book combines the string in a conventional one-sided binding structure. The concentric contour line in the previous books *Lake* and *Hill* transforms to become a spiral shape, with a string connecting the centre of the spiral to the opposite page. The spiral shape is cut on one piece of paper, so when the book is closed it's completely flat, and when the book is opened, the string would pull the spiral to become three-dimensional. In this design, the value of the 'page' has become less significant in this design, and the relation to contour lines or to the landscape has also become less visible. Overall it's more sculptural.

Some design ideas in this section may not be directly used in the final book works as we shall see in the next section; however, all of them display a contrast between the book's 'closed' and 'opened' state, which in itself is an intriguing aspect of viewing a book. Related issues are discussed in the latter part of section 4.4.3.
4.4.2 General description of the pair of book works: *A cuboid has penetrated* and *A cuboid that penetrates*

This pair of book works has two different titles each with their distinct cover: the larger one reading *A cuboid has penetrated* has a cut-out rectangular shape throughout the whole book, while the smaller, second book reads *A cuboid that penetrates* on the cover, and no cut-out shape visible from the surface (figure 4.16).

The size of the cut-out rectangle on the larger book and the two titles on the books suggest that the smaller book can be put into the cut-out shape (figure 4.17).

![Figure 4.16 Front view of A cuboid has penetrated and A cuboid that penetrates.](image)
The content of the first book is an extract from E. A. Abbott’s *Flatland*, without any editing of the original text, but with a brief introduction on the first page written by the author of this thesis. The two major characters, the Square and the Sphere, engage in a conversation about what it means to be three-dimensional. The Sphere, who comes from the three-dimensional world, tries to explain in language what the next dimension beyond Flatland means: however the Square, who is an inhabitant of Flatland, always interprets it in two-dimensional form, for example, ‘up above’ and ‘down below’ would be understood as ‘north’ and ‘south’. The sentences in the conversation tend to be short, and on most pages there is only one or few lines of text from either Square or Sphere, therefore at a normal reading speed, the pages would be turned at a relatively fast pace. The cut-out rectangular shape, as suggested by the title, *A cuboid has penetrated*, is the ‘consequence’ or ‘evidence’ of some object’s penetrating the whole book. It implies that a certain kind of movement happens to the physical structure of the book in a three-dimensional sense. When proceeding with the conversation in the book, therefore, the cut-out rectangular shapes would always appear in the middle of the page. The relationship between the cut-out rectangle and the text thus can be ‘played with’ by arranging the texts in different places on the page (since the cut-out rectangle has a rather fixed position on each page) (figure 4.18). Sometimes the texts and the cut-out rectangle are very close to each other, creating a tense, uncomfortable feeling. In the process of design, it was tested that the text itself be cut-through, this causing some missing letters (though the whole word was still readable), to imply that the conversation has been severely interfered with by the penetration of the three-dimensional object. However, the result was not satisfactory in terms of aesthetics, and didn’t assist the story itself, so the final decision is that all the texts have been saved from the attack of the rectangular shape.

Figure 4.17 One example of possible physical interactions between the two books, *A cuboid has penetrated* and *A cuboid that penetrates.*

Figure 4.18 *A cuboid has penetrated*, showing the relationship between the cut-out rectangles and the texts.
The content of the second, smaller book is also an extract from *Flatland* (two segments from chapter 18 and 19, respectively, without further editing of the texts), talking about the Square’s first-time experience in the three-dimensional world. The Square finally comprehends the three-dimensional world by first-hand experience, and also realises that his equivalent in the three-dimensional world is a cube. The style of the original story here is more descriptive than conversational, making the position of texts through the pages less straightforward than in the first book, so that how much text should be included in one page is considered and edited; although the original text is not altered. In the beginning part of this book, there is no cut-out shape, while in the later part, circle and square shapes can be seen in the last few pages. The circles on each page form a sequence that firstly enlarges and then reduces, implying that the whole sequence, if the book is closed, would form a three-dimensional sphere. Actually it has been calculated that way to ensure the cut-out space forms a ‘correct’ sphere when the book is closed. The same situation applies to the small square, which would form a cube when the book is closed. The difference is that the square shape on each page doesn’t have to change size (figures 4.19, 4.20).
4.4.3 Implications of the physical properties of the two books

There is an obvious relationship between the two books, suggested both by their titles as well as by their physical shapes: the smaller book is just the cuboid that penetrates the larger book. Readers can physically realise this relationship by putting the smaller book into the cut-out shape of the larger book and penetrating it. However, after both books have been read and the physical relationship had been played with, there are several more points to note:

Firstly, in the larger book, the conversations are taking place in the Flatland while the Spaceland still exists somewhere in some form that Square is not aware of. However, readers (as the Square refers to in the Flatland: “you, my Readers in Spaceland”) can be aware of its existence in the form of the cut-out shape. That is to say, the cut-out shape itself is read as meaningful rather than ‘nothing-ness’ of the paper. This utilisation of the cut-out shape is also seen in book works under the theme of scale, where the cut-out circles are also identified as an object other than ‘nothing’.

Second, in the smaller book, the scenario is taking place in the Spaceland. The physical ‘identity’ (a cuboid) suggested by the title also coincides with this fact: this part of the story is represented in a cuboid. Furthermore, the cut-out three-dimensional shapes inside the smaller book also augment this ‘three-dimension-ness’ of the smaller book.

Third, the ‘correct’ cuboid, sphere, cube, and the penetrated space all require the books to be in a closed state rather than an opened state. This fact provides readers the opportunity to ponder more on closed books. Closed books, since most of the information in the inner pages is not revealed, are more of a physical object and sculpture-like. This opportunity makes it interesting to compare the book’s physical, sculpture-like properties with its textual and conceptual properties. In a normal reading situation, a book is read for its ‘content’ – mostly
written or printed information – and the book has to be ‘opened’ to reveal its inner surfaces. Indeed, a comfortable reading experience would require all irrelevant elements to ‘secede’ from the readers’ awareness – any uncomfortable reflection from the paper, stiffness from the binding of the leaves, inconvenience caused by weight, difficulty of holding and turning the page due to the thickness and texture of the paper, etc., are all best avoided. Most physical properties of a book are not intended to be ‘read’, but to support a comfortable reading experience. In this book design, on the contrary, the physical alterations away from a normal book should be read as visualisations and realisations of part of the story. Furthermore, when the books are closed, this realisation becomes even more significant. Usually, an ‘unopened book’ or ‘unopened chapter’ metaphorically describes some event that is yet to happen; and a ‘closed’ book or chapter signifies a conclusion; but this pair of books just doesn’t finish when they are closed. This may remind some readers of their own experience after finishing reading a splendid novel or inspiring book, when the closed book signifies the feeling of contentment or as a signifier of the impressive reading experience. Here this pair of books provides an even more direct way for a book to be read while it’s closed.

Another implication is related to an element used in the film 2001: A Space Odyssey, directed by Stanley Kubrick (1968). Readers may remember the black, sleek, and mysterious tombstone-like block of rectangular shape. Each time it appears, it signified an important ‘step forward’ of the evolution of the human being, including the use of weapons to kill his fellow man. In this book design, although the smaller cuboid book doesn’t have the same dark implications as the black block in the film, they do nonetheless share a sense of mystery and unknown. This is also implied in the Flatland – to the Flantlanders, three-dimensional shapes are unknown and unimaginable, and to us living in Spaceland, the four-dimensional shapes are equally
unimaginable, too. It is not unusual in different cultures that people often have the feelings that forces from an 'unknown dimension' or 'other world' can have an influence upon us through mysterious ways. When reading the first book, the cut-out rectangular shapes are like the mysterious impact from another dimension, and later it is revealed that it’s from another book – the book just like the black block in the film 2001: A Space Odyssey.

The design of the pair of book works, along with earlier experimental designs and other books containing cut-out shapes, are also related to the idea of positive and negative space in painting, print or sculpture. Detailed discussion follows below in chapter 8, section 8.1.

---

9 Ibid, pp.7-8.
11 Ibid, p.86.
Chapter 5  Transfer between Space and Time

5.1  Translation between time and space
   5.1.1  Explicit relationship between time and space
   5.1.2  Ambiguity between spatial and temporal concepts
   5.1.3  Journey-orientated maps and time
5.2  Relativity and the flexibility of thinking about time
5.3  Depiction of time: linear time and circular time
5.4  Design of book works: Expedition
While people refer to maps mostly for spatial information, maps also have an interesting relationship with time. On the one hand, time is never the central concern of a map – apart from the publishing date (for making sure that the map in hand is up-to-date), map-users are normally only interested in the spatial information, such as distance, direction, landmarks, scale of particular buildings or landscapes, etc. They wouldn’t expect the map to show different information according to different time of a day, in a good or bad weather. On the other hand, the environment is ever changing, and the map is only drawn from a thin slice of time from that particular ground, so a map is in a sense always doomed to be out-of-date, and new updates will always be necessary for a map to keep its ‘longevity’. Furthermore, since one of the important aspects of map is that it assists a map-user’s journey, and journeys always take time – suddenly we find that there are more time-related implications in a map than at first appeared.

5.1 Translation between time and space
When people say ‘a journey from A to B’, at the most obvious level, A and B refer to two different locations in space – whether it’s physical, psychological, or even metaphorical one – and the journey is a subject’s movement from location A to location B. At a less obvious level, though, A and B can also mean two different points in time. This is because, when people are talking about journey, their interest is more in the process itself rather than the outcome, and this process always occupies time. If a subject could be at A and B simultaneously, people wouldn’t describe it as a journey at all. This suggests that the element of time is always involved in the idea of ‘journey’.

One can consider the relationships between time and space in the context of journey and map using on several levels. In this section, I will start from basic physics that concerns the
motion of an object – from which we can find explicit, unequivocal relationships between spatial and temporal measurements. Then we will move on to more ambiguous situations where space and time may be translated or substituted between each other. In the last part of this section, we will see examples of maps that are ‘journey-orientated’ and discard various level of spatial information. Some of them have even become ‘time-orientated’ maps.

5.1.1 Explicit relationship between time and space

In a classical, Newtonian world in which our daily life takes place in terms of physics, when we travel from A to B, it is a process of moving at a certain velocity across a certain time span. Among distance, time and velocity, if we know the measurement of any two of them, then the third one is also certain. To put it in plain English, if we know the speed of the traveller, and the length of the route from A to B, we will also know how long it takes to travel between A and B. If we know the speed of the traveller and the time it takes, then we also know the length of the route between A and B. The formula for this is:

\[ V = \frac{S}{T} \] (velocity equals distance divided by time)

People can also grasp this idea at a very intuitive level, even without learning any physics. For example, in a race, since S (distance) is the same for every competitor, the winner is the competitor who has the largest V (velocity) and the smallest T (time span). Or, if I travel in the same speed but to different destinations, if all other conditions are the same, I can be certain that the place where it takes more time to travel is farther than other places.

The Portland Speed-Time-Distance calculator (figure 5.1) is an interesting example which
offers a quick reference for sailors to plan their journey. As the name suggests, it has three scales representing speed, time, and distance, respectively. The centre and outer parts of the calculator can slide against each other. If the distance from the destination and the time allowance are known, by lining up the mark on time scale with the mark on distance scale, the speed will also be shown, thus the sailor knows the minimum speed required to get to the destination.

![PORTLAND SPEED-TIME-DISTANCE CALCULATOR](image)

**Figure 5.1 A Portland Speed-Time-Distance calculator**

Also related to sailing but on a very different scale, there is the example of the relationship between temporal and spatial information that ‘the knowledge of time helps to locate the position’ when a ship goes on a cross longitudes journey. Dava Sobel’s *Longitude: the true story of a lone genius who solved the greatest scientific problem of his time* (1995)\(^1\) popularises details of how John Harrison designed the most accurate and reliable ‘timekeeper’ (as John Harrison called it) of his day in the late eighteenth century, thereby solving the longitude problem.

Longitudes are lines that mark the north-south directions along the surface of the earth, or any sphere. The circles drawn by longitudes are of the same size, and they all converge at the north and south poles. Conversely, the circles drawn by latitudes are concentric circles that are
parallel to each other, the largest being at the equator, and the smallest at the north and south poles. For a ship sailing on the open ocean with few if any visible landmarks, to decide its latitude is much easier because the zero-degree latitude is decided by nature. It can be measured by a skilful sailor from the length of daytime, the height of the sun or familiar guiding stars. However, longitudes are artificial lines decided arbitrarily. Where the zero-degree longitude should be laid is largely a question of convention.

Because the earth completes one rotation of 360 degree in 24 hours, each hour can be calculated as 1/24 of the length of the circumference, or 15 degrees. So the difference in hours between the time on the ship and the time in the place of its departure means the difference of the longitudes the journey has covered. Everyday on the ship the sailor would adjust the clock when the sun reaches its highest point in the sky – ie high noon – and then compare it with the time of the port where the ship departed. Every one-hour difference means 15-degrees of longitudes. If the sailor knows their latitude, the distance of each 15-degree longitude can also be calculated. At the equator, 15-degrees longitude is equal to 1000 miles. The mileage decreases the closer you travel toward the north or south poles.

The longitude problem, for the sailor and explorer prior to the 18th century, lay in the fact that it was impossible to be sure of the time in two different places simultaneously. Old pendulum clocks on a ship rolling on the waves might be either too fast or too slow, or might even stop all together. Changing climatic conditions also played a role in causing the metal parts to expand or reduce in size. Because of the problem of not being able to determine the longitude accurately, even the best captains equipped with the most accurate charts and compasses would get lost at sea, often with fatal consequences. The expansion of international maritime trading gave added weight to the pressing need for improved communications; and the requirement for determining
the correct longitude was correspondingly acute. It was John Harrison, the watch-making genius, who first created a reliable timekeeper for maritime use.

Nowadays, with the assistance of new technology such as GPS (Global Positioning System) and Sat Nav (satellite navigation) equipments, old tools like Portland Speed-Time-Distance calculator or an accurate clock have lost the attention they once enjoyed. Nevertheless, time and space have displayed to us a relationship so tightly interrelated that the knowledge of either of them could give us knowledge of the other.

5.1.2 Ambiguity between spatial and temporal concepts

In normal English conversation, people ask “how long does it take?” to travel from A to B. If we deal with this question literally, it asks about the time it takes. However, the real interest of concern is rather ambiguous: a sense of distance from A to B may be what the questioner wants to get. Things vary a little depending on ones personal or cultural background: a person from England may reply “about 60 miles”, while a person from United States may answer “one hour by car”. A similar situation happens in Mandarin conversation: when a person asks, “how far is that place?” one is more likely to hear the answer “15 minute’s walk” than “one kilometre away”.

It is worth observing that some descriptions in the vernacular are not exclusively applied to spatial or temporal ideas: ‘long’ or ‘short’ may be used to describe both time and distance – both in English and Mandarin. In addition, in Mandarin, ‘far’ and ‘near’ not only apply to spatial relationships, but also to the temporal-relation of certain events to the present moment. Other descriptions that are exclusively spatial include ‘above’ and ‘below’, ‘high’ and ‘low’.

Here is an ancient Chinese story related to the idea of distance, set in the era of the Jin Dynasty (A.D. 256 - 420).
Once upon a time, the young Prince Ming sat beside his father, Emperor Yuan, when a messenger from Chang-an (a big city at the time) arrived at the Palace and greeted the Emperor. Wishing to test his beloved son, the Emperor asked Prince Ming: “Which one is further away: Chang-an or the sun?” “The sun,” the little Prince answered. “Why?” the Emperor asked. “People come from Chang-an, but I’ve never heard of anyone coming from the sun, so the sun must be further than Chang-an.” Emperor Yuan was very impressed. The very next day, in the banquet with all the ministers, Emperor Yuan wanted to show off to his officers and asked Ming the same question again: “Which one is further away: Chang-an or the sun?” “Chang-an,” prince Ming answered this time. “Why?” the Emperor was shocked. The little Prince then replied, “For everyday I can see the sun easily, but I’ve never been able to see Chang-an no matter how hard I try, so Chang-an must be further.” Everyone was impressed.

Comparing the two answers that the Prince offered, the second is solely visual, while the first relates to the ability of people to travel. Even though the conclusions are contradictory (in this case, it so happens that the visual information was misleading), both answers make a point, and either may sound convincing.

