The Architecture of the Extended Mind: Towards a Critical Urban Ecology

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6 Bodies and the Timing of Space: The Architecture of Cognitive Mapping

> The objects we perceive in our surroundings – cities, villages, fields, woods – bear the mark of having been worked on by man. It is not only in clothing and appearance, in outward form and emotional make up that men are the products of history. Even the way they see and hear is the inseparable from the social life process, as it has evolved over the millennia. The facts, which our senses present to us, are socially preformed in two ways: through the historical character of the object perceived and through the historical character of the perceiving organ.[1]
> Max Horkheimer

6.1 Mind and Ecology

Despite the increasingly widespread adoption of various conceptions of embodiment across the cognitive sciences, much thinking still seems to default to the habit of assuming a tight correlation between mind and brain – or at least between mind and brain-plus-body. However, as was argued in the previous chapter, mind can surely only make sense when seen as a wider ecological concept. Mind is always composed of loops, relations and processes that integrate an actor and its environment, as subject and object. Mind is always, in this Batesonian sense, fundamentally aesthetic and fundamentally ecological. In the case of human consciousness, these loops necessarily pass through the physiological and neurological processes of the body and brain. However, whilst necessary in this regard, the brain is not alone sufficient for any explanation of consciousness. As Alva Nöe notes:

> ... not only can we not explain mind in terms of brain alone, but we can only explain the brain, and its role in helping give us minds, by thinking of the place of the brain in the context of our interaction with the world.[2]

In this chapter, I will draw together thinking on the relations between an enacted, extended and ecological mind, and the neurology of an embodied brain, with a focus upon our cognitive mapping of our body in space. Understanding the way that the body is mapped as a body, and thus as a body in space, is increasingly seen as vital in grasping how mind and consciousness arise in humans. As far as I am aware, this is the first time that

Cerebral Structures

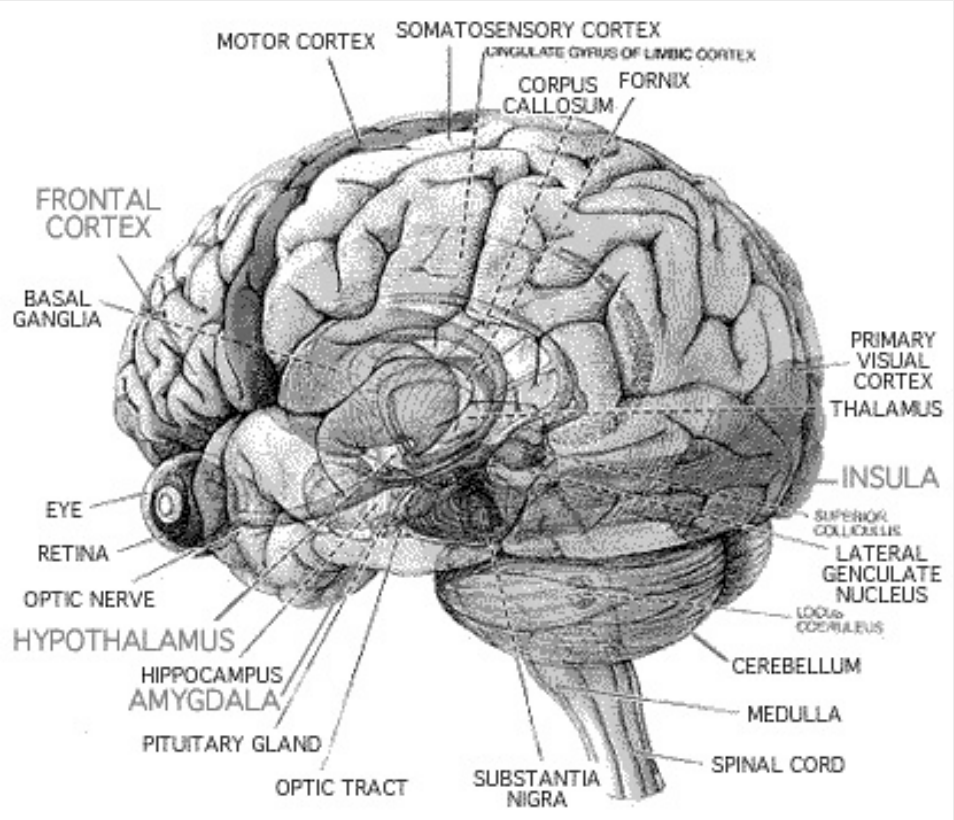


Fig. 6.1 View of internal/surface brain structures. Typically today the structural anatomy of the brain is introduced through a division into cortical and sub-cortical structures. The major sub-cortical nuclei are clustered around the brain stem and below the cortex, and include the thalamus (which is often described as a relay station), and the basal ganglia (typically described as motor-based and action-based), but which also includes the amygdala (generally thought important in decision making and emotion). The hypothalamus regulates homeostatic mechanisms in the body, such as metabolism, food intake, and temperature, whilst the cerebellum, at the back of the brain is closely integrated with the frontal cortex, and is involved in planning and coordinating movements. The hippocampus is generally thought to be involved in spatial and memory processes.

The popular reference to “grey matter” refers to the visual appearance of the neurons on the surface of the cerebral cortex. The white matter beneath the cerebral cortex is made up largely of nerve fibres (i.e. the axon-dendrite connections between the cortex and the lower regions of the brain.) If a section is taken through the brain, the layer of grey matter on the surface is composed of cortex neurons (in total six neurons, or less than 1 cm thick), and the white matter below that is a dense network of connections between these neurons. The characteristic folding pattern of the cortex increases the surface area, which increases the number of cortex neurons that can be located there.

All of the different brain regions are composed of different variations of two particular kinds of specialised cells: the neuron and the glia. There are approximately 100 billion neurons in the human brain, and around ten times as many more glial cells, which support neuronal activity in a variety of ways. A piece of brain the size of a grain of sand contains 100,000 neurons, 2 million axons, and 1 billion synapses. Neurons are cells which conduct electricity in short impulses which can be frequency modulated - thereby encoding information into different firing rates. The neuron can be broken down into a number of elements. The main part of the cell - called the soma - contains the nucleus, and branching off of this are thousands of projections called dendrites and axons. The dendrites bring information in the form of modulated electrical signals into the neuron from other cells, and axons take signals from the neuron to other cell’s dendrites. The bridge between one neuron’s axon and another’s dendrite is called a synapse, and each neuron has between one thousand and ten thousand synaptic connections to other neurons, muscle cells, glands etc. A neuron can be anything from a few millimetres to the full height of the body in length. Bundles of axons and dendrites are referred to as nerves. The various glial (meaning "glue") cells do not transmit electric signals, but rather maintain the neurons.

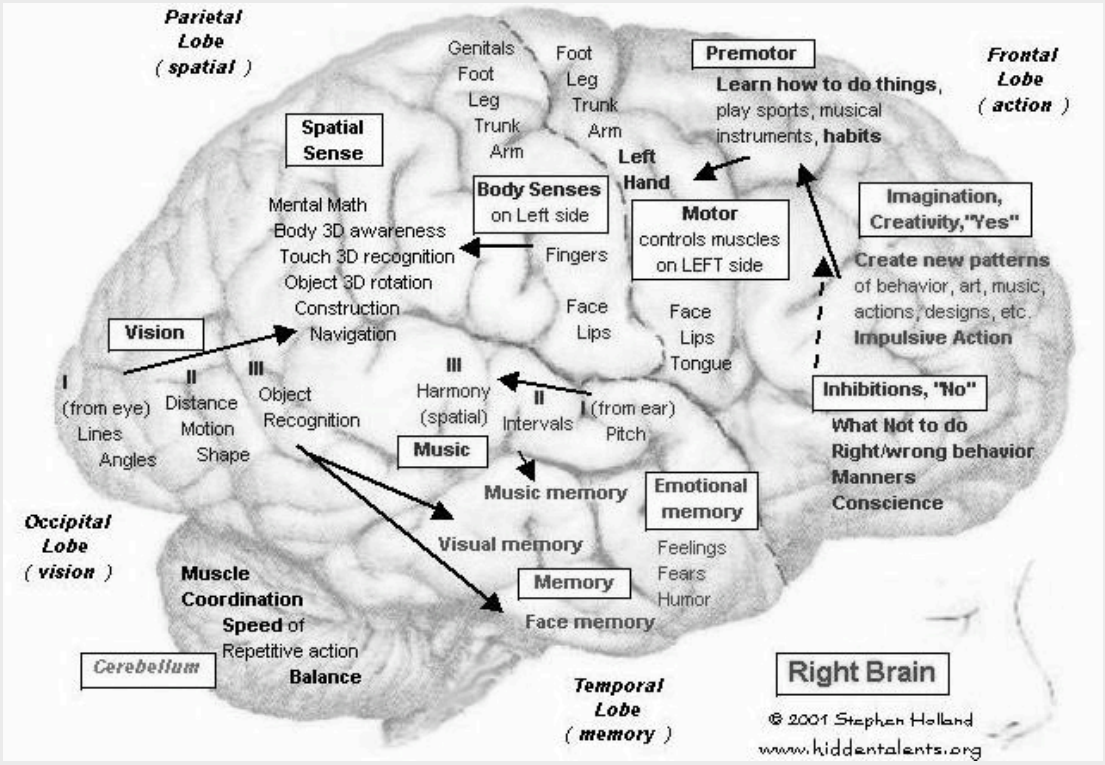
research from so many different areas of neurological and psychological research into how the brain maps space has been drawn together in one place, certainly in relation to architecture and spatial environments.[3] When viewed together, it seems to me that this material makes the embodied account of mind incontrovertible. Furthermore, much of this material also lends support to the the general externalist, extended and ecological approaches to cognition that I have built up over recent chapters. This is perhaps not surprising. An externalist approach to mind might expect to find its clearest support in exploring how it is that the organism describes and defines its external environment.

Whilst this chapter is not in any simplistic way an exercise in neuroaesthetics, there are some interesting readings to be made regarding how we experience architectural form.[4] In particular, I will propose "an affordance based theory of decoration in architecture". However, my primary aim – following on from the last chapter on extended mind, and preceding the next chapter on empathy – is to explore the mechanisms through which our sense of our self emerges from our sensuous and physical engagement with the world.

In the previous chapter we saw many of the problems associated with the idea that minds "compute" on the basis of "representations" of the external word. However, there is clearly representation in some form going on, and understanding what form this takes, and what it means for thinking about architecture in the broadest sense is a key aim of this chapter. Above all, the attempt to define an architecture of mind – i.e. the claims that we can legitimately make concerning our minds, bodies and environments – is not an abstract and neutral scientific or philosophical endeavour, but always a live political project; it is a way of making claims about who and what we are, individually and collectively.