Perhaps one shouldn’t be surprised by this ambiguity. If I recognise my body as the centre of where my experience takes place, then any place that is not immediately reachable must be both some distance and some time away from my body. It is only with the assistance of our stereovision that the distance of objects can be decided without moving our body (bearing in mind that moving always occupies both space and time). Through this capacity of perceiving distance in a purely visual manner, we are able to manipulate spatial measurements to describe a much larger area than my body can reach immediately (it is 60 miles from A to B). However, this kind of spatial manageability, this power to operate a sense of space, is limited or rather
illusionary. A description related to our own bodily experience usually makes more sense (such as “a one-hour’s drive”). Indeed, if we make a statement that some place is 60 miles away from here, we clearly cannot be making a visual judgement; we must be relying on some other source of information in order to make such statement, such as a road atlas, a guide book, a road sign, somebody else’s directions, or our previous experience of driving. Comparatively, if the question becomes “how far away is that lamp over there on the opposite side of the street?” then our answer would definitely be based on a visual estimate – 10 yards for example – rather than how many seconds it takes to walk there.

If we consider the case of blind people, we find an extreme situation where there is no visual concept nor information available to them, the way people can make sense of the world becomes largely time-related.

In *To See and Not See*, Oliver Sacks notes his observations when he had the chance to get in touch with Virgil, who had been blind from infancy for more than forty years, but regained his eyesight for a period of time following surgery to remove his cataracts. Sacks observed how difficult, confusing and ‘unnatural’ it was for Virgil to adapt to a world full of visual information. Among many things, Sacks notes the following consideration about space and time:

> We, with a full complement of senses, live in space and time; the blind live in a world of time alone. For the blind build their worlds from sequences of impressions (tactile, auditory, olfactory) and are not capable, as sighted people are, of a simultaneous visual perception, the making of an instantaneous visual scene.

Sacks also cites John Hull, who had experienced five year of blindness. In his autobiography, *Touching the Rock*, he wrote,
This sense of being in a place is less pronounced... Space is reduced to one's own body, and the position of the body is known not by what objects have been passed but by how long it has been in motion. Position is thus measured by time... For the blind, people are not there unless they speak... People are in motion, they are temporal, they come and they go. They come out of nothing; they disappear.  

Just as Sacks notes, with normal eyesight, we live in both space and time. But this also means we don’t live in space alone. There is a limit to our spatial capacity – as compared to Hull’s “space is reduced to one’s own body”, in a large environment, compare to blind people, normal sight is only slightly better. It extends the space out of our body, but still has its limit, and is constantly blocked by other objects. Beyond that space we are also blind: places are in motion, a place beyond my eyesight is temporal. It comes out when I arrive; it disappears when I leave. To think of how far a place is, inevitably, it should be able to be related to my experience, and the movement of my body is readily taking involvement.

5.1.3 Journey-orientated maps and time

Topography notes the study and measurement of the shape of the land. It is solely spatial. The outcome can be a map with clear and accurate spatial information. However, as previously mentioned, when a map is used to assist our journey, it always concerns time: if we are planning a journey using a map, the route the finger or pencil passes is like a mini journey taken in a small span of time. Or, if we refer to the map in the middle of the journey, when we look for the next stop from the current position on the map, in a sense we are also looking into the future.
Some maps are designed for the traveller with specific purpose – to assist the traveller to get from A to B, not somewhere else. It is called ‘route map’ and can be traced back to Roman times (see figure 5.2), when commercial and military interests dictated efficiency of travel. The emphasis is not on the overall geographical features, but on the routes that connect specific places. For example, note the map in figure 5.3. This is a map by Georg Erlinger in 1525 after German map-maker E. Etzlaub’s map of the route to Rome – originally made for people going to Rome to celebrate the half-millennium in 1500. While some geographical features are retained, the lines of red dots mark the network of routes which can be taken; the interval between the dots shows one mile, and towns are marked by a circle.

**Figure 5.2** Detail from *Peutinger Table*, a later copy of road map of Roman Empire which after 1507 came into the possession of the Nuremberg scholar Konrad Peutinger, after whom the map is named. From Hodgkiss, *Understanding Maps*, 1981.

**Figure 5.3** Detail of Georg Erlinger’s *Gelegenheit Teutscher Lannd*, Bamberg, 1525. This is a version of Etzlaub’s map of the route to Rome. From Barber et al, *Tales from the Map Rooms*, 1993.
Some route maps omit even more physical features to focus on the necessary information on the specific journey. The map in figure 5.4, for example, is made by Matthew Paris, a Benedictine monk around 1252. This map is for the pilgrims to the Holy Land from London (bottom left). The shape of the map has become strips. No orientation nor geographical features are provided, but we can find the sequence of important towns – potential places for resting – and the distance between the towns are carefully indicated as travelling time in days.

In John Ogilby’s ambitious atlas *Britannia* (1675) (figure 5.5), the format is very similar with Mathew Paris’, but with a lot more details provided: orientation is indicated by the campus, the dots in the middle of the double line indicate the interval of one-eighth of a mile, miniature town plans are provided, and the landscape along the route is shown, such as woodlands, hills, and streams. He also indicates the nature of the track such as hedged – by continuous lines – and open – by dotted lines.

It is interesting to note the intended sequence for making use of the maps in the above two cases. Both maps start from the lower part of the far-left strip, and when the reader reaches the top of that strip they proceed to the next right hand side strip, where they begin from the bottom again. The sense of orientation is highly user-centred and intuitive: the journey on the map proceeds in the same direction as the traveller does on the road. Overall, these maps efficiently assist the traveller by giving just enough information to ensure that the traveller is on the right track. A similar principle is at work today in maps such as AA road maps for motorists (figure 5.6): the main difference being that the information required is no longer woodlands or streams, but motorways and their exits, the branching of A and B roads leading to different towns and roads, and the distance between them.
Figure 5.5 From John Ogilby’s *Britannia* (1675), Volume the First, the road from Combe to Montgomery (detail). From Barber et al, *Tales from the Map Rooms*, 1993.

Figure 5.6 The M40 (detail) in *AA Members’ Handbook 1992/3*. Automobile Association. From Barber et al, *Tales from the Map Rooms*, 1993.
The next example considers a map for the blind or visually impaired (figure 5.7). Here is part of a map of the Leeds and Liverpool Canal, prepared by the Royal National Institute for the Blind (1988). An essential feature and benefit of this map is that information is presented in the same way that it is received: sequentially. The orientation is ignored and, to save space, the route has become a serpent-like strip. Unnecessary details have been omitted on either side of the route, and the display is limited exclusively to those features of significance to the blind hiker, such as locks, tunnels, bridges (the difference between bridges and rail bridges is also marked); the canal and tow-path is also shown on the correct side.

This map for the blind and visually impaired can be considered as a sequence of objects or ‘events’ on the road that will be encountered by the hiker. In essence it is not very different from the strip maps we just saw above. This may also remind readers of the discussion in previous section that blind people live in time rather than space: on a larger scale, normal sighted people also have limits on their perceivable space. When we are moving, every place is a temporal encounter with our body. These maps in strip style can be seen as representations of a journey, just as we experience it – only with limited surroundings at every moment, but in a continuous flow of time.

5.2 Relativity and the flexibility of thinking about time

Another area where the idea of time is closely related to space is Einstein’s concept of Relativity. This revolutionised man’s concept of the structure of time and space at the turn of the 20th century.

Before Einstein adopted Time as a dimension having equal properties with three spatial dimensions and thus constructed a ‘Space-Time’ system, time had been regarded as having very
different properties from space. Dimension was almost exclusively used in spatial terms, therefore the ‘fourth dimension’ was also a spatial one. In fact, in *The Flatland* (see chapter 4 for detailed discussion), by depicting the interactions between inhabitants of two-dimensional and three-dimensional worlds, Abbott assisted us to imagine a world of ‘higher dimensions’ beyond our three-dimensional world. The use of the term ‘higher’ dimension implies a world beyond us: a mystical and spiritual – if not God’s – world (Hinton, 1904).^{13}

What Einstein began with was relatively simple. For a man in his house, the floor is static, his can pour himself a cup of tea from the teapot without difficulty. The same goes for a notional woman on a train, she can walk around as she always does, and could pour herself a cup of tea from a teapot as well. Then, just as the train is flashing past the house, the man and the woman would be able to catch a glimpse of the other person, and would perceive the other as moving at a very fast speed compared to their own floor, which they each perceive as being static. We can’t say who’s perception is right and who’s is wrong. However, something even more intriguing taking place here: for both the man and the woman, if they observe and measure the speed of light, would get the same result – actually, no matter how ‘fast’ the observer travels, the measurement of the speed of light would be always the same.

From this observation, Einstein made a mathematical demonstration that time, just like the measure of space, is not absolute, but possesses variable values. That is to say, time can ‘flow’ faster or slower in different conditions. If we travel at a very fast speed close to the speed of light, time will slow down, and our physical length in the direction of travel will shrink to near zero, and our mass will increase considerably. If we travel just like light, time will become zero, and the mass will become infinite.

The Theory of Relativity opened up a whole new arena of human imagination. People could
now start to entertain the idea that ‘time is not absolute’. The measurement of time depends on the conditions of our position. Furthermore, if something as fundamental as time is not absolute, might many other objects, concepts or qualities not be absolute, either? It is interesting to point out that the way most people think, imagine and use the word relativity is very different from Einstein. The Theory of Relativity applies to the world at a much larger scale than our earth-bound life. We, with our biological body, simply live in a world that cannot experience the slowing down or speeding up of time in the sense of the Theory of Relativity. Our daily life experiences belong to the classical Newtonian realm. However, because the term ‘relativity’ has acquired so much popularity, it assisted twentieth century human beings to think in a much more flexible manner. People gradually started to apply relative terms to many areas, and also to be aware that what they see is in relation to the observer’s condition. The way we relate ourselves to other people and to the world has become less certain, less finite, and more flexible.

5.3 Depiction of time: linear time and circular time

Before we proceed to the design of book works under the theme of transfer between space and time, the idea of the representation of time itself needs further discussion.

Although it is very hard to say whether we actually experience ‘time’ (itself a matter of heated philosophical debate), it is safe to say that the way we experience time is largely dictated by changes to things surrounding us. A seed becomes a plant, a train travels across the field, an arrow flies from the bow to the target, a child becomes a teenager, etc, are all familiar references we associate with the idea of time.

The way things change, and therefore the kind of time we experience, can be categorised into two groups: linear and circular. Changes described above are rendered as linear, because
they happen in a one-way and irreversible manner. When we say ‘time flies’, it not only implies the speed of how things change, but also that the change is irreversible. This style of time usually implies there is a beginning and an end, and while in some occasions a beginning and an end may not be easy to identify, a sense of direction is very strong. On the contrary, for circular changes, things happen repetitively every once in a while, the sense of direction is vague, and things are often described as rhythmical, such as the rhythm of day and night, the cycle of seasons, the repetitive heart beats and pulses, and even the cycle of life (since the life of one individual is not able to repeat itself after death, there is no ‘circle of life’ for named individuals: it only makes sense when we see it as collective phenomena from a broader point of view).

The words ‘linear’ and ‘circular’ are originally spatial terms, but it seems very natural that people borrow them to describe temporal phenomena. It is as if we are drawing a trajectory from ‘something’ that is not spatial to make it become visible. This is another example that spatial and temporal ideas are interrelated and interchangeable with each other.

5.4 Design of book works: Expedition

The major idea here is to make readers become aware of the sense of time, and notice what elements provide them with this experience. By reflecting upon the means and experience, the relationship between spatial and temporal elements can be shown, thus demonstrate the transferable properties between each them.

Based on this requirement, the book needs to consume the reader’s time and make the reader to be aware of it. A long narrative is preferable; and it is considered best to avoid complicated information or difficult concepts, so that the reader is not led astray in complicated thoughts, since these would make the passing of time less noticeable.
One early experimental book in this study exploits the discomfort of waiting in a concert to achieve the awareness of time (figure 5.8). In the beginning of this long, thin music book, *Original Music for Recorder – With the audience’s guide for cough*, it reads “please clear your throat before the recital. Once the music begins, coughs are not permitted until you see the symbol ✖”. This symbol later appears within the musical score.

In the following paragraphs I will describe several examples of experimental designs from my book works, and eventually reach the final design for this part of the thesis.

- Design 1: unfolding

![Figure 5.8](image1.png) The cover of the experimental book *Original Music for Recorder* (2004).

![Figure 5.9](image2.png) The unfolding process of design 1: unfolding.
This design focuses on the ‘unfolding’ process in a journey. The cubic box is actually formed from a long, thin, folded strip. The texts on the strip, “unfolding of space unfolding of time” with each word on one ‘page’, suggest the orientation and encourage the reader to further unfold the structure. The sense of direction in reading this ‘book’ recalls the strip maps by Matthew Paris or John Ogilby – from bottom to the top of the strip. While the strip unfolds, its width narrows, thus creating an additional visual sense of perspective from the reader’s point of view.

• Design 2: drawer

![Figure 5.10](image.jpg)

*Figure 5.10* The opening process of design 2: drawer.

The principal intention of this design is to record the passage of time via its structure. The segments or pages are like an interconnected set of drawers: as one page is pulled out, the next comes into play. As each page is exposed the work gradually occupies a new space. Hence, the
action of the reader leaves a visible trace in space, and the length of the resulting book on display is a translation of the time spent by the reader.

Comparatively, for conventionally bound books, the passage of time also leaves a trace in space – as indicated by the thickness of the pages that the reader has gone through or the corresponding thinness of pages yet to be read. However, in a normal reading situation, the space a book occupies does not expand.

- Design 3: concertina

Figure 5.11
Book design 3: concertina; overview and detail.
Figure 5.11 shows the designs based on the exploration of the concertina book form. The concertina form is often used to represent the element of time, in particular the linear experience of time.

The structure in this design is closer to the musical instrument of the same name than it is to a traditional concertina book. The characteristic movement of the instrument is its elasticity; this design exploits the sense of a non-absolute, ‘elastic’ quality to our experience of time. The structure involves vertical walls and a frame-like ‘scaffolding’ structure connecting the upper edges between the walls. This design makes the whole structure sturdy, and visually enhances the resemblance to the musical instrument.

Another major element in this design is the sequence of dots. The dots may resemble the buttons with which the accordionist plays chords, and may evoke the musical dots on the page of a score, or even a visual dance. They also relate to the route of a journey, twisting and turning like footprints. The distance between the dots may represent distance or time – just as in John Ogilby’s Britannia. The arrangement of the varying density of the dots may represent varied pace of movement, and here again this could remind the reader of music or dance.

• Design 4: concertina revisited

After Design 3, this book further explores the concertina form (figure 5.12). Structurally, the folding of the paper gives readers a hint of landscape – hills, valleys, bridges and tunnels. As in Design 3, the dots serve as indicators of a route, like a footpath on a map or a conventional indication of the trace of a journey, or else like the trace of a journey or passage. The density of dots also provides a sense of time.
In this design two types of dots are tested to examine their properties and limitations. For the punch-through holes, the relationship with the ‘bridges’ is limited – the width of the bridges cannot be shorter than the diameter of the holes. The elevated, embossed circles don’t have such a limitation, and offer a more subtle and elegant design.

Figure 5.12 Book design 4: concertina revisited. Top two images show the interaction between punch-through circles and bridge-like structure; the bottom image shows similar ideas displayed by embossed circles.
Design 5: *Expedition*

One of the main alterations from previous designs is the selection of ants, instead of dots, to depict the traces of a journey. These ants, as with the dots, represent both distance and time. Compared with abstract dots, the behaviour of ants, familiar to most people, provides a clear, linear sense of direction, and a sense of ‘expedition’, whilst still preserving the appearance of simplicity and directness; thus they are eminently suited to my purposes.

This design also utilises the three-dimensional properties of books, in the first, larger book, by punching big holes through the pages and allowing the array of ants to march through them.
As the reader follows the progress of the ants, the structure of the book unfolds naturally. There are several ways the ants can interact with the pages; they are arranged in a specific order so that the reader will see the easier and more intuitive one first, and gradually proceed to the less intuitive one. The ways the ants march across the page and punched circles are: going through the hole to the next page (figure 5.14); jumping a page via the edge of the adjacent pages; going through the hole to the other side of the paper; going around the lower or higher edges of the page to the other side of the paper. Within this order, the readers will be assisted and encouraged to follow the ants at both sides of the paper in a more adventurous manner (figure 5.15). Eventually, the whole book can be unfolded to become a large ring, and the array of arts connects back to where the reader started – the cover of the book – and forms a circular, infinite journey.

The relationship between ants and paper in this design may remind readers of M. C. Escher’s ants on a Moebius strip, such as in *Moebius Strip II* (1963) (figure 5.16). Moebius strip is a surface of only one side, and can be made from a long, thin paper strip by twisting the paper at one end and sticking it to the other end. The result is continuous surface of the paper ring where the usual ‘inside’ and ‘outside’ relationship is broken. If an ant walks on the paper, as in Escher’s work, it will sometimes appear ‘inside’ and sometimes ‘outside’ the paper ring, while there is no exact point to distinguish the two sides. The ant on a Moebius strip also carries on a circular and infinite journey. Escher’s ants successfully highlight the properties of a Moebius strip in a two-dimensional image. Comparatively, the design of book works emphasises the three-dimensional properties of a book and breaks the usual relationship between the printed images and the pages.
By completing the expedition as a big circle, the design also represents the circular aspect of time. It can be achieved because the printed elements (ants and the title of the book) have continuity across the cover and ‘inner-pages’; structurally, the ‘inner-pages’ have been deliberately stuck to the cover in this manner – all other books in this study have a different structure between cover and inner-pages. It is also worth noticing that, in this design, the more inner-pages you have, the longer the sense of a linear journey; but however long the journey is, it is still a circular journey, since it will connect back to the beginning. This can be compared to our sense of circular time. For example, a year is usually quite ‘long’ in the sense that most of the time people wouldn’t think of its circular property, until the recurrence of some significant changes – such as the blossoming of cherry trees or the approach of Christmas.

In the second, smaller book, the basic rule remains – the array of ants goes through the pages on both side of the paper. However, the punched holes are replaced with printed circle to become metaphoric holes. Because of previous experience, readers would be able to associate these printed circles as holes and to look for the ants at the other side of paper.

The two books can be joined together at the spine, and the clue is provided by the cut-out circle on the larger book and the elevated circle on the smaller book (figure 5.17). By joining these two books, the whole expedition of ants elongates – the sense of a linear journey increases substantially – but it’s still a circular journey (figure 5.18).
Finally, the *length* of the journey has double meanings both in time and in space: the longer the array of ants (spatial), the longer the journey (temporal). After following the expedition of these ants, the reader gains a sense of having taken a journey, and this assists in the formulation of thought about the relationship between space and time discussed in this chapter.

**Figure 5.18** Seen from above, the two books joined together to prolong the ants' journey.


4 Ibid, p.117.

5 Ibid, p.118.


7 Barber, Peter and Christopher Board. *Tales from The Map Room: Fact and Fiction about Maps and Their Makers.* London: BBC Books, 1993, pp.50-51.

8 Ibid, pp.44-45.

9 Ibid, pp.44-45.


12 Ibid, pp.52-53.

Chapter 6  Object and symbol

6.1  Symbols in maps

6.2  Reading and using visual depictions of objects
   6.2.1  Recognition of actual objects
   6.2.2  Association of the visual depiction with actual objects
   6.2.3  Operation with symbols

6.3  Design of book works: *A field guide of commonly mapped objects* and *Key to commonly mapped objects*
6.1 Symbols in maps
A map is not a realistic visual replica of the world. Depending on the purpose of the map, data of the environment has to be selected and then represented in a communicable style. In its verb form, ‘to map’ can apply to the collection, organisation and representation process of data in almost any area, not only in geographical terms. Therefore we may be said to map the annual weather condition of an area, the literacy rate of a nation, the genetic codes in our chromosomes, and even our thoughts relating to a particular issue (and we give its visual representation a name, ‘mind map’). By and large, the mapping process transforms obscure, scattered, hidden or raw data into visible, readable, organised and meaningful representation. Therefore it is only natural that a result of this process cannot be a realistic snapshot of what we directly see in front of our eyes. As Mark Monmonier put it in *How to Lie with Maps*: “to portray meaningful relationships for a complex, three-dimensional world on a flat sheet of paper […] a map must distort reality.”

However, a map for using in an environment is also very visual due to its topological nature. The shape of the coastline, the curve of the road, the outline of the park, etc. are all close to what we perceive. There are also elements that are moderately easy to relate to the actual object: the wiggly thin line really does resemble the contour of a river; the image of woodland almost speaks for itself. For some other lines it may be necessary for the reader to refer to the key or legend at the corner of the map to make sure whether it’s a road, railway, or boundary. Some other information just spells out as texts, not images. We have more image-like forms on the one hand, and abstract elements on the other. Between these two extremes lies a series of transitions embodied as different images or icons. This is not only shown in different elements in one map, but also reflected in various styles of maps (figure 6.1). Yet a map user can read them all. In this
Chapter 6 Object and symbol

In this chapter, the basis of our cognitive capacity for using pictorial depictions against the actual environment is firstly examined, then we will see examples of map symbols that have various distances away from realistic images, before looking at the design of book works on this theme.

**Figure 6.1** Example of the contrast between a realistic, pictorial map and an abstract map. The left is a detail from Unique Media Inc.’s *Unique Media Map* of Vancouver, Canada (2005); the right is a detail of the same city from Dorling Kindersley Limited’s *Eyewitness Travel: Vancouver Pocket Map & Guide* (2008). In the Unique Media map, significant buildings and architectures are drawn as if seen from a bird’s-eye view, and a user can easily compare the features to identify the drawn architectures with the actual ones. In the Eyewitness Travel map, significant areas, such as parks and stadium, are outlined according to their top view, and no detail features are provided. It also uses symbols to indicate places such as sky train stations, which are not identifiable from the Vancouver map. However, both use texts to indicate the name of buildings and streets, and colours to indicate water and green areas.
Two points about symbols need to be clarified before we proceed to the detailed examination. Firstly, the word ‘symbol’ used in this study is a collective term for those images, depictions and icons that can be found in keys or legends on a map. It is not used in the sense of some artificial intelligent researchers’ arguments about whether the brain is like a computer working on a symbolic level. Symbol here means a stylised image (sometimes incorporated with text) on a map interacting with us through our perception. The second point is that symbol and sign are normally seen as two different categories: sign (or representational sign) is more easily related to what it indicates and usually has a more obvious, direct meaning between the sign and what it indicates, such as the traffic sign that uses profiles of a standing and walking man to indicate to pedestrians what to do. On the contrary, the meaning of a symbol (or abstract sign) is assigned arbitrarily without any similarity to what it indicates, such as using a dot to indicate a post office. In the case of a map, since there is no distinct boundary to separate them (in section 6.2.1, a model proposed by neuroscientist M. J. Farah about human cognition can help us to reassess this issue), and also because the word ‘symbol’ is commonly used when the map is first introduced to children (see figure 6.2 for example), the author will use the word symbol in the following discussion.

Figure 6.2
Chapter 6 Object and symbol

6.2 Reading and using visual depictions of objects

The ability to relate to a realistic depiction of an actual object seems to be a fundamental ability of human beings. We can, for example, easily recognise people we know in a snapshot; we use illustrated signs to identify animals in a zoo; we use a field guide for plants in the wild; we even trust these visual depictions to the extent that we consult illustrated shopping catalogues to get an idea about products we are interested in, before deciding whether to go to see the actual objects in a showroom. To take it a step further, we may sketch out the whole arrangement of furniture in a room before actually going to a shop to get them. The complexity of the last case is beyond a simple comparison between an object and its visual depiction – it requires the ability to manipulate visual depictions in a planning process, in other words, to operate on the visual symbols before taking further action. This is also an essential ability when using a map in an environment and deciding which way to go. In this section, we consider three levels of human cognition that, working together, can achieve a successful map-using process: firstly, we have to be able to recognise actual objects; secondly, we have to be able to associate the visual depiction with actual objects. Thirdly, we have to be able to manage and operate with these visual depictions.

6.2.1 Recognition of actual objects

Object recognition, an ability that seems very natural to most people, is a subject that has been undergoing extensive research in the fields of neuroscience as well as artificial intelligence, partly because of its substantial potential application to robots and machines, and partly because it’s so fundamental to humans, and is an intriguing area of study in its own right.
Researchers have confirmed that infants can recognise objects by common motion – that is to say, when a group of elements move together, they can be seen as one unified object – as early as four months old, though not so in newborns. Most researchers believe this ability may begin to develop around the age of two months. Tests also show that infants around 4 and a half months old can use object shape to segregate objects, though they cannot perform this segregation on the basis of colour alone. The visual perception system shows dramatic developmental changes early in life. Although researchers haven’t been able to answer precisely what changes in the brain enable the development of object perception, we can nonetheless speculate that, in order for these changes to happen, personal visual experience needs to have taken place in the real world. Remember: those who have been blind from early in their life, as Sacks observed in the case of Virgil, have great difficulties recognising objects when they firstly regain their eyesight.

Examples of visual agnosia tell us more about how our visual system recognises objects. The word ‘agnosia’ is derived from the Greek word *gnosis*, meaning knowledge or knowing, and its opposite *a*-gnosis. Visual agnosia thus describes people who have difficulty visually recognising objects and people, and is usually associated with neurological illness or brain injury. Sacks has reported the case of Dr. P, a musician who developed strange behaviour, such as not recognising his pupils, and sometimes patting the heads of water-hydrants and parking-meters in place of the heads of children. He also confused his left foot with his left shoe, and mistook his wife’s face for a hat. Further testing on behaviour reveals these rather strange patterns in his perception: he had difficulties recognising faces and facial expressions – he couldn’t recognise family members in photographs, nor even himself; he couldn’t grasp the emotions displayed on a Hollywood film. When asked to describe an image or an object, he was
able to pick up minor, individual features, but not ‘the scene-as-a-whole’. It seemed that he approached human faces in the same way: by parts and details, but not by the whole face. However he could recognise people he knew if they talked. On the contrary, abstract shapes seemed not to pose a problem to him; he could even identify a dodecahedron, for example. In the test of a glove, he described the structure and texture of the object in detail, but couldn’t name it, until he accidentally put the glove on and “exclaimed ‘My God, it’s a glove!’”

Progress in research has associated these erroneous perceptual patterns with injury or illness, such as strokes or tumours (this seemed to be in the case of Dr. P) in the right hemisphere of the brain. The inability to recognise people visually in particular is called ‘prosopagnosia’ (prosopo being the Greek for face or person) also known as ‘facial agnosia’. Patients with this inability are not usually able to see the face (or other objects) as a whole, but only their parts. Patient P.T. in Oregon, USA, had similar problems recognising his wife’s face or even his farm animals’, and the latter case resulted in his attempting to milk a bull rather than a cow. However, when his wife spoke, he would immediately recognise her voice, and the form of her would “fall into place”. Similarly, he could recognise specific objects by touching them.

Research has shown that, for healthy people, facial features are poorly recognised in isolation – it is much more difficult to recognise somebody’s nose compared with the door of a house. This finding suggests that when we recognise faces, the perception system has to work on a more holistic level, and this also give explanation to why patients like P.T or Dr. P, while being able to examine objects in detail, were not able to recognise people or some objects.

Studies of visual agnosia and related experiments have confirmed that the visual system contains multiple pathways, each specialised to specific information, such as facial recognition, motion perception, colour perception, etc. However, the independence of these pathways
remains a subject of debate. In general, it is commonly agreed that the left and right hemisphere of the brain has specialised in different operations for objection recognition. Warrington proposed a two-stage model,\textsuperscript{9} when we look directly at an object, initial visual analysis occurs in both hemispheres, then the first stage of perceptual categorisation is dependent on the right hemisphere. The second stage involves semantic categorisation in which the perceptual representation is linked to semantic knowledge and is dependent on the left hemisphere.

Later, by studying another subtype of visual agnosia, \textit{acquired alexia} and comparing it with prosopanisia, Farah proposed a “two-process model” for object recognition.\textsuperscript{10} Acquired alexia refers to patients who have reading problems following a stroke or head trauma. Anatomically, alexia is associated with left-hemisphere lesions (as opposite to prosopagnosia, which is related with right-hemisphere). She proposed that recognition can be based on two forms of analysis, \textit{holistic processing} and \textit{analytic processing}. The contribution of these two systems varies for different tasks. Analysis by parts is essential for reading texts and also central for recognising objects. Face recognition depends on holistic analysis; this process also contributes to object recognition (figure 6.3) In summary, face recognition works in holistic processing, reading text works in analytic processing, and object recognition falls in between these two extremes.

In \textit{Sign, Symbols and Ciphers: Decoding the Message},\textsuperscript{11} the French author Georges Jean describes the duality when the maps are seen as “hotbeds of signs”:

\begin{quote}
Our approach to [maps] is twofold and even contradictory: we both look at them as visual objects and read them as texts.\textsuperscript{12}
\end{quote}

With the understandings from object recognition, we may now see this duality with new insight: the way we approach maps is indeed at the same time holistic and by parts since we look
at it both as a whole object and as detailed parts; however these two ways are not contradictory, but with different proportions of the combination of the two, and between the two extremes lies a series of gradients.

6.2.2 Association of the visual depiction with actual objects

It may not be a surprise how easily we take a snapshot as a realistic visual depiction of what we see. After all, when seeing things with only one eye, we see a flat image that is projected by the same optical principle with a photo taken by a camera. Apart from depriving us of the sense of depth, all other visual elements for recognising objects, such as boundary, shape, shade, colour, etc., are essentially the same when things are viewed as a snapshot. Indeed, when considering the ability of associating the visual depiction with actual objects, perhaps it’s more what we see in our mind of an object, rather than how ‘realistic’ the depiction is, that contributes to a successful association.

The example of patient P.T. from Oregon, as mentioned above, may give us cause for some further reflection on this issue. He was shown two paintings, one by Monet depicting a 19th century countryman dressed in his Sunday suit, and the other by Picasso of a weeping woman (figure 6.4). P.T. was asked to describe what he saw in each painting. Strikingly, when he was shown the Monet, he looked puzzled – he saw no definable forms, only an abstract blend of colours and shapes; but with the Picasso, he readily identified the figure in the painting and indicated that it was a woman, or perhaps a young lady. This is quite counter-intuitive, as most people would agree that the Monet is more ‘realistic’. These two paintings display significantly contrasting characteristics: in the Monet, the blend of colours is more subtle, the gradual changing of shade hints at the transitions between different facial parts, and the colour choices

Figure 6.4
are of similar brightness. In the Picasso, the eyes, eyebrows, and the mouth are clearly
delineated with a black contour, the colours chosen are bold and in sharp contrast, distributed in
separate units. As we have seen that P.T. is not able to perceive objects as a whole visually, the
emphasis on distinct parts may actually help him to grasp information that contributes to a face.
This may also have occurred in Dr. P’s case, as Sacks observed that a series of paintings by Dr.
P happened to reveal his change of perception in chronological order: from his earlier naturalistic
and realistic works, with vivid mood and atmosphere, to less realistic and increasingly abstract
and geometrical ones; Sacks describes the last painting as “mere chaotic lines and blotches of
paint”.

Another case of patient G.S. gives us clues from a different angle. G.S. had a stroke while
still in his thirties. He subsequently recovered. A few years later, tests showed that his sensory
abilities were intact, language function was normal and there were no problems with coordination.
Yet G.S. had severe problems recognising objects, and the deficits were even more marked
when faced with photographs of objects. To take one example, he was shown a picture of a
combination lock with a dial. Initially he failed to respond, then he noted the round shape; and
when prompted to make a guess, he reported that the picture is a telephone. He had perceived
the numeric markings around the lock’s circumference, and this prompted him to believe that it
was a telephone. Interestingly, G.S.’s actions indicated that his understanding of that picture
went beyond his erroneous answer: whilst viewing the picture, his fingers started twirling in an
action just like one would have when operating a combination lock. After a few more incorrect
tries, he looked at his fingers, and then announced, rather proudly, “It’s a lock, a combination
lock.” In this case, his fingers did the talking. By vision alone, G.S. had difficulties recognising the

Figure 6.5 A painting by the
16th century Italian Giuseppe
Arcimbaldo, rotated 180°.
From Gazzaniga et al,
Cognitive Neuroscience: the
object, but he certainly saw something characteristic in the picture so that he was able to guess a telephone.

From these examples – Dr. P’s paintings, P.T.’s recognition of Picasso’s *Weeping Woman*, and G.S.’ guess about the combination lock – what is intriguing is what they can see in their mind before they report or depict it. For most of us, we recognise both Monet’s and Picasso’s paintings as portraits because we can see human face in both of them, even though we are aware of the strong contrast between the two paintings. We may not see a telephone in the combination lock, but when G.S. reported this answer, we know that the numerical round face prompted him to come up with this guess (and it was only a guess, not a direct perception). By a similar token, when we are able to associate an image as a depiction of an object, we must also have been able to see that depiction in that object. A simple drawing of a table may provide the edges and boundaries that our visual system can pick up from the actual table. A pile of vegetables can be seen as a face because we perceive the essential cues that constitute a face the same way as when we see an actual face (figure 6.5). When we can say a cartoon-like depiction is a tree, we must also see those elements in a tree – maybe not particular ones, but collective trees from memory and experience; we can see depicted mountains in real mountains (figure 6.6), and the depicted waves in real waves (figure 6.7). In the world of maps, it is a mapmaker’ job to choose what can be seen and understood by most people in the real world, and then extract and depict them on the flat surface of the map.