6.2 The Architecture of the Brain

The possession of a nervous system is common to all multi-cellular creatures.[5] The brain – which together with the spinal cord is conventionally described as constituting the human central nervous system (CNS) – is not necessarily best considered as one organ at all, but is rather more like a network of nuclei or sub-brains. Furthermore, our central nervous system is itself inseparable from the physical human body, which is itself



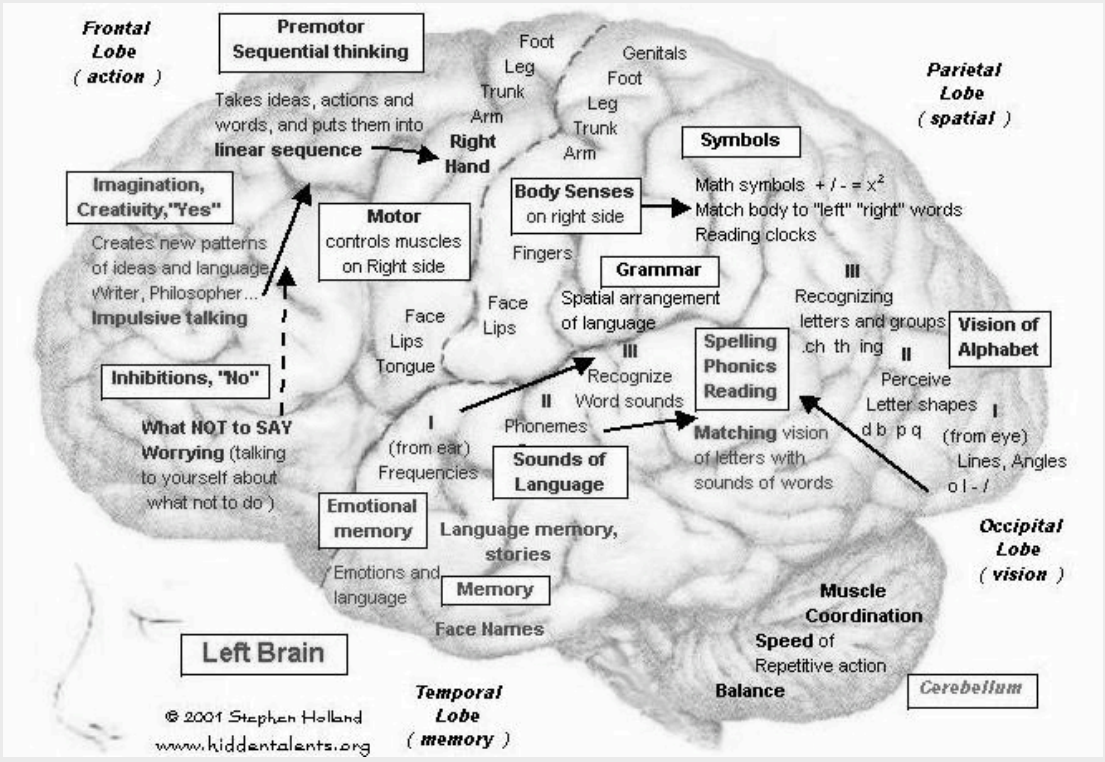


Figure 6.2 and 6.3 Left and Right functional elevations of brain (to be interpreted with caution).

inseparable from its broader physical and social milieu. Before considering the interrelation between the brain and the environment through various forms of spatial practice, and cognitive mapping processes, it is useful to briefly lay out some of the basic concepts and terms that are used to describe and think about the human nervous system.

The network of brain regions that make up our human nervous system can partly be understood as the result of our evolutionary history, in that there is – according to one simplified interpretation at least – a layering to the brain network: the archaeology of our phylogenetic trajectory. The oldest brain in our head is, according to this account, a fish-reptile brain, which is located at the top of our spinal column. Built over that is the mammal brain. And finally, on top and in front, is the primate brain, the cortex, of which the largest version is that of humans. The most widely disseminated version of this interpretation was popularised by Carl Sagan as “the triune brain”, which he described as being composed of the reptilian complex, the limbic system, and the neocortex.[6] The triune brain was seen as the neuronal analogue to the broader conception of “ontogeny recapitulate phylogeny” – which (although broadly refuted in its original form) interprets the embryo’s development as a series of stages that seem to retrace the historical lineage of the species.

The concept of the triune brain is clearly an oversimplification,[7] and recent studies suggest that brain evolution is not in any way a simple additive process. There has been a highly plastic series of reorganisations of a whole series of sub-components of our inherited reptile and mammal brains – some were grown, others were cross-connected, allowing latent potentials that can be found present much lower down in the phylogenetic tree to become dominant, and so on. These sub-components of the compound brain, called nuclei, are cross-connected or networked together, and networked back to the cortex, in ways that are specific to humans. Nonetheless, the triune brain is still a useful way to start to think about the organ – as a network of sub-brains, each of which has a distinct evolutionary history.[8]

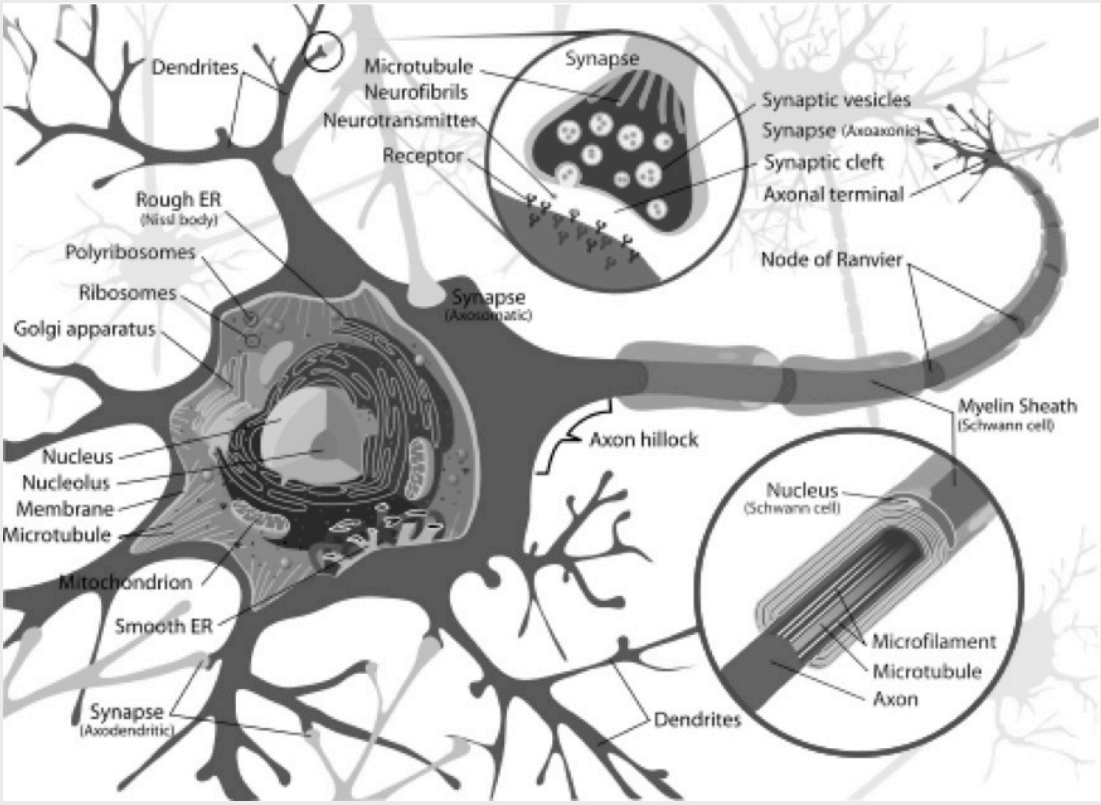


Figure 6.4 Diagram of the architecture of the neuron.

Seth Grant is a leading researcher involved in the proteomics of the synapse: the study of groups of proteins associated with synapses across different species (synapses being the connecting mechanism between neurons). Specifically, Grant has been researching the evolution of the synapse between species, and the results are interesting in regard to cybernetic arguments. Grant looked at a range of different organisms, including vertebrates, invertebrates and also single-cell organisms that do not have nervous systems, such as yeast. The results have suggested that “there appears to be a very interesting connection between the molecular complexity of synapses, and the anatomical complexity of big-brained mammals such as ourselves.” (Seth Grant in conversation with Ginger Campbell, accessed from http://docartemis.com/brain%20science/51-brainscience-Grant.pdf)

Intriguingly, these findings support the the work of Maturana and Varela regarding cognition. Grant has found that 25% of the proteins that are active in human synapses can be found in yeast. However, yeast do not actually have any synapses, rather these “proteins that are found in unicellular animals are used by those animals in their response to their environment.”

As discussed previously, Maturana and Varela argue that the very act of engaging with an environment, even the simplest chemical response, can itself be considered to be a cognitive act. However, one wonders whether they would have anticipated that literally some of the same chemicals used in this primary cognitive-practical activity have remained central to the cognition of all of the organisms that have evolved, including humans. As Grant points out:

“... what this is telling us is that the very origins of the brain, the evolutionary origins of the brain, are not in animals like jelly fish and other very simple animals with a few neurons in a very simple brain, but the origin of the brain is much earlier than that – it is right back in unicellular animals, and that ancient molecular machinery was allowing that animal to make decisions and respond to its environment.” (Ibid.)

6.3 Embodied Brains

If the brain in our head is actually a network of sub-regions, it is also a part of a larger network of neuronal and nervous tissue running throughout the human body. Our nervous system is not just the network of nerves that sensitise our skin and/or specialise to form our various senses. All of our major organs are sheathed by and interpenetrated with neurons, and as a result each organ should be thought of as also making to the greater brain system. The glandular system also makes a significant contribution to the chemical information flows throughout the nervous system.

Some research suggests that the so-called limbic system, which is widely associated with emotional experiential content, is closely connected to frontal lobes, and it is in part through this connection that emotional content is given a rationality, thereby allowing the "intelligence" of the limbic system to be incorporated into our "newest" brain. The hypothalamus in the brain is also deeply connected into these systems, and "can be regarded as the 'brain' of ... [an] archaic, ancillary nervous system."[9]

Perhaps most intriguing and important of all – given widespread folk beliefs throughout history in the cognitive role of the heart – is the fact that the heart is the only organ apart from the brain that is primarily composed of neurons.[10] The neurons in the heart are of a specialised kind, with heightened electromagnetic sensitivity and function. Heart cells collectively self-organise in order to transmit beats of electric pulses through their structure, in order to pump blood around the body. In fact, heart cells grown in a petri dish will spontaneously start to beat in unison.

Although there remains much work to be done in understanding exactly what this neurocardiological system is, and how it should be thought about, some argue that the "brain of the heart" is an independent cognitive system with its own independent autonomic nervous system running through the body, and which proactively interacts with the brain in the head in ways that facilitate or inhibit cognition, perception, and decision making processes based there.[11] In addition to direct neural connections, the heart communicates with the main brain, and thus the rest of the body, through biochemical (hormones and neurotransmitters)[12] and biophysical (pressure waves) means – and some suggest, through electromagnetic fields.[13]