![Figure 6.6](image1.png)

*Figure 6.6* An example of depiction of mountains in cartographic style, dated 1654. From Hodgkiss, *Understanding Maps*, 1981, p.40.

![Figure 6.7](image2.png)

*Figure 6.7* An example of depiction of waves in cartographic style, dated 1681. From Hodgkiss, *Understanding Maps*, 1981, p.43.
6.2.3 Operation with symbols

Some symbols used in maps appear to be arbitrarily assigned, such as the use of a bird to indicate 'nature reserve', or sailing boat to indicate 'water activities' (figure 6.8), since a nature reserve is not necessarily the habitat of water bird and obviously there are a lot more choices for water activities than sailing. However, they do still link to our conceptions of nature reserves or water activities in one way or another: the type of nature reserve most familiar to the general public is where they can spot wild animals, among which birds near the water are relatively easy to spot; and boating is the most familiar form of water-based sports for most of us: in comparison, scuba diving or surfing may not be as universally accessible. So the type of symbols used in maps echo the subject of section 6.2.2: we can see these depictions in the actual environment.

Another group of symbols or indications are even more arbitrary, but still relate to our perception. In maps where towns or cities are indicated, the following method is commonly used: the size or administrative importance of the town is displayed by the size and thickness of the font of the town’s name. A city is indicated by larger font size and boldness than a village. The same principle is used in political maps, too: where a spot is used to indicate the location of city or town, the larger the circle, the larger the population or the higher the administrative status. Although the shape of texts and spots may not be visually related to the actual place, their physical size does reflect the ‘weight’ of their features – they are not arbitrary within their genre.

Beyond these, there are symbols that are ‘genuinely’ arbitrary – such as the use of the shape of a star to indicate ‘other tourist feature’ (figure 6.9), or different kinds of circles to indicate stations of different types (fig. 6.10). For these symbols, the map user would have to refer to the legend or key to learn what is indicated. It is interesting to note that, while there are many shapes
that are possible be used for this kind of arbitrary indication, the most commonly seen is circle. According to different maps, a circle can mean bus station, railway station, underground station, bollards (in a tourist map of Cambridge), post office (in a Brighton city map), outdoor status and sculptures (in a London Mapguide), ‘pedestrians only’ (at both ends of the particular passageway, in a Collins London map), motorway service area – off road (in a tourist map Insight Map: Cornwall).

This freedom of association is actually one of the important features of symbol-using and, indeed, it happens in human language. Human language, in comparison with other animals that use body signals or sounds to communicate, has an ‘unbounded signal set’\(^{16}\) – the words, the elements of human language, and the way in which they are put together make it essentially unbounded. Human language also has ‘situational freedom’ – humans can communicate about objects and events in the world, even though the events may be far removed in place or in time.

Human language, however, has also been considered from a biological and neurological point of view. Examples such as Steven Pinker’s work, *Language Instinct: the New Science of Language and Mind*,\(^ {17}\) promote the idea that human language has its biological origins and is instinctive to human beings, just as flight is to geese. Neurologically, different parts of the brain have been identified as being associated with different types of *aphasia*, or deficit of language. There is a particular kind of disorder related to mathematics, called *dyscalculics*, or mathematical disorder, in which sufferers have difficulties relating the sense of the numerical amount figures shown, so that they are unable to perform simple calculations, and even have difficulty recognising numbers. However when the same sufferer looks at an actual scene, they can still tell which tree contains more apples, for example. They still have a sense of relative amounts,
the difficulty lies in their inability to relate this sense to the specific, numerical symbols of written language.

When we consider that one of a map’s basic functions is to tell other people how to get to a certain place, the ability to use symbols provides an efficient method of achieving this – not by language alone, but through the spatial arrangement of symbols to indicate landmarks and their spatial relationships. P. D. A. Harvey compares some of the earliest map-like examples in history and in relatively primitive cultures before they were exposed to western influence, and points out the possibility that the earliest forms of maps could be much more symbolic than pictorial. One such example can be seen from Mer, one of the Murray Islands in the Torres Straits (between Australia and New Guinea). Before the late nineteenth century, when the boys in Mer still underwent an initiation ceremony, the story of their legendary hero Malu used to be told and was related through the placing of 14 stones, which was said to reflect the relative positions of the island of Malu’s voyage before he arrived in Mer. People in Mer also used shells placed on the stone to represent villages on different islands, and an oracle about a particular village would be connected with the appropriate shell. This kind of example illustrates a map that is visually simple, using readily available materials as symbols, providing only information essential for the purpose, where some part of the knowledge is hidden and has to be told directly to the audience by the mapmaker. Because of the nature of the materials, this kind of map tends to have a short life (for example, since the stones and shells are not fixed to the surface, any alteration of their position would mean the end of the map’s life). These kinds of maps may have existed throughout human history, but they are by their very nature difficult to trace. We still make these kinds of maps today: sometimes when we want to indicate some spatial information in a conversation we may make use of readily available objects – such as salt and pepper pots on the dining table – to represent
certain buildings or the spatial setting of some event. Once the conversation is finished, those objects may return to their original use and position, leaving no trace of their special use. Or, when we draw a simple street map for a friend to indicate some place on a piece of paper, normally we would only provide a simple illustration of the streets, adding only minimal information such as arrows or a cross, to indicate the destination. Other necessary information would generally be given orally as the map is being handed over to the recipient. When the same map is given to other people who were not present in the conversation, it would become almost like a riddle and may not serve the original purposes of the communication. Furthermore, this kind of map can simply be thrown away after the purpose is achieved.

Based on the principle that a symbol can be used to denote almost anything that doesn’t have a visual similarity with what is indicated, any kind of sign can be used to represent any landmark – as we saw earlier, a circle can represent almost anything; likewise, any shape can be used to represent a landmark. The only thing that always has to be consistently represented according to the real world is the spatial relationships between these symbols. This is where we can always find visual similarities between the map and the environment, and we approach the map as if looking at a picture rather than reading a text. Even in the case of a strip map or the map for visually impaired people (as introduced in chapter 5, figures 5.6 and 5.7), the order of the important features in the journey still obeys this principle in a linear space.

To think of the use of symbols in terms of spatial arrangement one can find similar considerations from a linguist’s point of view. In Lakoff and Johnson’s work, *Metaphors We Live By* (1980), they propose a way of seeing language in relation to our spatial perception. They proposed that,
Since speaking is correlated with time and time is metaphorically conceptualised in terms of space, it is natural for us to conceptualise language metaphorically in terms of space. Our writing systems reinforce this conceptualization.²⁰

The following is a brief account of the examples they provide. The first case is related to conduit metaphor, which defines a spatial relationship between form and content: linguistic expressions are containers, and their meanings are the content of those containers. When we see actual containers that are large, we normally expect their contents to be large. Applying this to the conduit metaphor, we get the expectation: more of form is more of content. Such as:

He ran and ran and ran and ran.²¹

Which indicates running a greater distance than

He ran.

Another factor is that closeness is strength of effect. Compare the following sentences:

I found that the chair was comfortable.
I found the chair comfortable.²²

The second sentence indicates that I found out that the chair was comfortable by direct experience – by sitting on it. The first sentence leaves open the possibility that I found it out indirectly, perhaps by asking other people. The closer the I is to the chair and comfortable, the more direct is the experience that is indicated.

The basis of Lakoff and Johnson’s ideology is consistent with their later and further developed work, Philosophy in the Flesh: the Embodied Mind and Its Challenge to Western
Thought, in that the human thought process, including the use of language and formation of concepts, is shaped by the form of our biological body – in other words, it is embodied.

Back to the symbol usage in the context of maps, the spatial relationships among objects have critical importance in maps. The arrangement of symbols in a map is comparable to the formation of sentence in language. We may say by analogy that the reading of symbols on a map is just like the reading of visual sentences.

6.3 Design of book works: A field guide of commonly mapped objects and Key to commonly mapped objects

The purpose of book works under the theme of symbol is to encourage readers to find the connection between the symbols and the actual objects. By doing so, readers will find that there are various degrees of similarity between the depictions of objects and objects in the actual environment.

Some earlier experimental designs of this part of the study emphasised the manipulation of symbols in a way similar to language or to written text. In the experimental design in figure 6.11, for example, the author chose the symbols used in Explorer Map (scale 1:25000) by Ordnance Survey, in particular those of similar size, to arrange them in a way visually similar to paragraphs of normal text. The order of the symbols is arbitrary, but when read closely it provides a sense of narrative, some of the pictorial images being easy to identify. Others may become puzzling elements as with unknown words in a text in the creation of narratives in the reader’s mind. Thus the contrast between more realistic and abstract images used in maps would become more obvious.

Fig. 6.11
One of the early experimental designs, using map symbols to create an impression similar to paragraphs of normal texts.
The next group of designs are based on a similar arrangement of symbols, but this time with less arbitrary arrangements (figures 6.12 and 6.13). Each page on this design depicts a possible journey, represented by relevant symbols. For example, figure 6.12 can be read as “start from a car park, visit the information centre, walk along a footpath for some longer length, reach a viewpoint, then walk along a footpath, and then finish at the car park”. In figure 6.13, the journey reads “start from a railway station, travel along the railway, reach a railway station, visit a public convenience, then travel along a footpath, visit a building of historic interest, reach a viewpoint, visit a public house, then a garden, then a public convenience, travel along a footpath, reach a windmill, then a footpath, then a place of current or former place of worship, more footpath, then railway station, railway, railway station, shorter journey along a footpath, then finish at the youth hostel”. The arrangement of symbols tells the story more completely in this design: the repetitive appearance of the symbol of footpath or railway track represents the length of time spent on them, which can be intuitively understood by the readers – probably under the same principle as conduit metaphor (section 6.2.3). The scenario also appears convincing. This design can be described as a record of or a recipe for journeys using map symbols.

The final design of the books A field guide of commonly mapped objects and Key to commonly mapped objects (figure 6.14), emphasises the comparison between more realistic, pictorial depictions and more stylised and abstract depictions used in maps. In the larger book, A field guide of commonly mapped objects, the collection of images has a more straightforward relationship with the objects they depict. These images are chosen from actual maps or plans ranging from the 14th century to the present, and the fact that they have been repeatedly included in maps over the years suggests that they have been seen as important features in the landscape. The guideline for choosing the images were that they should be easy to recognise.
even when they stand alone as individual images, independent of the map. When maps are read for the purpose of finding one’s way, the individual depiction of an object is usually less appreciated – generally playing the role of a medium that has to provide efficient communication. By extracting the depictions from the map and representing them individually, however, we are given the opportunity to look at them directly, and to reflect on how the depiction and its association with the actual environment has been achieved.

In the smaller book, *Key to commonly mapped objects*, the images are mostly modern map symbols, for example from Ordnance Survey maps, with the description underneath each image. They are more abstract and ‘symbolic’ depictions of the actual objects in the environment. The ‘pages’ of the smaller book are loose, folded papers that can be handled individually.
One of the major differences in the theme of symbols from other themes is that there are fewer possibilities directly related to three-dimensional structure when we consider symbols – symbols themselves are not necessarily related to physical, three-dimensional features, so the strategy of suggesting the physical interaction between the two books is carefully modified. It is firstly suggested by the shape of the larger book – the cut-out shape allows the smaller book to fit in, suggesting that it’s the place the smaller book could go (figure 6.15). Secondly, the function of the cover and the pages in the smaller book serves more like cards then a book, which means each individual element, including the cover and pages, can be handled and placed in the cut-out space of the larger book individually. When the image from the smaller book is placed against the corresponding image of the larger book, the contrast between the two types of images will be seen directly. Take the trees for example (figure 6.16): the pages of the larger book contain images of trees from a historical map, Sebastian Münster’s woodcut map of Franconia from his edition of Ptolemy’s *Geographia*, (Basle, 1540)\(^2\). These trees are individually depicted from lateral view, with shadows that suggest a sense of three-dimensionality. The image from the smaller book is the symbol for trees, from the Ordnance Survey’s *Explorer Map* (2005). It is a much more simplified image that, whilst also depicting the trees from a lateral view, suggests an area of trees through its homogeneous pattern formed by identical, tree-like symbols.

A previous design of the smaller book includes an extra diagram attached to the inner side of the cover (figure 6.17). This diagram is a ‘key’ usually used in taxonomy for identifying plants or animals. The intention is to provide a game-like activity for engaging the reader to think through each symbol more consciously and carefully. Furthermore, the meaning of ‘key’ in taxonomy is essentially the same as the ‘key’ in a modern map in the sense that they both provide users the reference to unlock information. However, even though this design provides a sense of

Figure 6.15 The smaller book can be fitted into the larger book, as suggested by their shapes.

Figure 6.16 The page of the smaller book can be read against the larger book.
playfulness in the small book, the situation that there are only eight images to decode proves that the ‘key’ is not necessary for the reader to tell each image apart, and the amount of textual explanation in this diagram actually conflicts with the design rules of book works that three-dimensional features, rather than texts, are largely used to imply the relationships between the two books in a pair. Without this diagram, the purpose of matching the symbols from the small book to the images in the large book can still be achieved as effectively, so eventually this diagram was removed from the final design.

Figure 6.17
An earlier design intended to be used for the inside of the cover of the smaller book, not adopted in the final design.
The spatial arrangement of the more realistic images at the outer, frame-like surface and the more abstract image at the centre reflects one of the thinking styles of human beings related to visual perception. Usually, our attention only occupies a relatively constrained area at the centre of the whole visual field. The more we concentrate on one particular detail or object, the less we are aware of the surrounding visual information. This can also be said to be true in abstract thinking: when we focus on one particular issue or idea, the tendency is that the degree of abstraction is heightened and the connection to the environment – which is the source of the raw materials – is lessened. The spatial arrangement of the images in the two books is a visualisation of this tendency, as shown in figure 6.18.

**Figure 6.18** Schematic view of the direction of abstraction in human thinking style. The spatial arrangement of the two book works corresponds to this model.
This outer-inner arrangement of the two books can also be referred as mirroring the relationship between a door and its key. The smaller book plays the role of the key that physically can be put into the slot in the centre space, and conceptually helps to further explain the features of the more realistic images in the larger book.

3 Ibid, p.620.
7 Ibid, p.148.
12 Ibid, p.64.
21 Ibid, p.127.
22 Ibid, p.130.
Chapter 7  The container and the integration of the four themes

7.1 The black box: its design and implications
   7.1.1 The box
   7.1.2 The cube
   7.1.3 The black box and bodily experience: the *bento* box

7.2 The layered structure

7.3 Horizontal relationships between the four themes
After examining the four themes in the context of map using and the design of related book works, in this chapter I will firstly focus on the container of the thesis – the black box – and discuss its design and metaphorical implications, then proceed to the design of the two layered structure of the arrangement of the book works. Then the interrelationship between the four themes will be examined in detail. In the end of this chapter, I provide an approach to see the whole content in a synthetic way that emphasises the balance of analytic and holistic views, and suggest that this approach can apply not only to the relationship between map, map user and the environment, but essentially to the relationship between any visual information, the human agent, and the world.

7.1 The black box: its design and implications

7.1.1 The box

The container of this thesis, the black box, is a cube measuring 23 x 23 x 23 centimetres, handmade by the author (figure 7.1). It is made of millboard with the surface covered by Classic Buckram black book cloth. The lid is on one side of the cubic shape, and can be completely detached from the rest of the box (figure 7.2). There is no decoration on the outside. There is no significant visual information to indicate where the lid is, although looking closely of the structure may reveal its position (figure 7.3).