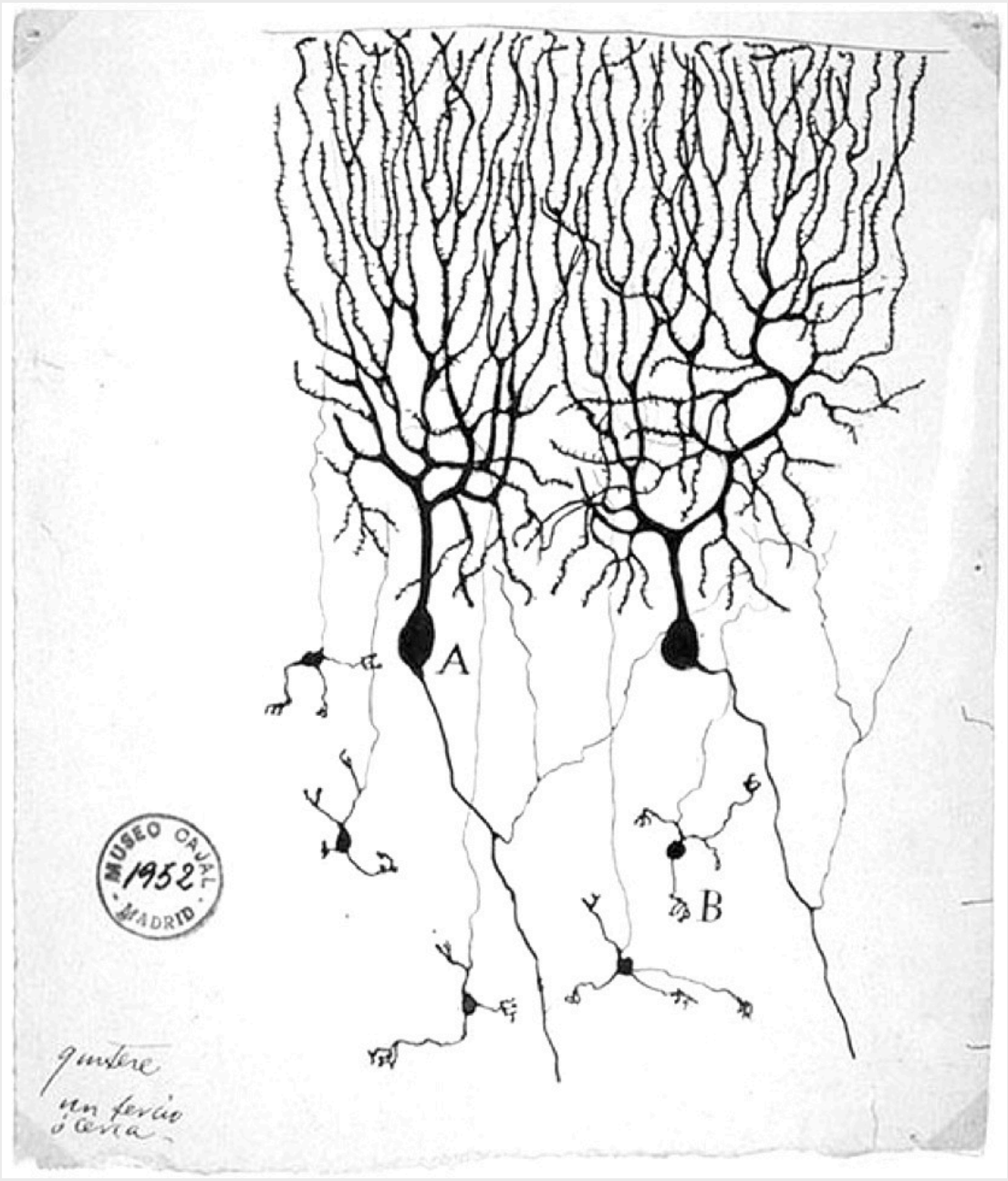


Figure 6.5 Drawing of Purkinje cells (A) and granule cells (B) from pigeon cerebellum by Santiago Ramón y Cajal (1899). There are different types of neurons. They all carry electro-chemical nerve signals, but differ in structure (the number of processes, or axons, emanating from the cell body) and are found in different parts of the body. Sensory neurons or bipolar neurons carry messages from the body's sense receptors (eyes, ears, etc.) to the CNS. Motoneurons or multipolar neurons carry signals from the CNS to the muscles and glands. These neurons have many processes originating from the cell body. Interneurons or pseudopolare cells form all the neural wiring within the CNS. These have two axons (instead of an axon and a dendrite). One axon communicates with the spinal cord; one with either the skin or muscle.

Neurons are either on or off, excitatory or inhibitory, and the number of possible brain states – that is to say, the number of distinct permutations of combinations of connections between neurons, etc – is greater than the number of elementary particles in the universe! Whilst the primary means of communication within neurons is electrical; with signals travelling at 200 mph, there are also a significant and wide variety of chemical signals, constituting communicative systems that operate at a variety of speeds through the body. Whilst the transmission of data across synapses is usually mediated by chemical signals, there are also other chemical signals in constant flow, from for example the nervous systems interconnection with the glandular network, through which information is processed at very different speeds.

Although there are only 40,000 neurons in the heart, this is similar to some nuclei, although numerically small compared to the total number of neurons in the main brain. However, the majority of the specialist neurons in the heart, which are called sensory neurites, have a distinctive electro-magnetic function, and create an electromagnetic field which is around five hundred times stronger than that of the brain in the head, and which can even be detected several feet away from the body.[14]

There are a number of speculative reading that have coalesced around this kind of information. It has, predictably enough, attracted all kinds of New Age interpretations. Equally, it has all kinds of potential attractions to externalist approaches. The kinds of suggestions that are made concerning 'cognitive' roles for the heart include the proposition that the electromagnetic field of the heart might act as a rhythmic information carrier wave for all of the cells in the body. Others suggest that this means that the heart is also very sensitive to electromagnetic fields in the environment, and that the heart does in fact create a distinctive electromagnetic field around the body. Some researchers claim that in this way we respond "instinctively" to the fields of other people, animals, and plants, as well as to the fields created by particular landscapes, geologies etc.[15] If there is in fact any basis to the idea that the heart is plays some kind of secondary role as a magnetic field sensor, to what extent the electromagnetic signatures of the stones and services of buildings and cities might contribute, to a deeper level of architectural empathy?[16]

6.4 Cognitive Maps

> A neurologist might conclude that God is a cartographer... for everywhere you look in the brain, maps abound.[17]
> [V.S. Ramachandran]

> Mind is ... influenced by 'maps', never by territory, and is therefore limited by the generalisation that its receipt of info will never prove anything about the world or itself.[18]
> [Gregory Bateson]

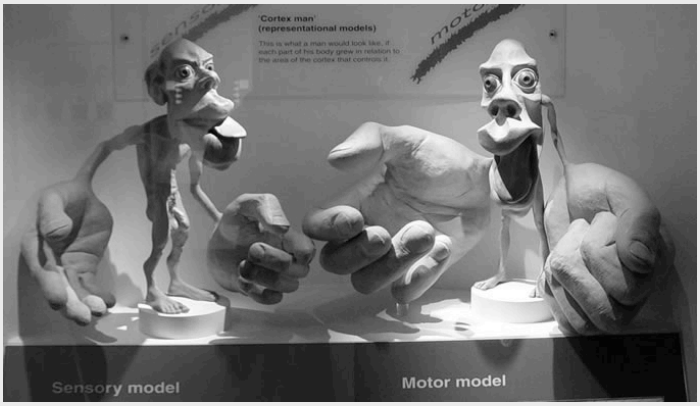
Whatever the ultimate intellectual robustness of some of the more speculative concepts of extended senses (whether based upon morphic, informational or electromagnetic fields), we can be sure that there are real connections between the human organism and its

environments. These are based in the receptors of electromagnetic fields that we know as our eyes, the receptors of auditory fields of vibration that our ears respond to, or of the olfactory fields of the nose, or the haptic fields of our largest organ – the skin. Whilst if the heart does act as a sensory organ for electromagnetic fields of a different wavelength to the eye, and even if the brain is able to pick up on the informational fields that pattern the matter of the rest of the universe, it still does not change the fact that this would just be more sensory information, which still needs to be processed, or given meaning, in the same way as we do with the other more familiar senses.[19]

In previous chapters I have reviewed the cybernetic and constructivist conceptions of the relationship between us as a subject and the external world, which can be summarised through the analogy that the taste of sugar is not in the sugar! To explain, the sugar molecule is not inherently sweet. Sweetness is in fact what some philosophical discourse would describe as a qualia, and is constructed through a particular capacity of an organism such as the human to react with an element of the external world in a systemic feedback loop, thereby connecting a carbohydrate, sensors on the tongue, connections to the brain, and quite possibly a range of other cultural associations connected with wherever the carbohydrate molecules have come from. A similar approach is considered to be true of all internal constructions of external reality. We do not in any simple way directly see or feel the outside world. Nor do we carry around a single “internal representation” that we solely refer to in any simple sense. What we as an organism do is dynamically interact with the world, and the enaction of those process do in some sense constitute maps for processes operating at other “levels”. It is through our interactions with the exterior world, and the maps (or system mirrors) that are produced and that we have access to, which feedback into determining new external interactions. The experience of the sweetness of sugar is then a system, a loop that is both external to the body, constituting one map, but also passing through (and referred to by) other internal maps.

The psychologist E. C. Tolman coined the term “cognitive map” in 1948 to describe an animal's mental representation of space.[20] However, the concept of body schema was previously used by the neurologists Henry Head and Gordon Holmes in 1911 to describe a person’s cognitive maps of their own body (indeed they realised that these schema even

Penfield Sensory and Motor Mappings



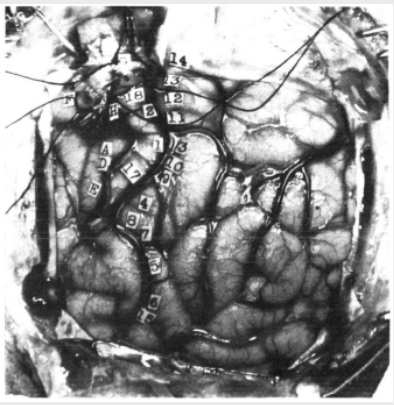
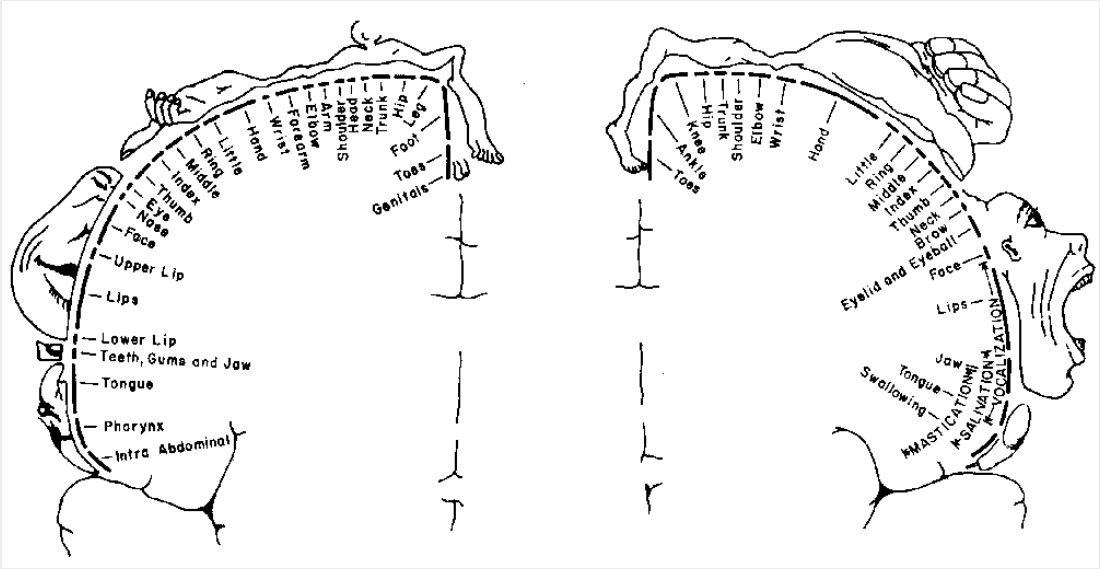


Fig. 6.6. Physical models showing the two Penfield Maps (sensory on left, motor on right).
Fig. 6.7 A photograph of Penfield mapping of a patients brain in progress. Numbers show tested areas
Figs 6.8 The original Penfield mappings, drawn by H.P. Cantilie (sensory on left, motor on right).



changed with whatever clothes were worn). The term “body image” was later added in 1935 by neurologist Paul Schilder.

Since its first use at the interface of psychology and neurology, the concept of cognitive mapping has spread widely.[21] It became an important term in sociology and urbanism, notably in the work of Kevin Lynch during the 1970s, in which Lynch explored the ways that people navigate in cities.[22] Over a decade later, the critical theorist Frederic Jameson took on Lynch’s concept within his discussion of late-modern capitalist culture, suggesting that the processes of mapping oneself spatially and culturally were closely related.

In this chapter I want to review what exactly is meant by cognitive mapping, and what is known about some of the actual processes involved. In fact, I will show that an understanding of the ways that the “brain in the head” maps the “space of the body”, and the body’s parallel interactions with the world, can bring radical insights into our understanding of architecture, and an extended appreciation of the concept of empathy. Empathy hence describes aspects both of the map-making process and the pattern that connects the resultant maps in our mind

6.5 Penfield Maps

In the 1930s and 40s the neurosurgeon Wilder Penfield, working at Montreal Neurological Institute, discovered two maps of the body on the surface of the cortex: the primary sensory and motor areas.[23] Penfield discovered these areas while preparing to operate on epileptic patients – basically using an electrode to explore the surface of the cerebral cortex, to make sure that he did not cut out anything essential. What followed from his studies were the Penfield Maps (made famous by the drawings produced by his assistant H.P. Cantilie) of the sensory homonculus and the motor homonculus, which showed that the amount of brain dedicated to the different parts of the body was not proportional to size, but to use.

Other animals have body maps that correspond to their specific lifeworld. Indeed, looking at the cognitive maps of different animal species emphasises the enormous differences in experience and the different worlds that are in Maturana and Varela’s

Ur-maps in the Cerebellum

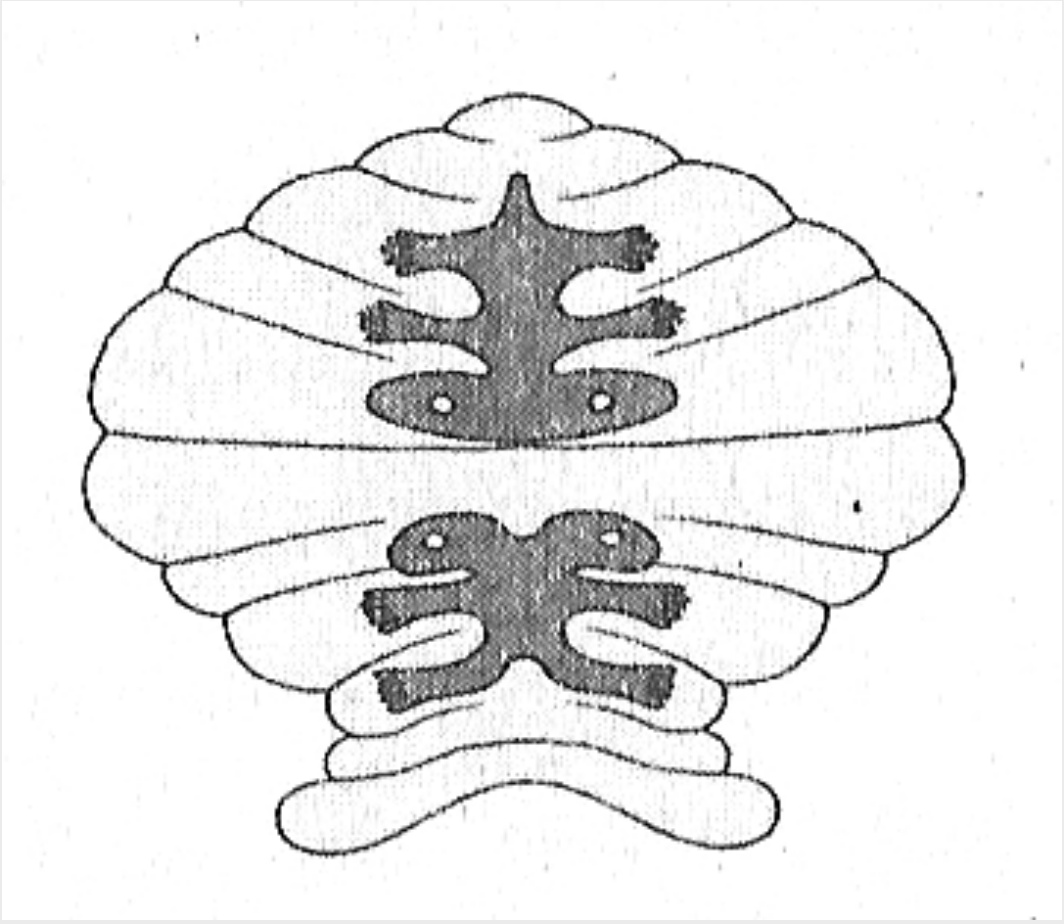


Fig. 6.9. Cognitive maps of the body, found in the cerebellum - perhaps the oldest maps of ourselves that we have.

phrase, “brought forth”. For mammals with whiskers, such as cats and mice, those organs (which of course humans do not have at all) dominate their sensory maps. For the star-nosed mole, the array of feelers that it has for its nose are all-important, apparently to the extent that the layout of the neurology of their sensory maps is visible to the naked eye as a shape on the surface of their cortex. In other animals there are entire senses that we do not have at all: some migratory birds, for example, have visual neurons that have built-in magnetised elements, which means that they literally sense the Earth’s magnetic fields, for use in migration, etc.[24]

In recent years there has been a dramatic increase in the number of cognitive maps that have been found laid out in the human brain. In fact, in addition to the two maps discovered by Penfield in the posterior region of the frontal lobe, there are an additional fifty or more major cognitive maps (and many more secondary ones), all of which have some bearing on how we extend our minds through our bodies and into our environments. All are involved in different ways in making and experiencing the spatial environment around us. A no doubt incomplete list of major cognitive maps includes:

1. touch/somasensory (Penfield)
2. primary motor (Penfield)
3. visceral – interoception (maps of organs, used in emotions)
4. proprioception (musculature etc)
5. secondary somasensory
6. pre-motor cortex - moving intention

7/8. cerebellum

9/10. maps of the body, on the body, such as on ears and feet (i.e. reflexology/ accupuncture maps)

11. peripersonal space -i.e. body coordinate maps (mirror neurons)
12. extrapersonal space parietal lobe (mirror neurons)
13. grid cells in hippocampus
14. place cells in hippocampus

15-45. more than thirty visual maps

Much of this new knowledge of the neurological workings of the human brain and body has in various ways astonishingly confirmed ideas mind and body in the world from very different knowledge areas, such as the phenomenology of aesthetics and philosophy, or eastern philosophy, or the radical constructivist position that emerged from cybernetics. In particular, the work that has developed out of the discovery of mirror neurons has particular interest for any anthropological and ethnographic understanding of empathy theory, since more broadly it suggests some of the ways in which tool use and the practice of building might have played critical roles in the development of human consciousness out of our “mind-at-large.”

In addition to the primary motor cortex found by Penfield, it has since been discovered that the primary somasensory (or touch) map, is in fact four separate maps laid out in close adjacency.[25] Two of these deal with touch, and two with proprioception (the felt sense of limb movements and positions.) There is also a secondary somasensory map which facilitates a greater degree of touch sensitivity. The skin, which as noted is the largest sensory organ, is not merely a touch receptor. There are also “distinct neural pathways that mediate sensations of warmth, cold and pain originate on the skins surface. These sensations have their own ... maps in the brain, but the paths used by them may be interlaced in complicated ways.”[26]

The pre-motor cortex located in the frontal lobe deals with the intention to move our limbs, whereas Penfield’s primary motor cortex is of course involved in the actual movement of limbs. There are maps charting the various muscles and joints, as well as a set of visceral maps. The visceral maps are an anatomical mapping present to a lesser degree in some primates, but are absent in almost all other animals; they represent the heart, lungs, liver, colon, rectum, stomach and other internal organs in the right frontal insula, and are the neural correlates of the sheaves of neurons that surround our organs (as previously mentioned).[27] Through this visceral network we are able to map interoception, the internal state of our body, which through some complex relationship to the autonomic and other secondary nervous systems mentioned above, provides us with a distinct sense of rationality on the basis of social emotions.[28] In addition to these cortical maps, there are two very old maps of the body that have recently been found in a completely different brain region, the cerebellum. The cerebellum is one of the oldest

Bringing Forth their World: The Very Other Sensori-Motor Maps of Non-Human Species.

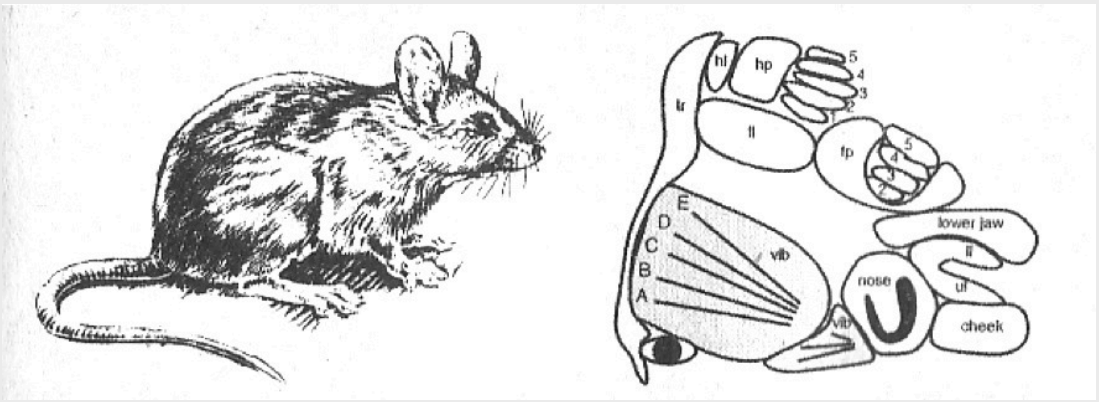
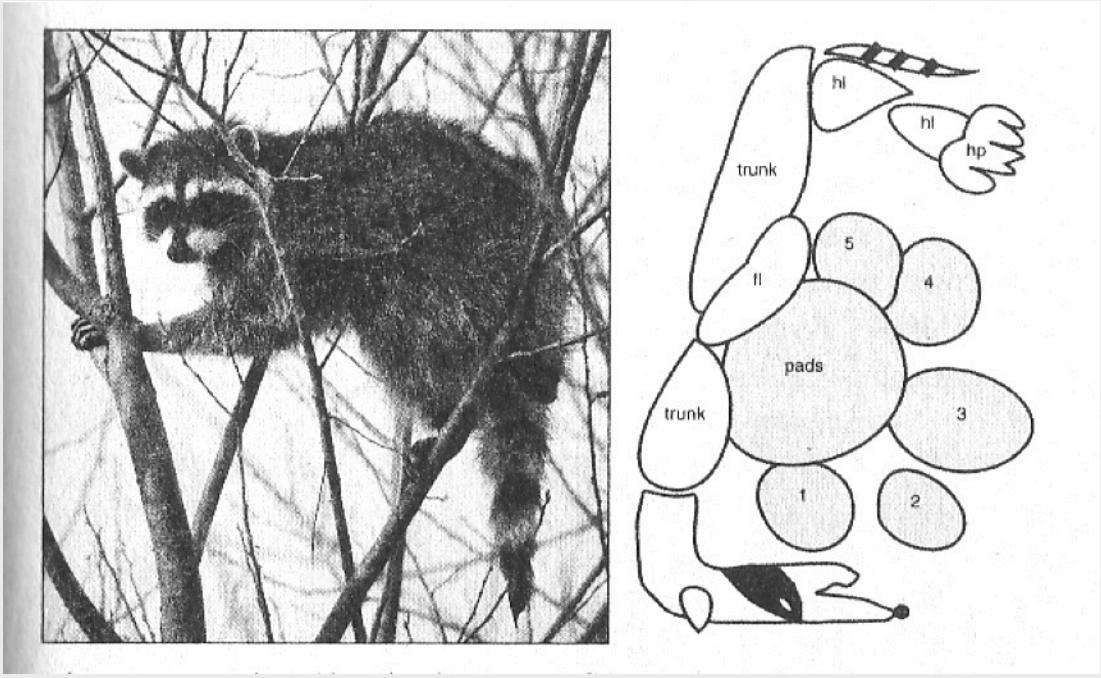


Fig. 6.10 Diagram of mouse sensory map, which is dominated by the whiskers (A-E) and paws.
Fig. 6.11 Diagram of racoon sensory map, which is dominated by paws.



parts of the vertebrate brain, but which nonetheless contains half of the neurons in the brain. These maps in the cerebellum create in my view an extraordinary figural gestalt, an almost a Goethean archetype of humans as ur-animal!

6.6 Visual and Kinaesthetic Maps

There is, then, as we have already seen in the brief survey above, a complex network of cognitive maps related to the human body. In addition to these, which I will return to again later, there are said to be at least 30 major maps related to vision – mostly located in the temporal lobes (located below the temples).[29] The workings of the visual mapping in the brain is both complex and contested. This is not least because we are actually concerned with two different questions when considering vision. Firstly, there is the processing of optical information from our eyes. But there is also the issue of *constructing* what we experience as vision, which is a very different thing indeed. The visual psychologist Beau Lotto in particular has demonstrated – in a series of live participation-experiment lectures and projects developed by his research laboratory Lotto Lab at UCL – that our actual experience and our visual perception are produced and systemically structured in ways that do not correspond to what might be imagined would be the characteristics of an simple and linear mechanical representation. Our perception and experience are shaped by our expectations in all kinds of ways. If we are waiting for someone dressed in red, then you will *see* more people wearing red. Equally, at a more basic level of perceptual construction, Lotto Lab have demonstrated that our perception of the building blocks of our experience – colours, shapes, distances, duration – are produced in relation to their context and our needs, and can be “deconstructed” through a series of perceptual experiments.

The construction of the experience of vision, in both practical and representational senses, is very closely related to the sense of the moving kinaesthetic body in space. Maps related to our kinaesthetic experience of space and body are thought to be located in the posterior parietal cortex. Blakeslee notes that:

Bringing Forth their World: The Very Other Sensori-Motor Maps of Non-Human Species.