A square box – not only a cubic shape in particular, but also rectangular shapes with different proportions of the sides in general – has been used and explored extensively in 20th century art, from Marcel Duchamp’s *The Box in a Valise* (1935-41) (figure 7.4) to Cildo Meireles’ *Geographical Mutations: Frontier Rio-São Paulo* (1969) (figure 7.5), among many other examples. Perhaps it’s because the nature of a box as a container fascinates us: it can contain
almost any kind of object, and can conceal as well as display objects. The very existence of a concealed box readily implies something more than just a box. An invisible space is there, only becoming visible once the box is opened. The objects in it could be letters from loved ones, jewels, sweets and food, a collection of objects related to personal memories, random collections of trivial objects... even a human body can be put into a box. It might convey a gift from one individual to another, it could be very personal, and it could simply be a temporary container for transport, to be discarded afterwards. Boxes can also display and make the objects in them more significant, such as displays of jewellery or specimens of animals and plants. In this case, what and how the objects are arranged in the box is in itself a visual statement, and artists such as Joseph Cornell (figure 7.6) and Joseph Beuys (figure 7.7) have extensively explored this possibility through the display box. Boxes can have a strong contrast between their concealed and open states, particularly for people who don’t know what the content is. It is usually more so when a closed, simple box can open up to a more complex structure, like a tool box or a sewing box, or in the example of Duchamp’s Box in a Valise, the seemingly simple box unfolds and stretches itself in the space to become a miniature museum that displaying the artist’s significant works. Boxes like this remind us of a magician’s skill in pulling a succession of impossible objects from a hat (or a box), and in so doing successfully surprising and pleasing the audience. The possible contrast between the closed and opened box intrigues people and arouses their curiosity. Of course, occasionally, this unexpectedness can turn into disappointment, too. A box could also be empty, containing nothing but void, however we cannot be sure until we have seen it opened.
In this project, the closed and open states of the box do have a contrast between them in terms of visual characters and structure – book works provides white against the black, and unfolding of the books reveals much more complexity in structure and surface than the simple cubic box. More details of this aspect, both visually and in its relation to the reader’s body and hand movement will be discussed in detail later in section 7.1.3.

An analogy of the black box in this study and its content is drawn to the human skull and the brain. The human brain has been considered the most mysterious part of our scientific knowledge: only as recently as the last 20 years when, with the advance of new technologies – such as f-MRI, functional magnetic resonance imaging, which began to be used in brain research in early 1990s – can we tell which part of the brain is more active in real time in living people, and new facts have just started to be revealed. Everyone would now agree that what has been happening in the mind cannot be determined from an examination of the skull. And even if we have gathered the anatomical facts about the brain, more importantly, it’s the interaction with the living brain that reveals to us how a human mind may work. Similarly, the black box doesn’t tell the reader what is in it or how the content works; the reader has to open the box and physically explore the books in their first person experience in order to fully appreciate the possibilities.

A box has been associated with portability and mobility, too. Indeed, in terms of its practical function, a box is usually associated equally with storage as well as transportation. When people move house, for instance, boxes are needed for carrying collections of objects to the new place. Again, The Box in a Valise serves a good example of utilising this aspect of box in art – the title itself already hints that the collection of works can travel from place to place, just like a road show. If Box in a Valise can be said to be a mobile museum, then, in this study, the black box is a
mobile library – the reader doesn’t have to travel to the location, instead, the library travels to the reader. It’s a portable library as well, as the set of books can travel as a group with the reader to different locations with ease.

In respect of colour, the use of black at the outer surface of the box is in accordance with the conventional perception that black is associated with mystery and the unknown. It might be related to an innate reaction of human beings, whose perception largely relies on vision and light, to the darkness and dangers of the night. From the optical point of view, black is not a colour, but the result of the absorption by the object of all sources of visible lights. It therefore can be related to concealment of information, nothingness, and mysteriousness. A black hole – with such a huge gravity that even light cannot escape from it – would be the ultimate image of this kind.

In terms of ‘something more than what can be obviously seen’, Kasimir Malevich’s Black Square in the 0.10 Last Futurist Exhibition (1915) (figure 7.8) explores this window of thinking by putting a black square at the corner of adjacent walls. Although black can be associated with nothingness, it is usually more than merely nothing and blank. In the Black Square, it provides a surface of seeing through, for projecting one’s thinking and imagination, much as the light that runs to the black hole.

A box also enjoys a close relationship with books. Functionally, a book in a box is better protected and has a longer life. For this reason, a book in a box is usually seen as more valuable, suggested by its need for protection (although sometimes it is not necessarily more valuable). Material-wise, these boxes for books are often made of the same materials as a book’s hard cover – boards plus cloth, paper or leather cover, stuck together by glue. Indeed, many bookbinders also make boxes, as the two areas of expertise have in common much knowledge and many techniques.

Figure 7.8
Malevich’s Black Square in the 0.10 Last Futurist Exhibition (1915) is putting at the corner of adjacent walls.
As mentioned previously, a box has its closed and open states (if we exclude slip cases, display boxes and boxes without lids), which resonate with a book. When people have decided to approach a box or a book, it’s usually what’s inside that people wish to explore (having been lured or intrigued by the cover). The intentions of the publisher of the book as well as of the creator of the box may be revealed once they are opened.

7.1.2 The cube

The shape of the black box in this study is a cube. As a geometric shape, a cube is one of the frequently seen simple shapes used to exploit various ideas in Minimal Art and Conceptual Art from the 60s and 70s. As simple and straightforward as it may appear, the cubic shape can create a lot of possibilities. Sol LeWitt’s *Open Cube* (1974) (figure 7.9) defines a cubic space by a freestanding, open frame. Looking at the structure, the reader is invited to reflect upon the question: what conditions constitute the shape of cube in our mind? Under the same principle, while the cubic space is subtly sustained, the construction of the frame is later developed in huge variety (figure 7.10). This is to see a cube as a space more than an object; although the frame of the cube is open, the space is still contained and seen. Within a relatively simple form, the *Incomplete Open Cubes* lead us to think of something that is not seen as of equal value as something that is visible. Part of the characteristic of book works is to see the space has equal importance as its solid neighbouring structure. This aspect will also be further examined in section 8.1.
A cube is indeed often associated with abstract, conceptualised ideas. One possibility is that of its being used as an object or shape for people to project their ideas, compared to other geometric shapes, perhaps because it is easy to construct (both in three-dimensional and two-dimensional form) and yet can begin to provide enough visible edges and faces for the projection of our thought – an octahedron, for example, is less familiar in daily life and comparatively more difficult to draw on a paper, while each side of a tetrahedron is relatively concealed from the viewer. Simple line drawings of cubic shapes on paper easily provide three-dimensional visual illusions, such as Necker Cube (see section 4.1 and figure 4.4 for detail). The witty cartoonist Saul Steinberg, now rightly considered more as an artist, had interesting thoughts on the cubic form related to their abstractness, expressed on a two-dimensional surface. In a rather humorous mood, Steinberg implies that a cubic shape is related to a geometric, rational and even rigid disposition by reshaping a wiggle, organic thread into a straight line with only right angles (figure 7.11); a rather rough cube can think of its pure and conceptualised form (figure 7.12); or the conceptualisation can just directly impose on a patched-up cube (figure 7.13). Steinberg’s drawing on a box, in another example, vividly combines the specific opening position of a cardboard box with a person’s gesture in a most animated way (figure 7.14).
One of the essential features of a cube is that it is square. In *Flatland: A Romance of Many Dimensions* (1884), E. A. Abbott describes the relationship between geometric shapes in two-dimensional world with their three-dimensional equivalents, as seen in chapter 4. A cube’s two-dimensional equivalent is a square. In occultism, the square and the number 4 imply the stable force in the universe. There is no surprise that squares are often chosen to be the main character in a story with geometric characters. Apart from *Flatland*, El Lissitzky’s *Of 2 Squares* (1922) (figure. 7.15) uses two squares as heroes to represent the force of order and stability. Number 4 is also associated with the four directions on a two-dimensional surface (as in *Flatland*, when the Sphere suggest ‘up above and down below’ for the first time, the Square mistook it for ‘Northward and Southward’; see the book work *A cuboid has penetrated*, for the conversation).

In this study, the simplicity of the cubic box also provides a locus for projecting thoughts. A cube is comprised of six sides and twelve edges, all in an equalised and balanced manner. When holding a cube in hand, structurally there is no side more significant than another, which implies the equality of different aspects, or the themes, represented in this study. The blackness also adds to the equality of every side, as it helps to reduce or eliminate the difference between the six sides, even when the lighting in the environment would still create a distinction between the sides.

The spatial relationship between the six sides also creates a partially concealed nature between different aspects: when focusing on only one side, the viewer would lose sight of the opposite side, and the neighbouring two sides become only partially visible, as according to the laws of perspective we can only see three sides of a solid cube at the most at any one time. If the viewer rotates the cube, however, the concealing and revealing of sides changes in relation to
the viewer along the time line. One metaphorical implication is embodied in this structure: it is hard for humans to appreciate the world from different aspects at the same time. But while focusing on a particular aspect, there is still the possibility to be aware of the existence of other aspects – partially aware of them, by inference, or through the memory of past experiences, thus the coexistence of different aspects can be appreciated.

7.1.3 The black box and bodily experience: the bento box

The container and the physical arrangement of its content of this project has a specific relationship with the reader’s bodily experience, and from the very early stages of designing the book works to be tested, the bento box, the Japanese lunchbox, as described below, was a useful model for a haptic experience involving unfolding content. Figure 7.16 shows one example of the finely represented cuisine in its special container.

Bento offers a kind of one-person’s portable, or boxed, meal that makes the food easy to consume anywhere. When served, it may be placed on the dinner table, on a small stand on the floor, or simply at floor level where the Japanese sit in a traditional kneeling posture – this spatial relationship between the bento box and the body is similar to the box and the reader in this study.

A bento has to be eaten to achieve its full purpose, even though at the same time it means the visual layout inevitably disappears. The consuming of bento is always accompanied by the changing physical appearance of the content. Thus, the experience related to bento is always in accordance with the diner’s actions and in relation to the flow of time.

This is the same situation when the reader interacts with the black box and its content. The design – the size and weight of the black box requires the reader to hold it with both hands – this

Figure 7.16 An example of finely presented bento. From Ekuan, The Aesthetics of the Japanese Lunchbox, 2000.
gesture is usually associated with respect and may suggest a sense of preciousness. The black box may be placed on a tabletop or on the floor, in front of the reader and within arms reach. Both hands have to be involved in the action of opening the box (the size and tightness of the lid is designed to be operated with both hands) and unfolding book works. When the lid is first opened, a moment of viewing and browsing the content takes place before the reader decides what to do next. Then there is the sequence of taking out book works and exploring the contents and structure of each book, which also interferes with the physical arrangements of the contents. Indeed, in essence, any action of opening a box and exploring its contents may be compared to the act of consuming bento, involving as it does the sense of expectation before the opening of the box and a sequence of actions as the contents of the box are explored. Furthermore, just like consuming bento, although vision plays an important part in appreciation, other senses, such as touch, smell and hearing, may also be involved in the process. Both eating bento and exploring the black box and its contents are multi-sensory experiences incorporating the movement of the body, and inevitably they both involve a process unfolding in the flow of time.

7.2 The layered structure

One of the significant physical features inside the black box is that the sets of book works are arranged in a layered structure: when the reader first opens the black box, four book works and one smaller black box are revealed, and when the second, smaller box is opened, four smaller book works and an even smaller black cube are revealed (figure 7.17).
Chapter 7 The container and the integration of the four themes

The original inspiration of this structure is from two sources in literature. The first is from J. L. Borges' *Partial Enchantments of the Quixote*. He quotes from the American philosopher Josiah Royce’s first volume of *The World and the Individual* (1899):

…let us suppose, if you please, that a portion of the surface of England is very perfectly levelled and smoother, and is then devoted to the production of our precise map of England… But now suppose that this our resemblance is to be made absolutely exact, in the sense previously defined. A map of England, contained within England, is to represent, down to the minutest detail, every contour and marking, natural or artificial, that occurs upon the surface of England… For the map, in order to be complete, according to the rule given, will have to contain, as a part of itself, a representation of its own contour and contents. In order that this representation should be constructed, the representation itself will have to contain once more, as a part of itself, a representation of its own contour and contents; and this representation, in order to be exact, will have once more to contain an image of itself; and so on without limit.

The second source is from Calvino’s *Invisible Cities, Cities & the Sky* (1972), with a similar idea, but this time the information is contained in a carpet:

In Eudoxia, which spreads both upward and down, with winding alleys, steps, dead ends, hovels, a carpet is preserved in which you can observe the city’s true form. At first sight nothing seems to resemble Eudoxia less than the design of that carpet, laid out in symmetrical motives whose patterns are repeated along straight and circular lines, interwoven with brilliantly coloured spires, in a repetition that can be followed throughout the whole woof. But if you pause and examine it carefully, you become convinced that each place in the carpet corresponds to a place in the city and all the things contained in the city are included in the design, arranged according to their true relationship, which escapes your eye distracted by the bustle, the throngs, the

Figure 7.17 The eight book works by the author, arranged in a two-layered structure in the box.
shoving. ... the carpet proves that there a point from which the city shows its true proportions, the geometrical scheme implicit in its every, tiniest detail.4

It is indeed very intriguing to think of a model that represents the original, then a second, smaller model that represents the first model... and so on. Normally we, as the viewer, are at the position in between the real world and the first model or map. However, if there is another model or map inside the first one, would there be another ‘us’ in the model or map in front of our eyes? And, if this kind of layered structure is without limit, as Borges’ quote suggests, what could be the structure of the universe?

A map inside a map, or a box inside a box, provides a ‘vertical’ relationship of the layered structure (it is described as ‘vertical’ in the sense of a genealogical lineage). The contents in the next layer in some way represent, imitate, and repeat the previous layer. In terms of design, it is in this way that the relationship between the first and second layer of book works is decided: the second layer of the book works should have the same theme as the first layer, but at the same time should have some continuity with its previous layer, too. So under the theme of the change of scale, the second book continues the direction of zooming up as the first book does; in the theme of flat and holographic experience, the narrative in the first book taking place in a two-dimensional world, and in the second book its in a three-dimensional one; in the theme of transfer between space and time, the expedition of ants in the second book continues from the first book along the time line; in the theme of transfer between symbols and objects, while the first book provides symbols in some abstract form, the second book carry on the same trend and make the symbols even far from the original object in the real world.

This kind of vertical lineage also provides relevant reference to the themes themselves. The second layer of the books is physically a smaller copy of the first layer – reflecting the theme of
the change of scale. The time taken by the reader to find and explore the second layer of books is an elongation from the first layer, and the exploration of more space (of the second books) indeed reflects upon the time taken – this also echoes the theme of the transfer between space and time. If the books of the second layer can be seen as the further pondering and investigation continued from the first layer, we might as well see it as further conceptualising of the real world, thus reflecting the theme of the relationship between symbols and objects. By a similar token, further thinking and research of a subject might take us progressively into new realms that we haven't been able to imagine previously, and this may be like progressing from a two-dimensional world into a three-dimensional, or even four- and higher dimensional world.

From the above considerations, the layered structures both of the box and book works enjoys a closely dovetailed interrelationship in which each pair of book works not only represents its particular theme at a more obvious level, but also reflect all the four themes in a subtler manner.

It is interesting to note that, in the second box, there can also be found a smaller black cube in the middle, which implies the possible existence of a third layer of the same but even smaller structure. At this point, the small cube is sealed and cannot be opened as were the previous two layers. The previous two layers have already demonstrated the logic of the four themes, and if there is a third layer, the reader should be able to infer what the books in the third layer would be like, at least approximately. On the one hand there is no real need to demonstrate to the reader what the third layer should be like, on the other, a sealed box may arouse more curiosity to guess what might be in it.
7.3 Horizontal relationships between the four themes

Apart from the vertical relationships between the pair of books in the first and second layer of the box, there are also horizontal relationships between the pairs of books. This shall eventually provide us with a more holistic view of seeing a complex system like the relationship between the map, the map user and the environment.

Throughout chapters 3 to 6, each of the four themes related to the map user’s transfer between different dimensions has been examined respectively. But in the discussion of each theme, the reader might be aware that certain areas in one theme could be related to another theme, too. This is referred to as a horizontal relationship, as it links the different but equally significant themes to each other.

In terms of the theme of change of scale – the change between large and small – it concerns the limits of human cognitive ability. When an area is simply too large and cannot be managed directly by the human perception and mind, people produce a map, the smaller representation, to make the large area manageable. The same situation happens when some place is far away and out of reach of our visual capacity; only the effort of travelling – our body movements unfold in the line of time – would make the faraway place come into our experience.

The relationship between the three-dimensional objects and their two-dimensional projections in a map not only concerns our ability of seeing things from above, but also concerns about seeing them at a smaller scale than our bodily experience of a much larger world.

The symbol used on the map, when it is more realistic, closer to the original object, is also a miniature depiction of that object, and our ability of identifying things both in small and large scales is also involved in the recognition of symbol.
Another aspect of symbol is that it is a simplified graphic depiction of the actual object, which also concerns the two-dimensional depiction of three-dimensional objects.

From these interrelationships between the four themes, a schematic model can be drawn as in figure 7.18.

**Figure 7.18**
The schematic model derived from the physical arrangement and the relationships of the eight book works. Dotted lines indicate the vertical relationships between the books in the first and second layer, while solid lines indicate the relationships between each theme.
In the diagram, the pair of book works, arranged in an above-below position, shows their vertical relationship as explained in section 7.2. The vertical relationships are indicated by the dotted lines. The arrows pointing towards both ends represent the possible layers beyond – both into a larger, macro universe (upwards) and into a smaller, micro universe (downwards). Horizontally, as each pair of book works represents a theme, the solid lines indicate the relationships between each theme.

At the centre of these four themes, physically also where the smaller black box sits, is the centre of the experience of using a map. All four themes are derived from our experience of map using, and can be examined as individual subjects. However, each theme is not absolutely exclusive from others. Indeed, the dissection of experience may help us to understand more about the detail of the part of the experience, but experience is always experienced as a whole, not partially experienced as dissected parts, nor a simple collection of these parts. The warp and weft of experience cannot just be cut open. It is a ‘thick moment,’ as biologist and philosopher Nicholas Humphrey put it, when one immerses oneself in the experience from the first-person’s point of view. In the Chinese language of experience, the second part of the term jingyan, ie yan, means ‘experience’ or ‘to examine’, and the first part of the term originally means the warp (figure 7.19) of a woven textile. This gives the sense that experience is something penetrating the textile and forming the basis of the textile, wrapped by the surroundings and permeating the line of time.

For further thinking about this interrelationship, we can borrow the example from the five-element system from ancient China, as introduced in chapter one (also see figure 1.1), to help us to start to make sense of the schematic diagram in figure 7.18, and being aware of the
interrelationships between the themes at the same time as seeing the individual themes. This implies the way of seeing a complex situation or system with both analytic and holistic views.

As previously introduced in section 6.2.1, the right half of the human brain is associated with holistic processing, while the left half with analytic processing. With facial recognition at the extreme of holistic processing and text reading at the other extreme of analytic processing, object recognition lies between the two extremes. Object recognition requires both processing at work, albeit with different degrees of activity from either side of the brain.

When we see an object, a situation or a system with different views, what we will see is actually filtered by the view itself. In *The Expressiveness of the Body and the Divergence of Greek and Chinese Medicine*, Shigehisa Kuriyama extensively examines the ancient literatures at the beginnings of Chinese and Greek medicine systems, and pictures the very different ideologies and practices of Eastern and Western medical systems of seeing, diagnosing and treating the human body. The different ways of approaching things indeed strongly shape the different diagnoses the two traditions obtain, even though they are looking at the same human body.

Similarly, the way of seeing what takes place in the relationship between the map, the map-user, and the environment, or indeed any system involving visual information, the human agent and the world, could be seen from a purely analytical view to diagnose the whole subject according to a defined and specific principle, and assume that it is the end of the task when each part has been examined in detail. Or, alternatively, it can be seen from a purely holistic view: to see only the forest without considering the individual trees in it. These two approaches would certainly produce their own results. But only examining with one approach is like suffering from either prosopanisia or alexia, and the picture of the world would not be satisfying. As our
experience is taken at the centre of consideration, the balance of both sides of the brain must be retained. And the physical structure of book works and the black box serve as the embodiment of this balanced thinking-model, thus offering the reader this reflection from their own experience of interacting with the books and boxes.

8.1 Reflections upon book form based on the development of this research
   8.1.1 Positive versus negative reflections on the book
   8.1.2 The book work as the place for experience to take place
   8.1.3 Considering the user’s experience
8.2 Re-thinking the experience from an integrated approach
8.3 Summary and future studies
In this chapter, I will bring this research to a conclusion by considering what has been learnt from the physical element of this research. This is discussed in three subsections which look at the essential physical characters of the book works in this research, the book as a place for experience to take place, and feedback from users. Second, this chapter reflects on the question of subjective versus objective approaches towards human experience in the light of what is learned from the research. The nature of the contribution of this thesis and possibilities for future studies are discussed at the end of this chapter.

8.1 Reflections upon book form based on the development of this research

The book works in this thesis, as pointed out earlier in chapters 2, emphasise in particular their three-dimensional, sculptural properties in representing specific themes and allowing readers to interact with the books physically. Now that each of the books under different themes has been examined individually in chapters 3-6, here the most significant features shared among the book works are further discussed and examined against the broader context of artists’ books, demonstrating how they have achieved their purpose of conveying desirable experiences to the readers in specific ways. Feedback from the users, who actually handled the set of book works, provide further insights into the potential of how the physical element could connects experience with an underlying concept and assists the communication of abstract ideas.

8.1.1 Positive versus negative space of the book

Chapter Two looked at how some of the elements of book form were selected and developed for the set of book works presented in this research. After the design decisions were made for the whole set of book works, one key characteristic emerged as an essential concept embodied in all
of the book works – that is the positive versus negative space of the book – and this is worth spending some time to discuss in more detail. This can be seen as an example of knowledge gained from the practice: something that can be reflected upon only after the physical experience.

The concept of ‘positive’ versus ‘negative’ is adopted in many visual disciplines. In printing text, for example, when the part we recognise as the letter has ink or a contrasting colour to the background paper, it is a positive image; when the shape of letter is without ink and shows the original paper, and the surrounding surface next to the letter is applied with ink, it is a negative image (figure 8.1).

Similarly, when we see a three-dimensional solid object, the solid itself is seen as positive, and the space around the solid is negative. This notion has been adopted in the training processes of drawing and painting, since it enhances the painter’s attention not only to the object itself but also to the surrounding area; by doing so, the painter is less constrained by his or her preconceived idea of what an object is, but is able to make observations with a less biased eye. There are more applications of related ideas in visual art, such as in Japanese and Chinese ink painting: there are places that are intentionally left blank in order to create a cloud- or fog-covered effect, suggesting a sense of spatial depth and providing viewers with greater freedom to project their own imagination. Before further examining the balance between positive and negative space, we should take a closer look at how this idea might apply to three-dimensional structures.

When we see a statue of a human figure, our attention is usually drawn to its solid parts rather than to its immediate surroundings; in other words, the viewing emphasis is on the positive rather than negative space. However, in the case of geometric form, for example Barbara

![Figure 8.1 Capital letter T, left: positive image; right: negative image.](image)

![Figure 8.2 Hepworth, Two Forms (Divided Circle) (1969), in the artist’s garden in Cornwall. From Phillips and Stephens, Barbara Hepworth Sculpture Garden, 2002.](image)
Hepworth’s *Two Forms (Divided Circle)* (1969) (figure 8.2), the positive and the negative space have equal importance – the two kinds of space wrap and penetrate each other, and, without each other, the three-dimensional shape cannot achieve completion. Viewers inevitably see the surrounding space together with the solid part as a whole, whether they are aware of it or not.

Using sculpture as an example, two of Antony Gormley’s works provide an intriguing comparison of positive and negative shape. *Blind Light* (2007-2009) is an interactive installation constructed from a square shaped glasshouse filled with thick mist, evenly lit by white fluorescent light. Viewers can step into the glass construction and are literally blinded by the bright mist. While they explore the ‘invisible’ space inside the construction, at the same time they are also immersed figures that become part of the work itself (figure 8.3). In the exhibition space in London’s Hayward Gallery in 2007, where this work was displayed in public for the first time, there was another work placed, apparently insignificantly, next to *Blind Light*: *Sense* (part of the *Concrete* series made in 1991) (figure 8.4). This work is broadly a cubic shape measuring 60cm each side, made of concrete, with a void in the shape of a crouched body in it; this human shape ‘touches’ the boundaries of the concrete cube, so that we can peek into the void and recognise that it is a human form. Originally, *Sense* materialises “the minimum space necessary to enclose the body in a contracted form”.1 However, by putting *Blind Light* and *Sense* next to each other, the viewer may start to wonder about the relationship between the human body and the surrounding space: which one defines and encloses the other? Which one is more solid, which one is more fluid? These two works, although not necessarily intentionally planned by the artist in this way, depict the human figure and the space from opposite directions. In *Blind Light*, the human body is the positive solid and the mist is negative space. In *Sense*, the human body becomes the negative void while the cubic ‘space’ becomes positive.
It is thus increasingly interesting to consider the negative shape in artists’ books. When the main body of the book is paper, the cut-out or missing shape of the paper can be seen as the negative space of a book. In a more direct approach, a stack of bound paper can be shaped as if it were a block of wood, such as A. R. Penck’s pierced book (figure 8.5) and *Objekt* (1973-4) (figure 8.6), or the texture of torn paper can be used such as in Yoko Terauchi’s *Ebb & Flow* (1988) (figure 8.7).

Because of the physical nature of a book being many leaves of pages stacking together, the torn or cut-out shape of the pages also creates the effect of ‘revealing something behind the page’ (in Terauchi’s *Ebb & Flow*, for example, the paper has different colours on each side, thus the torn and folded paper reveals contrasting colours), and this is not to be confused with positive and negative space of a book – what has been revealed is still a positive form of the book. The book works in this study, on the contrary, explore the usage of cut-out shapes of paper entirely on the contrast of positive and negative form. In *The circle has changed size*, the cut-out circle, suggested by the title, is a main figure in the sequence of the books, and the cut-out shapes provide an effective way to demonstrate how the circle can change its size (as suggested by the different images and scale on each page) or how it doesn’t change its size (as suggested by its physical size) at the same time. In *A cuboid has penetrated*, the cut-out shape suggests the impact from a cuboid and is the trace of an event happening in the three-dimensional world; it interfered with the conversation taking place on the inner pages, so could be seen as ‘tangible’ as the solid pages. In *Expedition*, the cut-out circles are actual geographical features that allow the army of ants to travel through them. And the relationship between the cut-out space in *A field guide of commonly mapped objects* and *Key to commonly mapped objects* is like the relationship...
between the keyhole and the key, essentially the negative space is as important as the positive, solid object.

Normally, when people read books, the tendency is to read the positive space and ignore the negative space, since the convention of book reading is to read the printed or written information on the pages, not the absence of pages – torn pages or eaten out pages, for example, would be seen as loss of information. A work by the filmmaker Anthony McCall provides an interesting point for us to reconsider. In his 1973 work *Line Describing a Cone*, an arc-shape line is projected on the wall, and in the 30 minutes the arc gradually grows to a closed circle. What is more intriguing is that the light from the projector to the wall in the shape of a cone is clearly shown, because there is spray of mist in the space to reflect the light itself, or, in other words, the mist becomes a soft, three-dimensional screen for the light to project on it (figure 8.8). Viewed carefully, the patterns shown in the light are constantly changing – because of the movement of the air current, the visible intersection between the light and the mist is constantly moving. In this work, a film is reduced to its purest form: consisting only of projecting light and projected screen. The usual relationship between them is inversed: in a normal film, it is the changing light which projects onto a fixed screen, here in *Line Describing a Cone*, it is the fixed light which projects onto a moving screen. However, the result is still ‘motion picture’ – the essence of a movie.

By the inversion of roles, *Line Describing a Cone* provides a way of further looking into the relationship between positive and negative parts of a whole system. On the one hand, it echoes the wrapping and penetration of positive and negative space in a sculpture that both parts have to exist in order to achieve the final form. On the other hand, it reminds us that the status of positive and negative is of equal importance, perhaps there is no one more ‘positive’ or ‘negative’ than the other. It is like the visual illusion of Rubin’s Vase (figure 8.9), whether one will see the
images as a vase or two face profiles depends on whether the white or the black part of the image is seen as figure (positive) or ground (negative). Both conditions work equally, and once the viewer becomes familiar with ‘switching’ between the two conditions, which part of the image is positive or negative becomes less important, even though one may still be keenly aware of the contrast between the two parts of the image.

An ingenious example in artists’ books of the balanced use of positive and negative elements can be seen in Ron King’s *Turn Over Darling* (1990) (figure 8.10). At first sight, the page illustrated with simple lines of nude female figure across both pages of the same spread. Viewed more closely, the simple lines are actually formed by blind-embossing, causing one side of the paper to stand out and the other side of the same paper intaglio. In the first image shown in figure 8.10, both pages in the same spread contain relief lines. When we turn to the next page, as shown in the second image in figure 8.8, the new left-hand side page is the back of the previous right-hand side page and contains intaglio lines; this new spread now shows a new nude figure presented by intaglio lines and actually shares part of the body (the lower part in this case) with the figure in previous spread. In the next spread, the figure would be in relief lines again and shares the upper part of the body with this spread. Thus, the sequence of nude figures are represented by positive and negative lines in turn. Each side of the same sheet of paper has equal importance to the composition of a figure, yet they are positive and negative images to each other.

This view of seeing positive and negative properties of equal and collaborative status echoes the ideology developed earlier in section 7.3: the way of seeing a system from both analytic and holistic views. As it is possible to be aware of the existence of analytic and holistic views at the same time, it is also possible to be aware of the existence of the positive and negative properties...
in the same object. Bearing this approach in mind, the cut-out shapes in the book works are
definitely not something missing, but validated entities that have equal importance as the
physical pages.

8.1.2 The book work as the place for experience to take place

As stated in chapter two, section 2.4.4, one of the general rules of the design of the book works
in this study has been to emphasise and explore the three-dimensional, sculptural properties of
books. Indeed, books as physical forms have been used in static installations, such as Buzz
Spector’s *The Library of Babel* (1988) (figure 8.11), or to alter and appreciate their possible three-

However, artists’ books also inherit from books the nature of interactive-ness, which may be
one of the most exciting aspects of books, inviting readers to use their hands and body
movements to play with the books physically. In this case, a book is not only for display (although
it always bears this property since it is an object), but also for exploration. At the very least, as far
as conventional book reading goes, readers have to turn the pages in order to read the text or
images in the book. The movement of the reader’s hands and body could be so mechanical and
almost automatic, that they are not very much aware of it. Books that subvert conventional form
and emphasise three-dimensional structure and interactivity would reduce the automatic body
movements and therefore make readers more aware of their actions. These books are unfolded
in less familiar ways, and each one is like a puzzle waiting to be solved. Kathleen Amt’s
*Kaleidoscopic ABC’s* (1991), for example, unfolds in a way resembling kaleidoscopic images to
reveal new surface with new text (figure 8.13). Creators of this kind of book usually take the form
and the meaning of the content into account. For example, in *Space + Time* (2002) (figure 8.14),
Ken Leslie took weekly photographs of his garden from one fixed point, but each week rotated 1/52 of 360° and at the end of one year he would be back to where he had begun. The resulting photographs are displayed as a circular montage that brings the viewer full circle both through the seasons and the round trip of the garden. Considerations of how to embody the idea in a specific form of the book are here in play.

The form, together with the content, suggests potential movements that readers might take to interact with it. In the case of *Space + Time*, the circular shape and the orientation of texts and images anticipate that the reader to rotate this circular book after it is fully open. Similarly, the cut-out space and the text on the book *A cuboid has penetrated* invites the action from the reader to put the other book (also suggested by its shape and the text), *A cuboid that penetrates*, into the space of the first book. In *Expedition*, once the reader starts to follow the journey of the ants willingly, the turning and unfolding of the pages revealing the passage of the ants becomes quite natural. It becomes explicit that, through careful planning and design, books can bring about the desired actions of many readers. Of course, there is still space for freedom in the reader’s movements and the potential for surprising the creator of the book; but as long as the desired actions can be maintained, the design is successful.

The experience of the book artist is yet another aspect to consider. Like other forms of visual art, the making or design process plays an essential part in the final result, and this process is where the artist’s former experience comes into play, and is also where considerable amount of new experience is to be gained. The artist’s direct experience with the medium and the environment certainly shapes the final form of the artwork. Under the influence of Merleau-Ponty’s ideology in phenomenology, this aspect has been brought to the awareness of researchers; a detailed consideration of the relationships between painters and paintings in the
context of phenomenology can be seen in Nigel Wentworth’s *The Phenomenology of Painting* (2004), for example. Experience gained from the making process, when well documented, also has its contribution to knowledge. This is one of the values of practice-based research, as suggested by Graeme Sullivan’s *Art Practice as Research: Inquiry in the Visual Arts* (2005). In this study, it is made clear that the formation of the set of book works has its own history of evolution, with various experimental designs that are not shown in the final presentation. The recording of these experimental designs in the written component on the one hand helps to illustrate the possible scope, variation and decision-making process of the book works in each theme. On the other hand it may provide knowledge to potential readers, whether researchers, artists, or just anyone who is interested in this research.