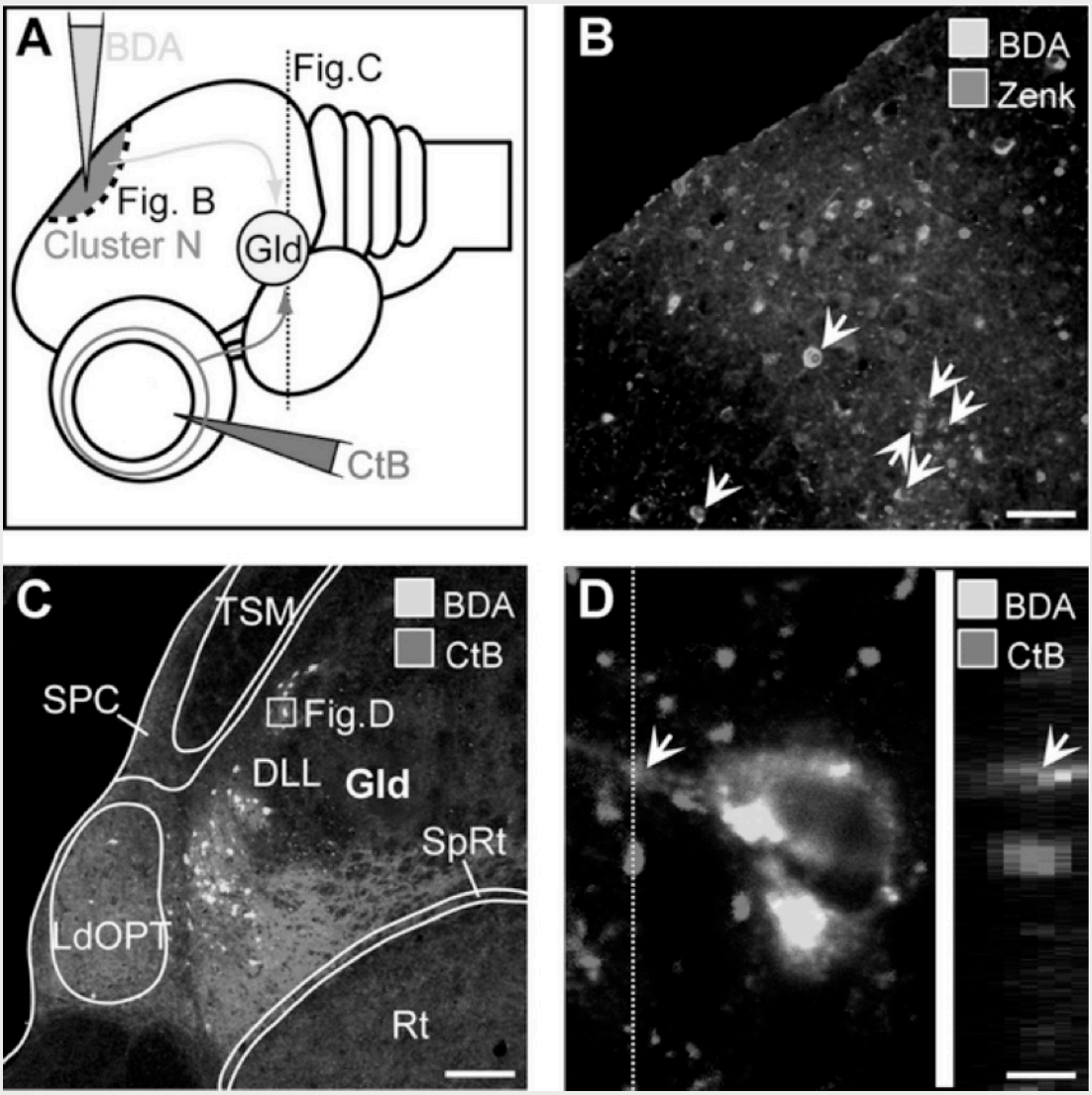


Fig. 6.12 Brain scans of a migratory bird, showing that they have neurons which contain magnetically sensitive molecules to pick up the Earth's magnetic fields. These are fed into the visual cortex, meaning that these birds in some way see the magnetic fields as visual overlays. In all of the above instances it is clear that the animal in question "brings forth" a very different phenomenological world to that of humans.

> ... parietal neurons are not concerned with identifying things in terms of their names, identities, or meanings. Rather, they are concerned with the composition of space and your body's relationship to its surroundings ... some maps 'think' in head and neck centred co-ordinates; some are trunk centred; some are arm and shoulder centred; some are eye-centred; some are hand-centred; some are whole body centred.[30]

Other maps then co-ordinate these maps with the motor maps in a process that, as we shall see, seems to be key to create a unified sense of self. The visual, sensory and motor areas are themselves networked together to form other, second-order maps. But just as importantly, they are networked through our action in the external world. In an important sense this process is the neurological correlate of the mechanisms that extended mind theory in general is concerned with. When you decide to move, this decision is initiated in the pre-motor cortex, and implemented through the motor cortex (i.e. one of the Penfield Maps.) Here is the primary motor cortex which deals with basic movements, and the supplementary motor area, which deals with more complex movement mapping skills. Simultaneously, as the signals are sent to the muscles, other signals are sent back to the cerebellum and parietal lobes. As the muscles then actually start to activate, even more signals are returned from the muscles and joints back to the cerebellum and parietal lobes. Together with the maps produced by visual feedback, a complex cybernetic loop is set up.

However, the visual recognition and motor areas are not simply joined in their end use. They co-evolve, in the development of each organism. Our vision, and that of mammals in general, essentially requires a sensing body in order to correctly develop. Experiments were conducted in 1963 by Richard Held and Alan Hein with two kittens, in which both kittens were held in connected moving baskets, but only one of them was actually in control of moving the baskets. The one which was in control of its movement developed normal vision as it grew up. The other kitten, which experienced exactly the same visual movements, but without any motor feedback – that is to say, without a proper cybernetic extensions of mind – did not develop normal vision.[31] These experiments, and others since, have shown that maps of the body and senses are plastic in the sense that they develop according to experience and sensory input.[32] More significantly, they show

Paul Bach-y-Rita and Sensory Plasticity

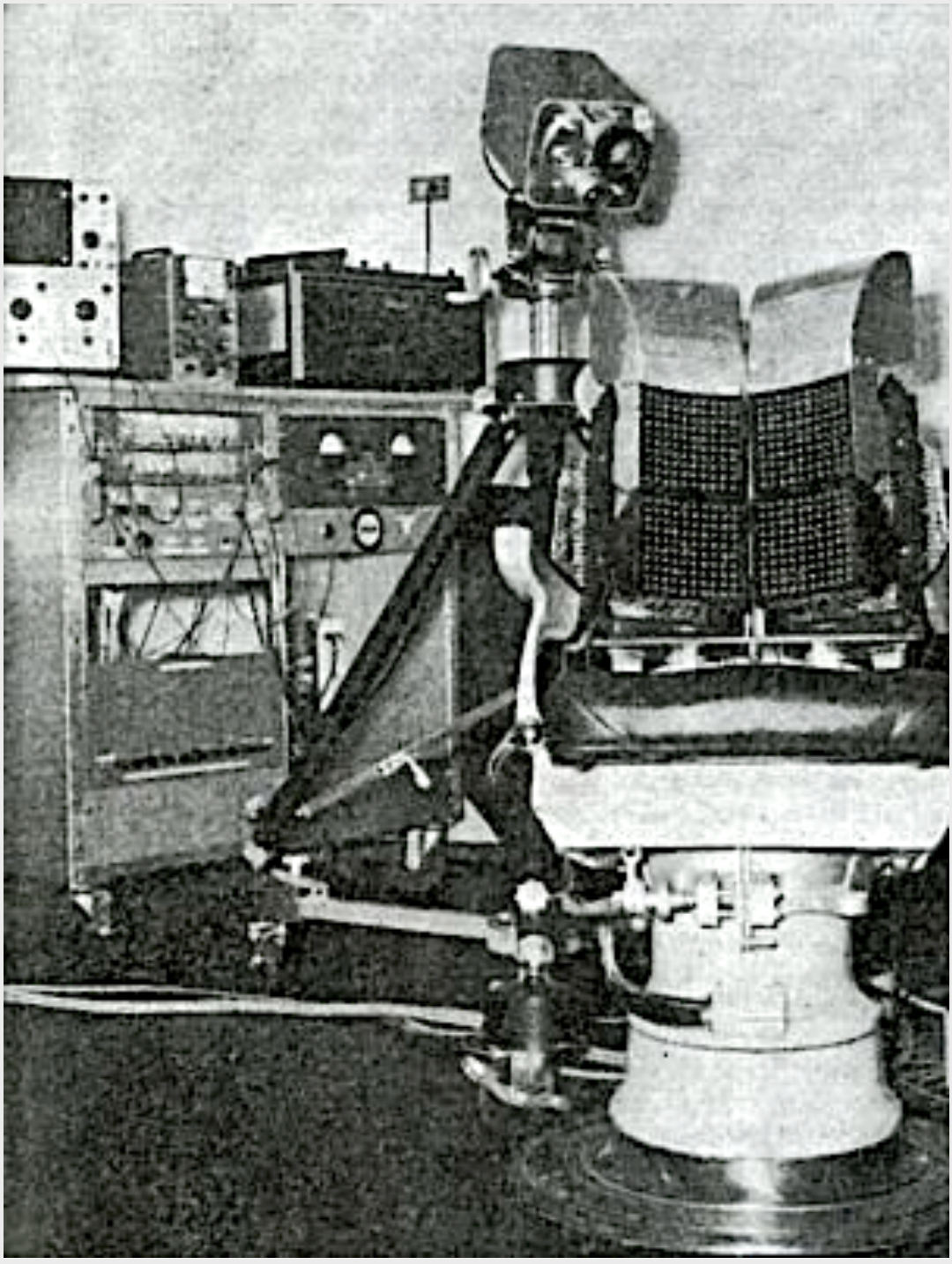


Fig. 6.13 Paul Bach-y-Rita's first experiments concerned feeding visual information from a video camera into touch pads fixed to the back of a dentists chair. Famously, this was ineffective until the subject took the camera in hand – the combination of motor and visual feedback is essential to the construction of a visual field. In more recent work Bach-y-Rita developed a micro sensitive touch pad which is felt on the tongue; this system is now used by deep see underwater divers in low light conditions.

Areas which in normal development might be used for hearing or sight will get used in other ways in people where the hearing or vision senses are in some way damaged. The brain in general is, then, according to much contemporary work, highly plastic. Richard Gregory defines plasticity in the following way: "Plasticity in the nervous system means an alteration in structure or function brought about by development or experience. But not just any alteration, to qualify for term plasticity, an alteration has to show pattern or order. Plasticity here means patterned alteration of organization." Richard L. Gregory, *The Oxford Companion to The Mind* (Oxford: OUP, 1998) p.623.

that the very formation of the senses requires an active body, and that the maps of the senses are not an additional representational add-on, but are a key part of the circuit. Of course, philosophers and artists who have reflected rigorously upon these questions in relation to their own experience have long known this to be the case. Whilst mechanistic and reductive approaches to the brain sciences had tended to try to define particular functions in particular areas of the brain, contemporary research tends to make it clear that that is only part of the story. The brain actually works as a network, with complexity arising through the assembled interactions of different areas of the body. Our visual perception of space is entirely dependent upon our ability to actively move in space. Again, this is an instance of science supporting the previous insights of artists and philosophers. For example, the neurological schema outlined above corresponds to what the Marxian philosopher Henri Lefebvre referred to as our representational space and our spatial practices (as referred to in Chapter One).[33]

The maps of the body also feedback information between the senses, the environment, and the physical structure and organisation of the brain, and the whole bodily circuit is required for the senses to work. As Giacomo Rizzolatti, the leader of the team of neurologists that discovered mirror neurons, puts it:

> ... these acts [moving our arms, hands, etc], insofar as they are goal-oriented and not merely movements, provide the basis of our experience of our surroundings and endow objects with the immediate meaning they hold for us. That rigid divide between perceptive, motor, and cognitive processes is to a great extent artificial; not only does perception appear to be embedded in the dynamics of action, becoming much more composite than used to be thought in the past, but the acting brain is also and above all a brain that understands ... this is a pragmatic, pre-conceptual and pre-linguistic form of understanding, but is no less important for that, because it lies at the base of many of our celebrated cognitive abilities.[34]