Any book will always produce experiences when it interacts with people. Even if a potential reader only had a quick glimpse of the cover and decided to skip the book, this encounter is still an experience, albeit a brief one. In the case of structurally emphasised books, on the other hand, the experience of the reader can be very dynamic and multi-dimensional: it may involve various body movements, the actions and interactions unfolding in the sequence of time; and the shaping of the reader’s thoughts and moods along the process. Just as with a physical journey from A to B, although every person would have his or her own unique, individual experiences of the journey, they have nonetheless travelled across the same landscape, there is therefore more to share and discuss between those who have taken the journey than with others. The set of book works in this study provides an equivalent landscape for travellers. Even though readers will have their own individual experiences as they explore the set of books, between the time they first open the box and reach the written component at the bottom of the structure a basis for communication had been established.
8.1.3 Considering the user's experience

As pointed out in chapter two, section 2.3.2, since the set of book works in this research serves as a physical, explanatory model in a way similar to a scientific illustration or study aid, the research itself would benefit from showing the set of book works to people and understanding people's response. This also means placing the set of book works in the 'real world', allowing actual interaction with people, and testing their reaction and understanding. There are two levels of communication that are of interest in this research: at a basic level the book works are readable to a variety of audiences whether they have previous knowledge and experience on artists' books or not; at the more advanced level is that the set of book works can open up communication on experience related to map using, cognitive science's understanding about experience, and ultimately to allow people to reflect upon their own experience in both subjective and objective ways.

A testing with selected users was therefore conducted – the method is described in chapter two, section 2.3.2, and the documentation of the result from four cases is provided in the appendix. (The permission has been given for revealing the real names of those participated in the test.) The number of cases may seem small, however it is adequate to provide some tentative findings upon which future research can be developed. Furthermore, the results are informative to this research and conversations between the user and the author have induced new insights into possible future developments. In effect, it is possible to see the testing conducted for this research as an explorative study for a much larger scale interview-based study, the potential for which will be discussed later in this section.
Here the testing results are discussed according to the two levels that are of interest to this research. For the basic level, observations were made on how users interacted with the book works – whether they handled the book works as intended by the author – and how the users formed their own understandings of the connections between the book works. All four cases showed that respondents grasped that the eight book works formed four pairs with different themes, and there was continuity between the two books in each pair (detail can be seen in the documentation included the Appendix). The significant clues for them to form the ‘pairing concept’ were varied, however. For example, user Clare Harris, who had worked with the publisher Dorling Kindersley as a graphic designer and is an art director at the time this thesis is written, explicitly indicated that it was firstly type (words) of each book and then graphics (visual shapes appeared on the surface of the books) that made her connected the two books into a pair. In other words, it was the visual clue on the surface of each book work that gave her the first impression that they were paired. On the contrary, Luce Choules, who has intensive experience on map reading, map using and documenting journeys and places by photography as her art practice, expressed that she “paired up concepts” in the books. Tom Ainsworth, a researcher and experienced craftsperson whose current research is related to the function and degeneration of human hands, pointed out that the specific pair of books, *A field guide of commonly mapped objects* and *Key to commonly mapped objects*, immediately gave him the clue that they were related to each other (although it might be also because *A field guide of commonly mapped objects* was the first book he started to explore among the books in the outer layer, and *Key to commonly mapped objects* was the first book he handled among the books in the inner layer. It is not certain were he to start with a different book, whether the answer would be the same). Ron King, the renowned book artist and artists’ books publisher, described how the books reminded
him of different aspects related to his own experience about maps and map using; so it was not the individual book that provides the initial clues for pairing, but something more holistic and related to his experience. It is interesting to see that, as it happened, each of the four users approached the set of book works from a different starting point but arrived the same conclusion of identifying the pairing system. It is reasonable to consider that the pairing system is easy to grasp, and it is so easy that everyone approaches it freely in each user’s own way. Such approaches related to users’ own previous experience on the way of thinking, their professional training, their perception of this project before the testing process, and even their order of encounter the individual book in the set of book works.

In respect of whether users handle the book works as intended by the author, there are two aspects to consider in the following observation. In the initial exploration stage of the testing, there was a slight tendency in most of the cases that they went through the book works one by one, from one layer to the next layer, perform the actions such as unfolding the pages of the book Expedition, and then paused after they finished the eight book works. It was only after a hint by the author, such as ‘the small cuboid book can literally go through the gap of the large cuboid book’, they started to enter into another active stage to play with the physical elements that linked the two book works in the same theme, and usually more creatively than the author’s original intention – such as trying to put every small book works into the space of A field guide of commonly mapped objects, or comparing the circular shapes in The circle changes its size and Expedition to see if they match in anyway (figure 8.15). (The exception was Tom Ainsworth, who actively tried out various physical combinations of the books in a pair from the beginning of handling the fifth one – that is, after finished the four book works in the outer layer and went on to the first book work in the inner layer.) Two observations are worth noting here: one is that every
user seemed to grasp the design in individual book works; the other is that although the physical interactions between the two book works in the pair was not performed at the beginning, once it started, it brought out a variety of actions that was beyond the intended design.

One simple explanation is that the clues embodied in the individual book works turns out better designed than the clues for physical interaction between the two in a pair. However, discussion with the users in a later stage of the testing process showed that they all grasped that the book works came as pairs and there was continuity and connection between the two in each pair. It suggests that, for the users, there was no need to physically handle the two book works together to understand that they were a pair. Rather, the users already knew that the book works were paired, and the physical interaction within the pair was more like an additional level of puzzle to be solved. It can also be understood this way: when dealing with books, people have a tendency to go through the content in a linear sequence, even when there are more than one volumes in a set of work – this can be the reason to explain the users' response in the testing process. However, when the existence of an additional level of puzzle is revealed, people engage in the activity of handling the objects mainly for the pleasure of discovering new possibilities, not for enhancing previously learned knowledge. Therefore a variety of actions can be developed, to the degree that is beyond the author’s expectation. If this set of book works is to be developed further in the future, it is worth considering whether the rules to connect the two works in a pair should be more explicit and strict, or if it is desirable to allow more flexibility in the interactions between all book works.

Two of the users handled the book works in a way that was particularly interesting from this research’s point of view: both Ron King and Tom Ainsworth occasionally held the books through the cut-out space of the work, for example A field guide of commonly mapped objects (figure 8.16).
or _The circle has changed size_, as if they were holding an solid object with three-dimensional shape. This may not be accidental, since both of them have engaged in sculpture-related activities themselves – Ron King is also a sculptor working with wood, and Tom Ainsworth had experience in craft and product design.

The normal tendency of people to approach books is to deal with the element of the book visually, as this is how most books provide their information. A cut-out circle tends to be conceived as a singular graphic element that helps to reveal something on the next page, and vision alone is enough to allow people to perceive the existence of the circle. However, what the two users performed here is that they perceive the cut-out space as part of the physical shapes of the object, and react to it with they hands naturally rather than vision alone. This could be also related to the fact that different types of people tend to use different sense (vision, touch or hearing) to approach the world. However, it is also possible, for the future development, to explore this physical aspect of books further by emphasis the shapes of books in the design, such as to deviate further from the conventional rectangle format of books.

As the purpose of the set of book works was to assist the communication of abstract concepts both to and between people, part of the testing process focused on conversations between the user and the author. To Luce Choules, the set of the book works was so simple to a degree that there was not very much information to explore. However, after more discussions on both her and the author’s experience related to maps and map using, she depicted the set of works worked as analogous to a ‘tool kit’ that could bring up conversations between people. She also expressed that, although the idea in each book work was very simple, the layered structure and the way the works were combined allowed the development of complex thoughts. These comments shed insights on one particular aspect of the research question and suggests the
need to conduct a larger scale study that focuses solely on testing this set of book works more widely, in order to understand people’s experience on journey and map using. When the professional, cultural and other backgrounds are also taken into consideration, it can be expected that there will be more to be discovered on the huge variety ‘from map to journey’ on different people.

My conversation with Ron King also revealed that, with ‘more oral instructions’ (to quote from him directly), there is a possibility that the set of works might assist people who don’t find it easy to use a map. The reason centres on the fact that the four themes did remind him of different aspects of his own experience on map using, and there is a possibility of assisting people to grasp these aspects one by one to achieve a more efficient use of maps.

When the set of book works is seen like a puzzle, it is possible to approach it like a game in an enjoyable way, as demonstrated by Tom Ainsworth and Clare Harris. It is not so satisfying if the set of book works is seen as a stand-alone work without further explanation, as both Ron King and Luce Choules suggested in their comments. However, with appropriate assistance from the conversation between the author and user, more can be achieved and more possibilities opened. In the scope of this thesis, the role of the set of books is as a physical model that occupies a role in the process of communication. The results from the testing process demonstrate that communication has been facilitated and that the set of works is proven to be useful.

8.2 Re-thinking experience from an integrated approach

Perhaps the most significant element of this research, which can also be considered as one of its contributions, is to utilise a creative method to increase the possibility of bridging different...
'dimensions' that seem very distinct from each other at the first sight. Any living human being are likely to agree that our experience and our interaction with the world are never clear-cut and easy to organise into an ordered, systematic picture. However, it is also in the very nature of any discipline that going deeper into a subject results in the acquisition of new knowledge on that particular subject, and at the same time a loss of perspective on the relationships between that subject and the rest of the world (essentially, this situation is the same with the problem of scale, which I discussed in chapter 3). With the rapid develop of communication and technologies and the growth of available types of media in the second half of the twentieth century, we also see a growth of need in interdisciplinary, cross-disciplinary or multidisciplinary collaborations and studies. On the one hand, it can be seen as to provide new opportunities for people in the traditional disciplines wanting to gain more achievements in a competitive environment. On the other hand, it can be that there is a real need in the way we understand the world and ourselves which is different from the reductionists’ method developed along with the progress of science in the last two centuries. In a more traditional setting, this kind of interdisciplinary activity takes the form of a collaboration between people from different disciplines, and those involved remain wedded to their original disciplines. However, in art-related projects it is not unusual to see the members involved have cross-disciplinary ability and training themselves. For example, a biologist may also receive training in statistics and computer science, whilst having the ability to conduct computer simulations for a biological project. Or the growing number of people who express their ideas through ‘multimedia’ instead of a single, traditional mean of artistic expression since the term first coined in 1966⁴.

This research takes advantages of the author’s previous training in biology and cognitive science to look at the issue of human experience with the assistance of the physical element,
namely book works. The spirit that permeates this research is that, although each established approach concerning human experience can be very different, it is also a time we have now accumulated enough knowledge in a diversity of disciplines that allow us to start to consider the issue in a more integrated fashion. The utilisation of the physical works opens up the possibility of thinking about active experience from individuals’ own perspective as well as serving to assist communication between individuals. This is an insight that is difficult to achieve by text alone. With the testing conducted, I also had the opportunity to confirm that the adoption of a physical element to the process is possible and has potential in aiding communication. In effect, an integrated method for the adoption of seemingly opposite concepts are explicitly or implicitly embodied in this research in various forms: science versus arts and design practice; an objective versus subjective approach; cognitive science versus body phenomenology; analytic versus holistic way of information processing; positive versus negative, and conceptual versus tangible means of explanation. This can be identified as a particular facet of the process and as such constitutes an important dimension of the findings emerging from this research.

8.3 Summary and future studies

Chapter One and Two provided a broader background to how the issue of human experience should be dealt with in this research. Chapters Three to Six and the corresponding pair of book works have examined the elements of the map-using experience in relation to the environment and human cognition, and the book form has been exploited to re-create and deliver specific experiences related to map using. By adopting the physical element, i.e. the book works, those elements of transfer between dimensions that are essential to the core of this thesis can be directly experienced by the readers, thus providing an opportunity for ‘thinking within experience’.
By representing different aspects of the issue via the set of book works, a tangible model that emphasises the balance between analytic and holistic processing towards a more complex and multi-dimensional system is also given, as I explain further in section 7.3.

Two possible future studies were mentioned earlier in section 8.1.3. One is to conduct a larger scale, interview-based study that uses a set of book works as a tool to collect people’s experiences and reflections on map, journey and map-using. This option can be designed differently to suit specific purposes. For example, it can be developed in the context of an art project that engages a wider public to reflect upon their own experience and share their experience with others. It could be developed to a project that with cultural emphasis to see the comparison of people’s experience against their cultural background. It could be further developed into a tool of data collection in order to understand people’s experience on map using and therefore to find possibilities to improve this experience. The other option, also mentioned earlier, is to adopt the set of book works as a teaching aid to assist those people who find it difficult to use a map. Further investigation is needed to assess the difficulties users may encounter.

The aspect of book form in this study will also be of interest to researchers of artists’ books, given that those studies of artists’ books already published focus almost exclusively on the genre’s history and variety, rather than on the capacity for interaction with readers. Practitioners of artists’ books may be quite aware of the influence of their work has upon readers’ behaviour, and such knowledge remains largely tacit; further studies focusing on this aspect would be beneficial to future book artists, while expanding further our knowledge of human interaction with books of this kind.
The model developed in Chapter 7 highlights the need for a balance between analytic and holistic processing, and has drawn an analogy from human cognition related to the different parts of the brain, while offering a comparison with the Chinese five-element belief system (see chapter one for the introduction and chapter seven for comparison). For the purposes of this study, such a model is useful in explaining the interrelationships between different aspects of the same issue. However, the degree to which such a model can be generalised from, while proven useful for dealing with complex, multi-dimensional processed is still to be fully understood.

Further study related to this aspect may involve exploration into how human cognition shapes our knowledge of the world – an ongoing work shared by many scientists and philosophers – or the comparison with other types of thinking systems – which in itself would be a quintessentially cross-disciplinary process.

This study has proposed a new direction that may help to bridge the gap between the objective, third-person’s point of view and the subjective, first-person experience. Previous arguments have mostly been based on the corpus of scientific and philosophical knowledge, since this issue is driven from the ‘hard problem of consciousness’ among philosophers who are interested in empirical studies of the human mind (as introduced in chapter one). Art and design, on the other hand, and cannot be separated from first-person experience, tangible works are always involved and modes of communication have been developed, as the example of map use has sought to illustrate. The practical component of this study – namely the book works – give access to experience while at the same time highlighting the need to refer to the complex role of the human mind. It would thus no doubt be revealing to study further the relationship between first-person experience and objective knowledge, since this relation is at the heart of all practice-
based research, and this could itself help us further clarify the merit of such an approach to human interaction with maps.

1 According to the artist’s statement from his official website: http://www.antonygormley.com/viewproject.php?projectid=21&page=4
5 In Keith A. Smith’s Structure of the Visual Book (1984, 2003), he articulated various possibilities on how books can interact with people and how a book artist can pay attention to these possibilities. There is, however, no research specifically on the physical possibilities and their relations to readers’ body movements by the time this research is conducted.
Appendix: Feedbacks from Users

This appendix provides documentation of the tests conducted by the author of a selection of four users, each chosen for their professional background. Permissions have been asked to reveal the users’ real names. The documentation includes: 1. a description of the testing process; 2. a written introduction to be read to the user at the beginning of the testing process; 3. records of the results from the four cases.

1. The procedure of testing

When the author and the user met at the location, the author firstly made sure the environment was suitable for the testing (with a reasonably undisturbed environment, and a clear clean surface) and that the user was comfortable about this setting.

The author then placed the black, cubic box on the surface in front of the user, and read a written introduction to the user (see 2. for content). This introduction was prepared in advance and the same introduction was read to each user.

When the user felt he or she was ready, the first stage of free exploration started. The user might occasionally ask questions or make some comments, but the author would keep the conversation to a minimum to allow the user to focus on the exploration. During the process, some photos were taken as a record of the process. The author also recorded the order in which the book works were handled, the user’s general attitude, and whether the user had performed specific actions intended by the design of the book works.

When the user indicated that he or she was ready for the next stage, the author would start the discussion. If the user had not fully explored most of the possible physical interactions with the book works, the author would provide a small clue to suggest further handling. (An example clue used was ‘The cuboid that penetrates can actually go through the gap in A cuboid has penetrated in two cases’). Most conversations were based on a list of questions prepared by the author. Beyond these questions, the author might ask the user more questions related to the specific experience the user had in the exploration stage, and in his or her own professional experience. In the last two cases, sound recording was also used during the discussion with the users’ permission.
2. Written introduction

The following paragraphs are an introduction to the user, to be read by the author at the beginning of the testing process. Every user received the same information before they started to explore the contents of the box.

Thank you for your participation. Before we start, please allow me to read this brief introduction for you.

The box in front of you is an essential part of my research project. You can find the title of the thesis when you open the box.

Inside the box, there is a written component and several book works. Today we are only going to look at the book works, so although you will see the conventionally bound written component, you can just skip it. It is only to give an idea of how the whole thing looks.

The job for us today is for you to explore the book works in the box. [There are eight book works in total.] Please feel free to look at them, handle them and play with them. There is no right or wrong way of doing so. [It’s just that we are going to focus on the function of the book works rather than how beautiful they are.] Please be relaxed and take your time.

During the process I may take some photos as a record for my project, and I don’t need your face to be shown so please don’t worry about your privacy or how elegant you will look in the photos.