6.7 The Mind's I

The U.S.-based Indian scientist, V.S. Ramachandran has noted in regard to the existence of various kinds of vision maps – but these comments are equally applicable to all the senses – that "the mere existence of this map does not explain seeing, for ... there is no

Paul Bach-y-Rita and Sensory Plasticity

Fig. 6.14-15 Paul Bach-y-Rita

Jeff Hawkins argues that the plasticity displayed by the cortex under conditions explored by Bach-y-Rita, and which are demonstrated in all kinds of traumatic or other conditions where normally visual areas are used for tactile senses, suggest that the the division of the cortex into functional areas is in some sense misplaced. Hawkins argues that “cortex is cortex”, and is primarily concerned with pattern recognition, from any source. In fact he suggests that the cortex will “look for patterns in whatever is available” and that its is programmed through “exposure to patterns in the world through your senses.”[109]

Hawkins suggests that our appreciation of music is in fact key evidence for the pattern recognition structures of the brain: “You could take an easy example of a pattern that exists in time like a melody. You can't recognize a melody by hearing one note. You have to hear it through time. You can only make a prediction like ‘what's the next note I'm going to hear in the melody’ if you've been exposed and remembered how patterns move through time- how the notes move through time. So one of the key elements of this theory- the memory-predictions framework- is that the brain is storing in sequences of patterns. You can think of them like little songs, like little melodies, but we do it not just for auditory. We do it for vision and we do it for tactile. So now the sensory inputs as well. There's a theory about how memories are formed by storing sequences of patterns through time in a hierarchical memory structure.”

little man inside watching what is displayed on the primary visual cortex."[35] This statement, an assertion of what is known as the "homunculus fallacy", is familiar from the broader philosophy of mind. The homunculus fallacy effectively dismisses a whole series of models of mind, because they rely upon a model of representation which merely displaces the problem of consciousness deeper into the mind, by imagining another mind (an homunculus) that is observing the representational screen of the first. An infinite regression is suggested of which one can only asks: "how is the mind of *that* internal homunculus working – is there another homunculus inside observing that?"

Whilst I would of course agree with this critique of simplistic representation-based models of mind, the problem is not as easily dismissed as the "homunculus fallacy" argument suggests. Indeed, according to Ramachandran's own insights, there *is* in some sense an internal homunculus, in the form of other internal maps. In fact, one might refute the "homunculus fallacy" argument to some extent by arguing that the mind is indeed something like a *network of homunculi*. This in fact, amounts to an approximation of Marvin Minski's insight in *The Society of Mind*, by which he proposed that our minds can be understood as an internal society.[36]

Images of infinite regression, or of recursion, remind us of the kinds of conditions conjured by opposing mirrors or by video feedback. As noted in Chapter Four, Douglas Hofstadter in particular argued that self-consciousness might precisely be the kind of recursive loop which is found in feedback systems, and in cybernetics such suggestions are commonplace. There is a curious sense, then, that the infinite regression problem or "homunculus fallacy" might be refuted through cybernetic feedback models. There is not a line of homunculi, but rather a chain or network of homunculi (in the form of cognitive maps), and it is thus this very feedback, with the observed in effect observing the observer, that is in some way responsible for some our experience of self-consciousness.

A recent model of visual information processing, as proposed by Gerald Edelman, suggests that there are multiple feedback loops between visual cognitive maps, and once again we are given a mirror-based description: "the brain's information flow resembles the images in a funhouse full of mirrors, continually reflected back and forth, and continually changed by processes of reflection."[37] Blakeslee also describes this feedback process: "in the cortex, so-called lower areas absorb raw sensory information and pass it over to

Recursive Body Maps?

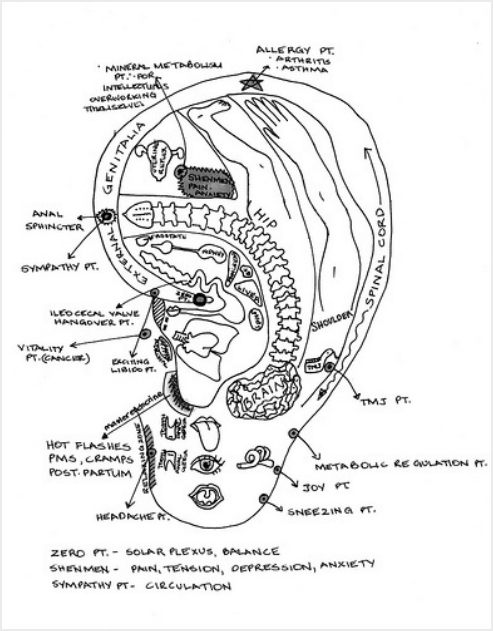
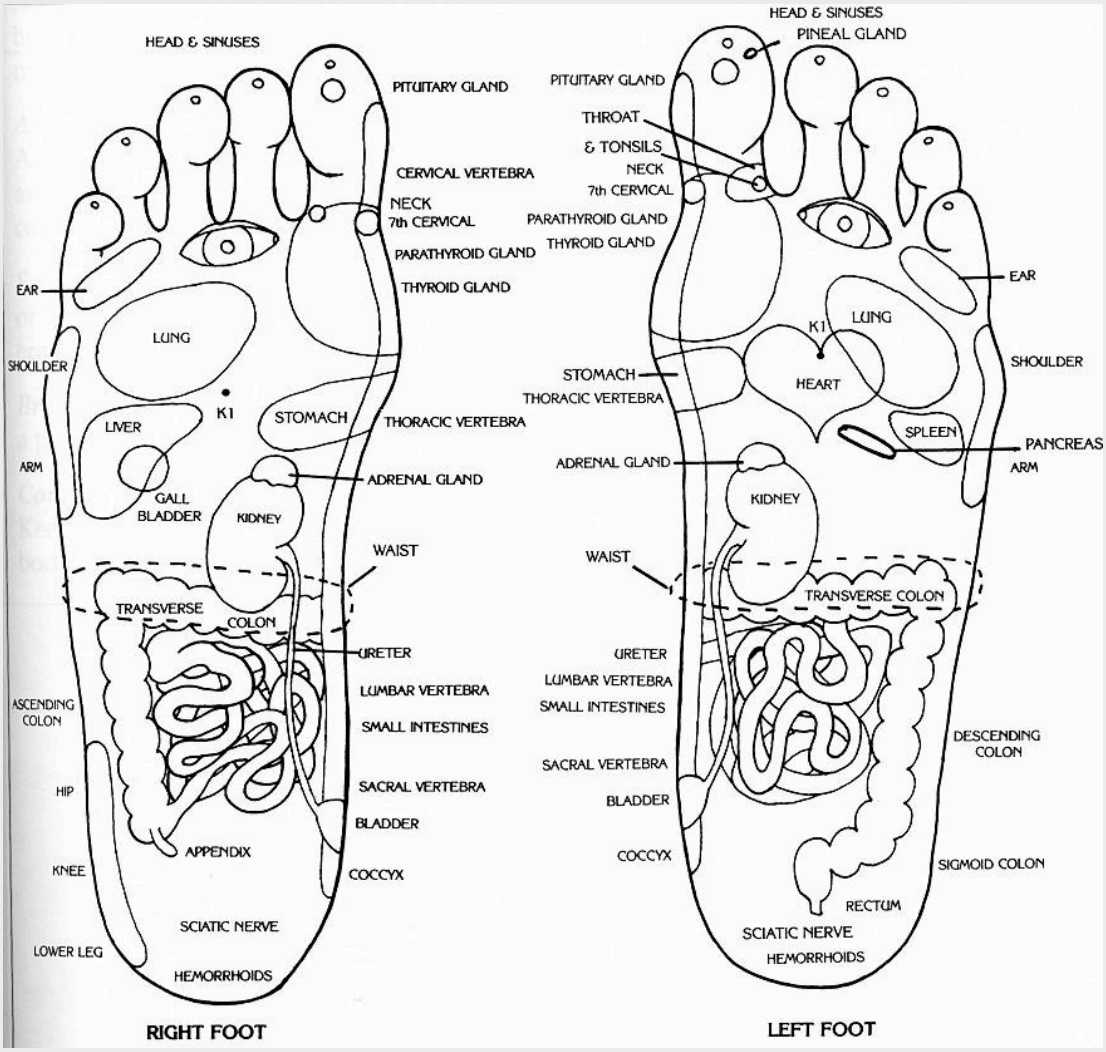


Fig. 6.16 and 6.17 Research is testing the so-called acupuncture and reflexology points on the ear and feet – of Traditional Chinese Medicine – which might be whole body re-mappings that give access to other maps, in ways not dissimilar to the phantom limb remapping discussed below.



higher areas where it is processed and then passed over to still higher areas. But there is no ultimate top area where everything 'comes together'... once information reaches the higher regions, it is fed back down the hierarchy."[38] In fact, in most areas "for every fibre carrying information up the hierarchy there are as many as ten fibres carrying processed information back down the hierarchy."[39] This kind of description of internal processing in humans is of course entirely in line with cybernetic descriptions of mind. Indeed, Blakeslee turns to an entirely second-order cybernetic analysis when she states that "the meaning of this massive feedback architecture" is that:

> ... mind operates via prediction. Perception is not a process of passive absorption, but of active construction." [40]

6.8 Pathological Mappings

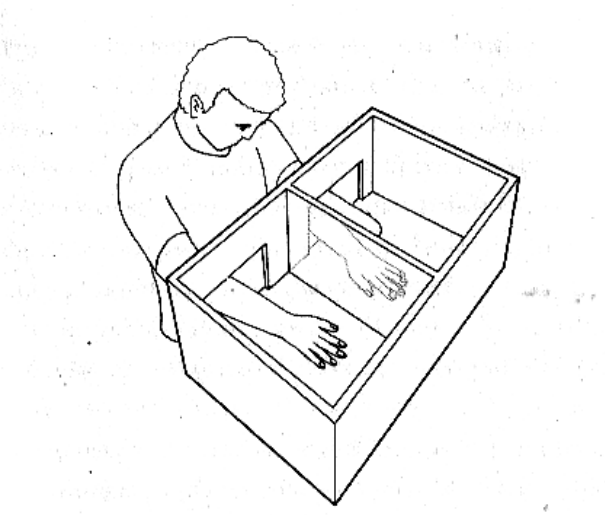
> "There is a pain somewhere in the room ... but I couldn't positively say that I have got it."[41]
> [Mrs Gradgrind, in Charles Dickens]

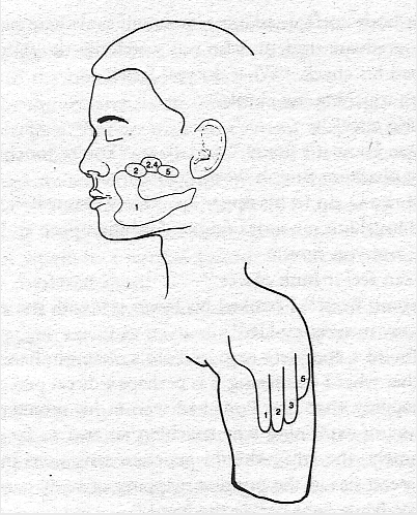
The clearest demonstrations of the reality of these multiple body maps, and indeed the clearest suggestions concerning the architectural significance of these maps, often emerge in extreme situations – for example in situations where an individual has had a limb amputated.[42] Phantom limbs sensations have been frequently reported; the individual feels the presence, through pain, movement or paralysis, of a limb that is no longer there. Famously, Lord Nelson lost his arm in an attack on Santa Cruz de Tenerife, and thereafter suffered from phantom limb syndrome, which he took as "direct evidence for the existence of the soul."[43]

V.S. Ramachandran has led research into this phenomenon, and has shown how in a limb amputation, the relevant map territory of the lost limb can become occupied by other expanding limb maps. In the Penfield Map, the hand and arm area are flanked by that of the face and the shoulder, and sure enough, Ramachandran found the hand to be remapped onto the face in phantom hand cases, and in one patient he also found "a beautifully laid out map of his missing hand tucked onto his left upper arm."[44] Often what

Recursive Body Maps?

Fig. 6.18 Diagram showing mirror-box experiment by Ramachandran.
Fig. 6.19 Drawing showing typical phantom limb remappings (after Ramachandran).





would happen is that stimulation of the face would directly trigger sensations in the phantom limb.