After you feel you have fully explored the book works, we will have some discussion about this experience. This is not a test for you, but to help me to understand my project better, so please don’t worry about how you think and feel about this experience.

Before we start, if you have any questions, please feel free to ask. If not you are welcome to start with the box now.

3. Records of the testing results (arranged in the chronological order)

A note for the abbreviation of the book works used in the records:

LC: *The circle has changed size* (larger copy)
SC: The circle has changed size (smaller copy)
LP: A cuboid has penetrated (larger copy)
SP: A cuboid that penetrates (smaller copy)
LE: Expedition (larger copy)
SE: Expedition (smaller copy)
LS: A field guide to commonly mapped objects
SS: Key to commonly mapped objects

Case 1
User: Clare Harris
Professional background: nearly 20 years' experience as a graphic designer in commercial publishing sector including Dorling Kindersley. Now an art director in publishing, packaging and branding.
Location: Room M56, Grand Parade, University of Brighton

Exploration stage
(This stage took 20 minutes)
The general attitude towards the book works: cautious, casual, puzzled, engaged, other: confident, natural, seemed to enjoy the exploration.
• All sitting down or occasionally standing up.
• The order of book handling: one by one. The order of book handling: LS, LE, LP, LC, SS, SE, SP, SC. When handling LP and SP, she was sitting down to read the texts.

Did the person ‘testing’ the book works:
• Put two “Scale” books against each other to compare the size of the circles? Yes
• Try to put small “Cuboid” book through the gap at the larger one? No
• Unfold the page of “Expedition”? Yes
• Put the two “Expedition” books against each other to form a longer ants journey? Yes
• Put the small “Symbol” into the larger one? No
• Try to read the small “Symbol” inside the larger one? Yes
• Did he or she handle a book work more than once? Yes, all of them.
• Pairing? Yes. If yes, when and how was this recognised: the orders of picking up book works were the same for the outer and inner layer.

When she finished handling each smaller book, she placed it against the corresponding larger book.

Other:
• Record of special movements/actions:
  The handling of the books seemed confident and adventurous. Most of the designs for pairing the book works were tested by the user during the exploration stage.
  The user read the book works both forwards and backwards.
  Noticed that the last circle and first circle of the two books The circle has changed size were real-size circles and liked the design.
  Noticed that the small circular hole on the spine of large Expedition can match the circular shape on the spine of small Expedition. Then match the large and small Expedition to form a continuous journey of the ants.
  Tried to figure out if all the circles in the book works were the same size.
  Compared the journeys of ants (narratives) in large and small Expedition.

Discussion
(This stage took 20 minutes)
• How does he or she feel about the books – interesting, confusing, complex, confusing than clear, all very puzzling, etc. Any thoughts he or she had during the handling process?

The general feeling of the interviewee was ‘interesting’. She appreciated the three-dimensional elements used in these book works and enjoyed playing with them.

• If the interviewee showed that he or she had grasped the hidden logic (for example the paired books) ask her or him to describe how and when they started to realise this.

The user clearly indicated that the elements that made her decide the pairing system were firstly type (words) then graphic.

• What related to his or her own experience and knowledge? “From your own experience, can you think of any activity, object or idea that is in any way similar to your handling of these objects?”

The user liked to pull out and unfold pages whenever possible.

The box gave her expectation: prepared to be surprised.

• Check the interviewee’s previous experience about artists’ books or ‘unconventional books’.

The interviewee had some experience in handling not-so-conventional books and she enjoyed the experience. The interviewee had worked in the publishing house (Dorling Kindersley) previously and was once involved in a project of a book with cut-out holes (which served as a ‘spot-light’ on an artwork for a gift book for adults). This experience could be linked to the element of circle used in the set of book works.

• Give the interviewee the names of the four themes (printed on cards) and ask the interviewee to identify which book/books they think belong to each theme. “Please attach the four descriptions to the books that you think are appropriate.”

The user accomplished this task efficiently.

• Records of other comments and discussions:

The user asked the author whether all the holes and squares were cut by hand.

The three-dimensional quality of books: both agreed that pages were not only flat surface but physical objects.
Generally speaking the user enjoyed handling these book works. Although she did not produce similar works herself (apart from the commercial project for DK), she showed an adventurous attitude towards the possibility of three-dimensional quality of the set of book works, and was confident about what she could play with.

Case 2

User: Luce Choules

Professional background: artist, publisher, art practice including photography to document places and journeys, map researcher, member of the British Cartographic Society and Fellow of the Royal Geographical Society.

Location: Royal Geographical Society, London

Exploration stage

(This stage took 10 minutes)

• The general attitude towards the book works: cautious, casual, puzzled, engaged, other: appeared neutral.
• All sitting down or occasionally standing up.
• The order of book handling: one by one. The order of book handling: LS, LE, LC, LP, SS, SE, SC, SP. The books were pre-arranged in the same orientation for the outer and inner layer, which could explain the same order of book reading for large and small books – i.e. the interviewee followed the same orientation to pick up books for outer and inner layers.

Did the person ‘testing’ the book works:

• Put two “Scale” books against each other to compare the size of the circles? Yes
• Try to put small “Cuboid” book through the gap at the larger one? Yes
• Unfold the page of “Expedition”? Yes
• Put the two “Expedition” books against each other to form a longer ants journey? Yes
• Put the small “Symbol” into the larger one? Not until told to do so
• Try to read the small “Symbol” inside the larger one? No
• Did he or she handle a book work more than once? Yes, all of them.
• Pairing? Yes. If yes, when and how was this recognised: when the parts of each pair were placed close to each other on the table after handling.

Other:
• Record of special movements/actions:

The range of actions was minimal.
The user stood up to help picking up the book works from the box, but after all the book works were out, she sat down again until the end of the interview.
The user read through all contents of the book works carefully.
When the user had read though all the book works, she said ‘I’ve finished all the books’ and signalled clearly that she was not content – she wanted to know more about these works.

Discussion
(This stage took 50 minutes)
• How does he or she feel about the books – interesting, confusing, complex, confusing than clear, all very puzzling, etc. Any thoughts he or she had during the handling process?

The attitude was quite neutral – the interviewee described her approach as an ‘encounter’, just like her attitude towards a new environment when she went on a journey or fieldwork. She also said she did not know what to expect from these works. Generally speaking, she enjoyed the Cuboid pair the most, because the graphic used to depict the story was simple yet more thought provoking, which included the use of negative space. The other book works all seemed very simple.
• If the interviewee had showed that he or she had grasped the hidden logic (for example the paired books) ask her or him to describe how and when they started to realise this.

 She immediately recognised the relation between *A field guide of commonly mapped objects* and *Key to commonly mapped objects* (and referred to it as “legend”); she felt the pair was close to what she was familiar with. She described herself “paired up concepts” (rather than titles, types, etc).

• What related to his or her own experience and knowledge? “From your own experience, can you think of any activity, object or idea that is in any way similar to your handling of these objects?”

 Other academic projects that included the use of box.

Implications of the black box, such as the blackness allowing the viewers’ thought to project

• Check the interviewee’s previous experience about artists’ books or ‘unconventional books’.

The interviewee designed and published ‘map format’ folded works.

• Give the interviewee the names of the four themes (printed on cards) and ask the interviewee to identify which book/books they think belong to each theme. “Please attach the four descriptions to the books that you think are appropriate.”

This step was not performed as in the discussion it was clear that the user already knew all these.

• Records of other comments and discussions:

The user asked what the author wanted to achieve with this box set. My answer was that it has two levels: the basic level was that these book works were readable, and the advance level was to open up the opportunity for communication. The user agreed and used the term ‘tool kit’ to describe the works. The user also expressed that if the book works were intended to be artwork, the information given was too limited and so did not convey full message.

The user also asked what the author would like to develop from the current set of work (and said she would encourage the author to take it further). Apart from to fulfil the requirements of a postgraduate thesis, one possible development is to explore the potential of this ‘tool kit’ further and to interview a lot of people from different backgrounds and with different associations with maps and journeys, to see how diverse the results are. There will be interesting new findings from a large scale interview.
Near the end, the user felt that although each of the book works was very simple, the combination of them provided opportunity for complex thoughts and the layered design also helped on this aspect. She expressed that she’s grown to like this project, and may have more thoughts after more digestion.

Case 3

User: Tom Ainsworth

Professional background: researcher and maker. Previous training includes product design. Current research on the function and degeneration of hands.

Location: Grand Parade, University of Brighton

Exploration stage

(This stage took 15 minutes)

- The general attitude towards the book works: cautious, casual, puzzled, engaged, other: enjoyed.
- All sitting down or occasionally standing up.
- The order of book handling: opened the larger box and then opened the smaller box, but decided to explore the contents in the larger box before proceeding to the smaller box. Handling the books one by one. The order of book handling: LS, LE, LP, LC, SS, SE, SC, SP.

Did the person ‘testing’ the book works:

- Put two “Scale” books against each other to compare the size of the circles? Yes
- Try to put small “Cuboid” book through the gap at the larger one? Yes
- Unfold the page of “Expedition”? Yes
- Put the two “Expedition” books against each other to form a longer ants journey? Yes
- Put the small “Symbol” into the larger one? Yes
• Try to read the small “Symbol” inside the larger one? Yes
• Did he or she handle a book work more than once? Yes, all of them.
• Pairing? Yes. If yes, when and how was this recognised: he started to put the pages from *Key to commonly mapped objects* into corresponding pages of *A field guide to commonly mapped objects*. The book *Key to commonly mapped objects* was the first book handled among the smaller books.

Other:

• Record of special movements/actions:

  *The larger book* *A field guide of commonly mapped objects* was held up against the scene outside the window while appropriate spread of the book was open, to form a frame for corresponding real objects, such as trees or buildings.

  The user commented on the books while handling them. When some physical element between the two books matched, the user showed a sense of satisfaction by saying “this is great” or “I like the game”.

  Interested in matching the circles between two *Expeditions*, to see if new possibility emerged for the journey of ants.

  Compared the circles in *Expeditions* and *The circle has changed size* to check the size difference between the circles.

  When holding both volumes of *The circle has changed size* and reading through the pages, occasionally the user’s fingers would placed at the inner side of the cut-out, circular space.

  When unfolded the pages of large *Expeditions*, the user occasionally pulled the paper by holding the fingers through the cut-out circle.

Discussion

(This stage took 40 minutes)

• How does he or she feel about the books – interesting, confusing, complex, confusing than clear, all very puzzling, etc. Any thoughts he or she had during the handling process?)
The user started to engage with the three-dimensional elements very quickly and actively. For example, before exploring the smaller books in the second layer, he used *A field guide to commonly mapped objects* to 'interact' with the environment. Furthermore, soon after he found out that there were clues to the 'correct' way of physically connecting the two books, he engaged with the activities and expressed it as 'game', as recorded previously.

- If the interviewee had showed that he or she had grasped the hidden logic (for example the paired books) ask her or him to describe how and when they started to realise this.

  *A field guide of commonly mapped objects* and *Key to commonly mapped objects* immediately gave him the hint of the connection between the two books. However, consider that the two book works were the first pair he handled, it was not certain if he handled the book works in different order, the answer would be the same.

- What related to his or her own experience and knowledge? “From your own experience, can you think of any activity, object or idea that is in any way similar to your handling of these objects?”

  *Children’s books in the form of pop-up books.*

- Check the interviewee’s previous experience about artists’ books or ‘unconventional books’.

  The user had not heard of artists’ books before and were not familiar with the possibility of this media.

- Give the interviewee the names of the four themes (printed on cards) and ask the interviewee to identify which book/books they think belong to each theme. “Please attach the four descriptions to the books that you think are appropriate.”

  The users accomplished the task efficiently. Although he also mentioned that the card “Perspective” (transfer between flat and holographic) made him think a bit more before he attached it to the pair of cuboid books, because he was used to think of ‘perspective’ in his own experience of climbing.

- Records of other comments and discussions:

  The user always uses a map to navigate when visiting an unfamiliar place. He admitted he quite often got lost, and the reason might be that he did not pay enough attention. When asked if he preferred to be given directions in the form of instruction (e.g. turn left at the next junction, then turn right…) or to be given the map, the user strongly favoured the map, because you can actively get the information, not passively.
The user was happy to be described as “have a good sense of space”.
The user has one particular experienced about scale: by looking at a map when he was in the US, he thought the distance from A to B would only take a few hours, but other people told him it would take two days to drive. This incident made him realised that scale was really an important issue.

Case 4
User: Ron King

Professional background: book artists’ and artists’ books publisher (Circle Press) that plays an important role in the world of artists’ books in the UK, US and worldwide. Also a sculptor working with wood. researcher and maker.

Location: The artist’s home in West Sussex, England

Exploration stage
(This stage took 30 minutes)
• The general attitude towards the book works: cautious, casual, puzzled, engaged, other: interested.
• All sitting down or occasionally standing up. (Only stood up in one short period)
• The order of book handling: opened the larger box and then took the small box out from the large box. Opened the small box, made sure there were eight book works in total and started to handle the book works in the small box. The order of book handling: SS, SE, SC, SP, took out larger books and decided to go through the larger books in the same order as smaller book, LS, LE, LC, LP.

Did the person ‘testing’ the book works:
• Put two “Scale” books against each other to compare the size of the circles? No
• Try to put small “Cuboid” book through the gap at the larger one? No
• Unfold the page of “Expedition”? Yes
• Put the two “Expedition” books against each other to form a longer ants journey? No
• Put the small “Symbol” into the larger one? Yes
• Try to read the small “Symbol” inside the larger one? No
• Did he or she handle a book work more than once? Yes, all of them.
• Pairing? Yes. If yes, when and how was this recognised: after he had been through all the smaller books, the user decided to handle the larger books in the same order as the smaller ones.

Other:
• Record of special movements/actions:

  This user was the first case to start with the smaller book works rather than the larger book works.
  He commented on his first impression of each theme when he handled the first book (in this case, the smaller books) in each pair: Key to commonly mapped objects – “quite thick card” (as referred to the material); small Expedition – “I like ants”; small The circle has changed size – “accurate cutting” (also checked with the author that the circles were cut by hand); The cuboid that penetrated – intrigued by the story of Flatland.
  When handled A field guide to commonly mapped objects, the user held the book work so that his fingers went through the cut-out space, just like holding a picture frame. He also humourously commented that “I can see great transparency in the book”. And he did try to look ‘through” the cut-out space.

  After unfolding the pages of large Expedition, the user also unfolded A cuboid has penetrated in the same manner.

Discussion

(This stage took 30 minutes)
• How does he or she feel about the books – interesting, confusing, complex, confusing than clear, all very puzzling, etc. Any thoughts he or she had during the handling process?

The user was impressed by the precision of handcraft shown on the cutting (particularly the cut-out circles) and box making.

• If the interviewee had showed that he or she grasped the hidden logic (for example the paired books) ask her or him to describe how and when they started to realise this.

When the user handled the larger Expedition and fully unfolded the pages to form a long circular shape, he followed the ants’ journey through the surface of paper and explicitly said “ah, I get it”.

The conscious decision on the order of handling the larger books after the smaller books were handled showed that the user was aware of the connection between the two layers of book works and that they were paired.

• What related to his or her own experience and knowledge? “From your own experience, can you think of any activity, object or idea that is in any way similar to your handling of these objects?”

Since this research was related to map using and has haptic quality, the user thought of one of his previous works related to maps (In the Sand Parishes).

He also referred to an 1849 book intended to teach school children geometry by the use of colours.

• Check the interviewee’s previous experience about artists’ books or ‘unconventional books’.

The user claimed that he worked as a printer and publisher perhaps for genetic reasons – the history of his family working as printers can be traced back to 18th century.

The user himself had engaged in the publishing of artists’ books starting in 1967. Since then, a lot of works had been produced and published, and many of the books were now in important collections in places such as the British Library.

• Give the interviewee the names of the four themes (printed on cards) and ask the interviewee to identify which book/books they think belong to each theme. “Please attach the four descriptions to the books that you think are appropriate.”

The step was not performed as the user and the author already talked about the different aspects of map using experience in earlier conversation.
• Records of other comments and discussions:

The book works in different themes did remind the user of the different aspects of his experience on map using. The user himself was confident in using maps, but he thought it was possible to adapt this set of book works to assist people who found maps difficult to understand – to help them learn the different mechanisms involved in the map using process.
Bibliography


---. *Wales and West Midlands (O/S Road Map)*. Denver: Ordnance Survey, 2005.


*3 Walks in the Ouse Valley*. Environment Agency and the Sussex Down Conservation Board, 1999 (publication No. SD L19/2).

**Secondary reading**

**Background studies about maps**


**Cognitive science and related philosophical issues**


**Phenomenology and perception**