Ramachandran explored the hypothesis that the syndrome's origins lay in feedback and cognitive mapping issues, rather than being a physical neurological or even spiritual problem.[45] He explored this hypothesis again through the use of mirrors.[46] A box was constructed so that the patient could insert their real hand into one hole, and 'insert' their phantom hand (or partial limb) into another. There was however, a mirror in the box such that, with a bit of adjustment, the reflection of the real hand can be made to align with the felt position of the phantom hand. If the patient now tries to conceptually perform some symmetrical movements, as if conducting an orchestra, such that the moving phantom hand is felt to to in the dynamic position of the seen reflection, then the results it seems could be dramatic. Ramachandran reports that phantom limbs that had been paralysed, or painful, are restored initially to movement, and frequently then disappear after practice. Ramachandran's thesis is that the phantom initially emerges due to the persistence of some cognitive maps of the body (exactly why is not clear). It seems to be resolved through the use of his device, as the visual feedback provided by the mirror box obviously correlates with the persisting map, but after that is not backed up by further feedback from the real muscles, which are of course not there. The inconsistency in the feedback forces another attempt at remapping – this time by eliminating the phantom limb.

However, not all cross body mappings are necessarily unpleasant or pathological. Ramachandran notes that the maps of the feet are next to that of the genitals, and suggests that this is why foot fetishism and sexual sensitivity in feet is so common.[47] Furthermore, in Chinese traditional medicine and reflexology there are thought to be homunculus maps of the body and organs – which are mapped over, in particular, the feet and ears – that are effectively thought of as built in remote control devices to access the maps of the body and its various sub-brains. There is some current research exploring these traditional Chinese conceptions of the body and energy in relation to phantom body cross-mapping.[48]

We do not not necessarily need to use mirrors to explore our cognitive map layouts. We can explore our body image and feedback loops through other analogue mapping techniques. The most common of these is the rubber hand illusion. Basically, it is

How to have an Out-of-Body Experience

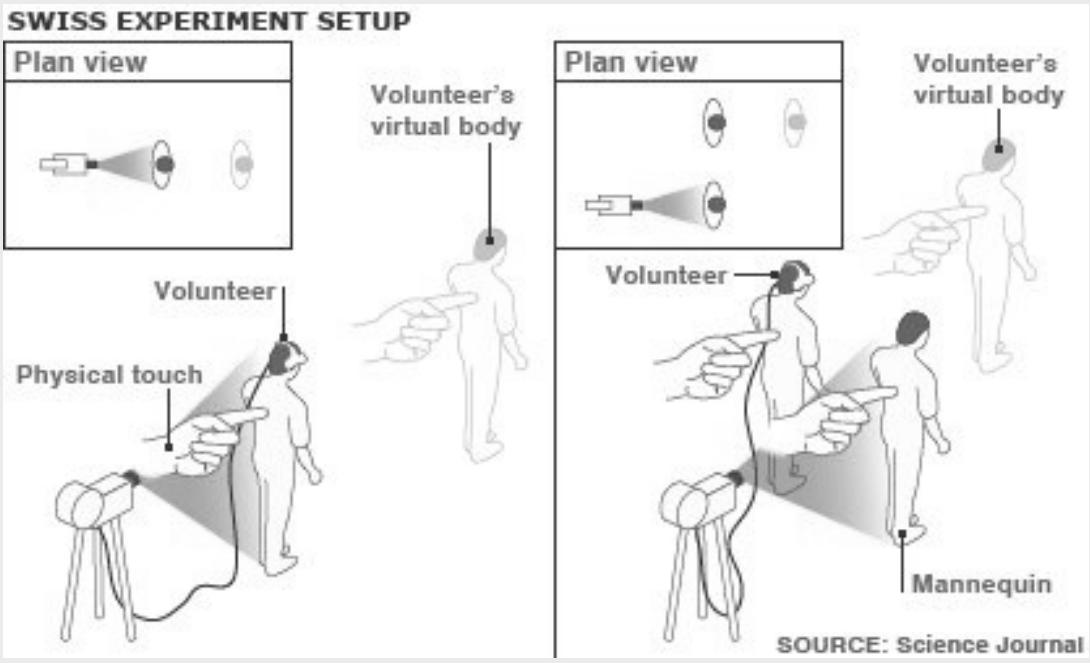
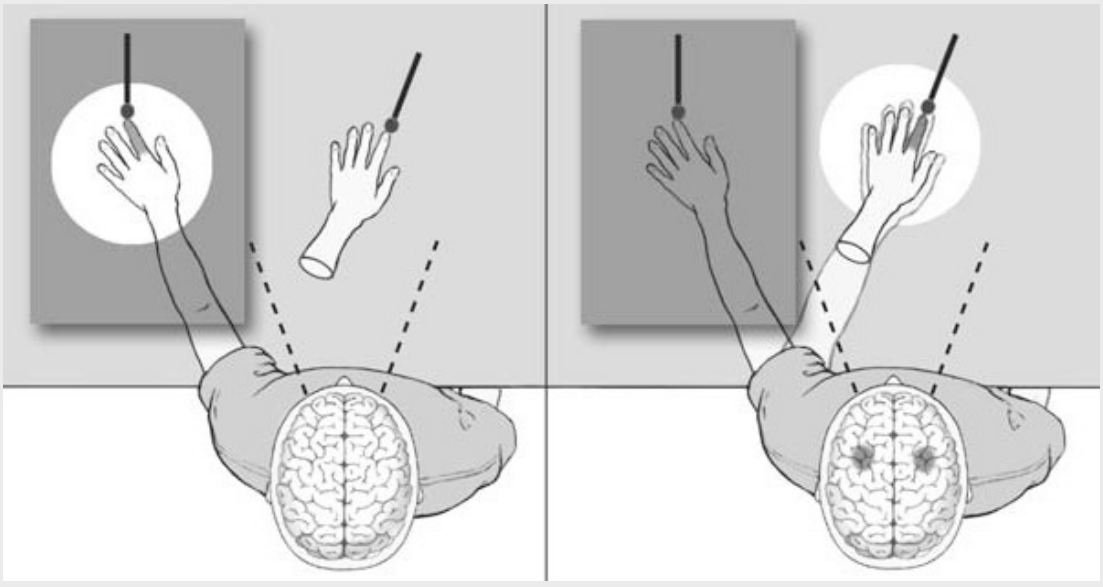


Fig. 6.20 Olaf Blanke lead one of several teams of neuropsychologists (others notably include Henrik Ehrsson's team) which have in various ways explored how it is that we come to have a sense of ownership of a defined body. Blanke's team have, in their case using VR headsets (although other versions of similar experiments can simply use a rubber hand), created OBEs by confusing the cognitive maps (or more precisely, the cross-mapping of visual and motor-maps). It is my assertion that the kinaesthetic experience of architecture - as described by empathy theory – can be understood as a form of out-of-body experience. Describing the experience, Blakeslee states "and so, you see this motion and you feel this motion, and then you leave your body. You move out of your body toward the virtual reality representation of your body. It's a dissociation." My argument in this regard is that this dissociation, or alienation, is closely related to the aesthetic experience of spatial empathy. In fact, in a series of important senses, architecture and urbanism initiate a series of dissociative' experiences.
Fig. 6.21 Rubber hand Illusion set up. The real hand is obscured, but is stroked in a synchronised manner with a visible rubber hand - which is typically incorporated into the body schema.



found that if you place a rubber hand on a table, and place your real hand under the table or otherwise out of your sight, and then have someone simultaneously stroke both your real and rubber hand, you will soon incorporate the rubber hand into your body schema. More complex virtual-reality-based versions of this effect has been produced by Henrik Ehrsson[49] (initially at UCL, now at the Karolinska Institute in Sweden) and Bigna Lenggenhager (at the Ecole Polytechnique in Lausanne). In both these cases, a user wore a VR headset, so they could see an avatar in front of themselves. They were then stroked with a stick along their back, whilst they watched the same happening to the avatar. At a certain point their sense of awareness jumps and they feel like the avatar body is their own.

In fact, as Ramachandran has noted, it is not at all necessary for the object of projection to have an close formal relationship to the form of the hand or body. It is possible to project your sense of your body onto a table or chair through the same technique. He suggests that "the idea that you can actually project your sensations to external objects is radical and reminds me of phenomena such as out of body experiences."[50] Whilst one can agree that this idea is radical, it is surely a closely related process to the aesthetic concept of spatial and formal empathy, that we are discussing here. I would also agree therefore that this has something to do with reported out-of-body experiences – although one the out-of-body experience that I think that this has most resonance with is architecture.[51]

There is, I will propose over the coming pages, a much more interesting relationship between architecture and space, and a whole range of out-of-body experiences (OBE), than has been appreciated so far. Neurologist Olaf Blanke[52] has induced OBEs in patients by stimulating the right angular gyrus, and Michael Persinger[53] has induced OBEs and a broader range of transcendental experiences with his so-called God Helmet (a transcranial magnetic stimulator.)[54] In both types of experiments it is the area where the temporal and parietal lobes meet (just above your ear) which is found to be the area that maps your body in space. In Blanke's research (much of which was produced and disseminated with the philosopher Thomas Metzinger), stimulating the right side above the ear caused patients to report suddenly finding themselves floating in the air with their backs pressed against the ceiling.[55] Stimulating the left side caused patients

to report feeling themselves being held by a shadowy figure. Although the patients involved often argue that these experiences are completely “real”, Blanke suggests that these experiences are the result of shifts in and projections of body maps:

> OBEs are related to a failure to integrate multisensory information from one’s own body at the temporo-parietal junction (TPJ). It is argued that this multisensory disintegration at the TPJ leads to the disruption of several phenomenological and cognitive aspects of selfprocessing, causing illusory reduplication, illusory self-location, illusory perspective, and illusory agency that are experienced as an OBE.[56]

Although there remain accounts of OBEs by reliable witnesses that cannot yet be exhaustively accounted for Blanke’s analysis[57], his basic proposition that this phenomenon relates to shifts in the ecology of body and space maps, offers a convincing explanation of, at the very least, some of the mechanisms involved.[58] In the context of both extended mind theories and the aesthetics of empathy, the spatial component of these experiences is obviously critical. Is the fact that people imagine themselves projected onto the ceiling, the architecture, important, or not? Is the fact that the many battlefield or sports field accounts of OBEs adopt an aerial plan view significant, or not?

Ramachandran notes that:

> ... for your entire life you have been walking around assuming that your ‘self’ is anchored to a single body that remains stable and permanent at least until death. Indeed, the ‘loyalty’ of your self to your own body is so axiomatic that you never even pause to think about it, let alone question it. Yet these experiments suggest the exact opposite – that your body image, despite all its appearance of durability, is an entirely transitory internal construct that can be profoundly modified with just a few simple tricks.[59]

It is interesting now to reflect upon these out-of-body experiences in the light of some of the discussion in previous chapters. The fact that our sense of body ownership is so easily adjusted, suggests that it might well vary historically and culturally, as much artistic and even behavioural evidence would suggest. It also means that we should wonder whether we might already in fact be occupying a series of related “out-of-body positions”, and that in some sense, it is the dominance in our modern consciousness of being tightly located

within our bodies alone (rather than experiencing *as our self*, our ecological extension) that requires explanation. This is of course not to say that there are not good reasons why, as individual organisms, we have also to be aware of the physical boundaries of our own "skinbags". Indeed, for Andy Clark:

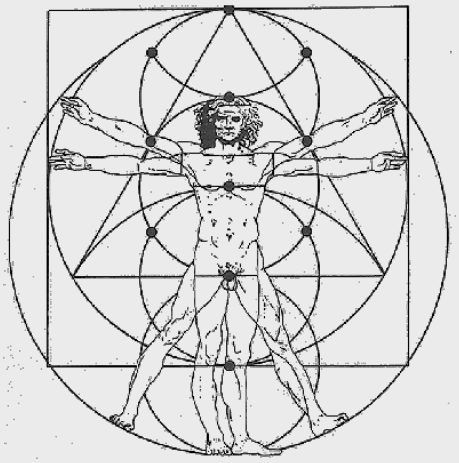
> ... the preconditions for the emergence of a rich sense of self begin to be met, I suspect, when on the basis of such information [sense of location and body boundaries] a loose knit system begins to stabilise itself and to actively protect its own problem solving infrastructure.[60]

Equally, as soon as we recognise the malleability of this sense of bodily ownership, we can start to recognise moments whereby we can identify all kinds of collective experiences as shared and social bodies (from sports to sex to political revolution). It suggests all kinds of possibilities for future, so-called "post-human" developments.

6.9 Peripersonal Space

To briefly recap, then, the idea that there is a straightforward representation of the world in our minds is problematic. Nonetheless, there is still representation of some kind going on: we do not solely use the external world as a "live database", that we access in real-time, whenever we need information about it, or where we are in it.[61] We use maps: lots of them, doing all kinds of things. These maps are then networked together and nested, in many different ways. The maps are mostly found across the cortex, the "newest" region of the human brain. However, there are also maps located in the cerebellum, one of the oldest structures in the brain, plus there are also important spatial maps in the hippocampus. Some of these maps are practically direct and unmediated reflections of our real-time muscular and skeletal activity: information dynamically produced regarding our bodily movements and locations in space. Others are constructed on the basis of sensory interaction with certain environmental domains: i.e. information produced by our senses as they actively participate in the flows of the external world beyond the various "edges" of our bodies. Still other maps are produced by combining in various ways these primary maps. In other words, there is an ecology of maps, a network of feedback loops

Imaging Peripersonal Space



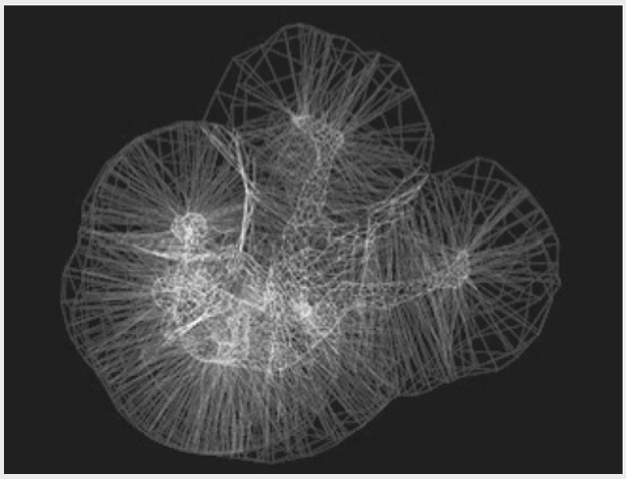
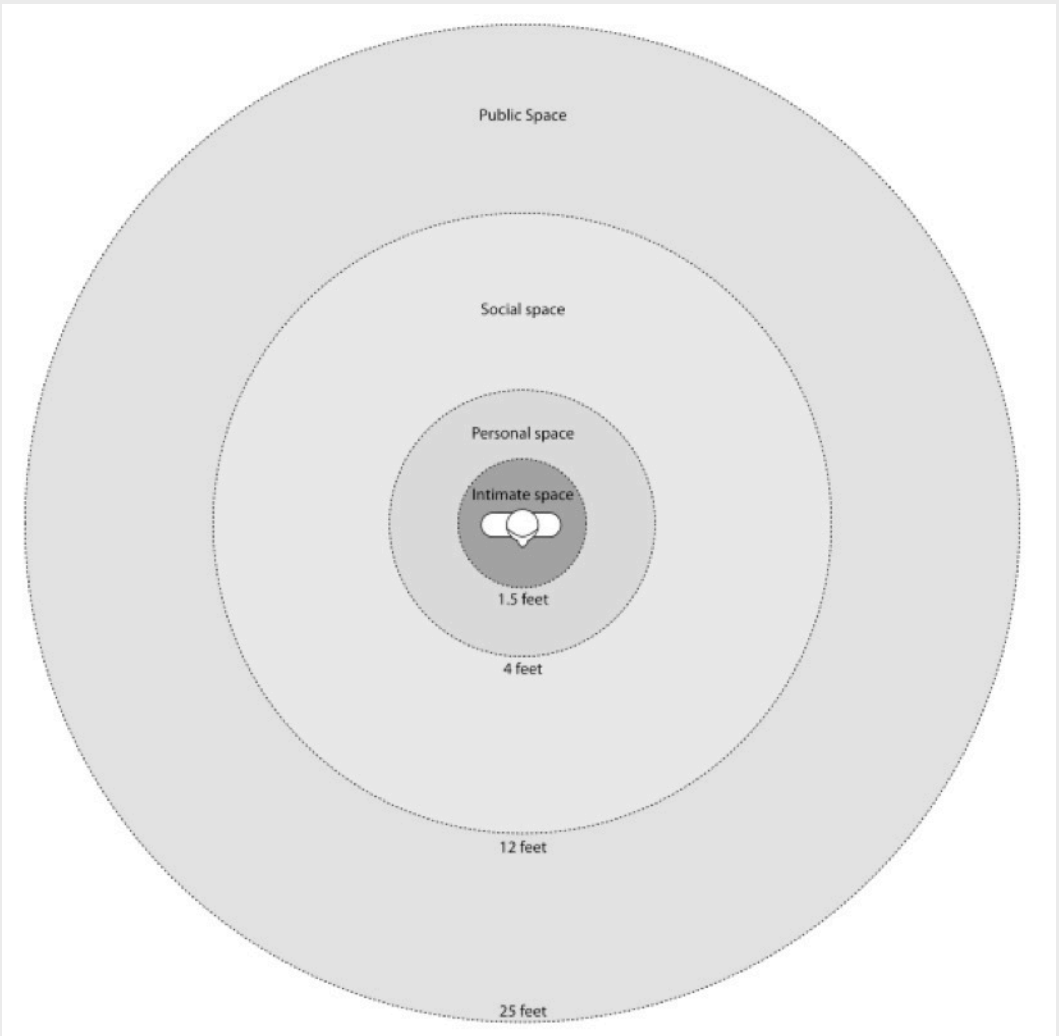


Fig. 6.22. Leonardo da Vinci, The Vitruvian Man (1487) - a map of peripersonal space?.
Fig. 6.23. Anthony Gormley, a mapping of human body and movement zones in space.
Fig. 6.24 A mapping of psychological/defensible space zones around the body (after Alice Coleman): intimate space, personal space, social space, public space.



between the mind, body and external world, and it seems that this ecosystem, as our interface with the broader ecology of minds, is a key component in our experience of consciousness. In a very real sense, it is not simply that we use maps, but that *we are maps*. And maps, as Bateson (drawing upon Alfred Korzybski) emphasised, are always and can only be constructed in relation to experiences of *difference*.[62]

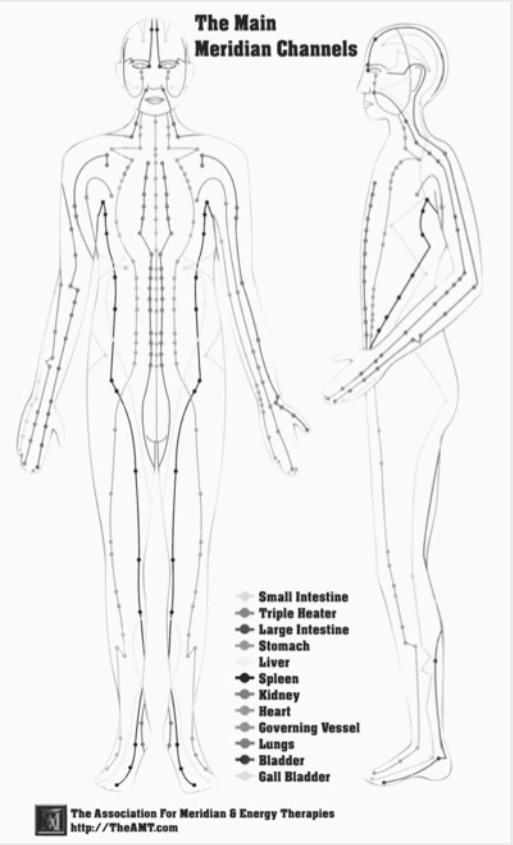
In addition to the maps so far discussed, we also have a complex series of mappings of the *space* beyond our bodies. [63] Our *peripersonal space* is that bubble of space that surround our body, and which is itself mapped through a series of body co-ordinate maps located in the parietal lobe.[64] It is defined by the space that we can reach if we swing our arms and legs around, or bend and twist our torso.[65] It is a dynamic space that shifts and changes as we move around in the world, and interact with other beings.[66] In our brain, this space is mapped out as an extension to the way that our bodies are mapped out. If an object or another person enters this space, neurons mapping that space will fire, just in the same way that neurons will fire if your arm has been touched. It seems that this space is mapped through a combination of visual, auditory, olfactory and various other clues and stimuli. It is not something that we are generally consciously aware of; it has become part of our mind, but not our consciousness:

> ... every point on your body, each internal organ and every point in space out to the ends of your fingertips, is mapped inside your brain. Your ability to sense, move, and act in the physical world arises from a rich network of flexible bodymaps distributed throughout your brain – maps that grow, shrink, and morph to suit your needs.[67]

Peripersonal cognitive maps are the neurological basis of our aesthetic and kinaesthetic sense of prosthetic bodily extension. By picking up a stick that we can swing around, our peripersonal fields extends to map this enlarged space of action. Again, this is no a metaphorical description, nor one that is “only” based upon aesthetic reflection or critical self-analysis; it has been confirmed in the way these neuronal mapping processes are working. When we pick up a stick, are maps of ourselves are literally extended.

Of course, in an important sense, many of these cognitive maps of peripersonal space have been, prior to their recent “re-discovery” by modern science, well established

Esoteric Mappings of Interoceptive, Proprioceptive, Somasensory and Peripersonal spaces



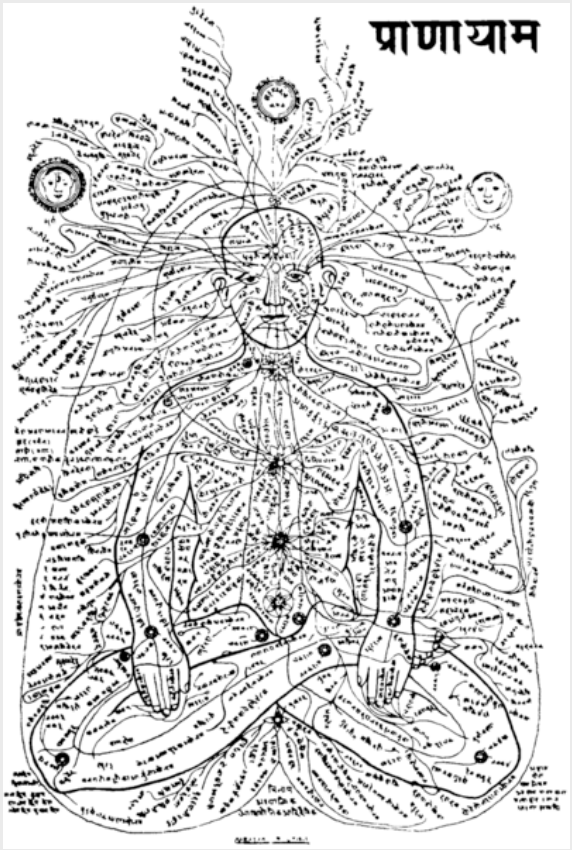


Fig. 6.25-6. Eastern philosophy and medicine in particular has long claimed to have rigourously mapped and manipulated a series of fields surrounding and interpenetrating the body. It seems that if nothing else, these describe the interrelations of the kinds of cognitive maps described in this chapter, and many yogic and martial art practices might be understood as methods for keeping these maps *in form*.

in esoteric literature, being widely documented for instance in the experience of martial arts and yogic practitioners. Blakeslee offers one way to understand this testimony:

> ... peripersonal space is physically, literally mapped in your brain's parietal and frontal lobes. So are your motor intentions within that space. Your sense of owning this space is so real and encompassing that you may feel tempted to feel that you can direct or otherwise manipulate the space as if it had substance or intrinsic energy. This is because your experience is of your brain's representation of that space, rather than the space itself ... because the many maps of the body mandala share information back and forth, these beliefs can even percolate down to the primary touch map and generate phantom sensations – tingles and gentle forces – that the mind interprets as perceptions.[68]

Peripersonal space has been known in western cultures too of course too, and perhaps is even described in Leonardo da Vinci's diagram of *The Vitruvian Man*. There are descriptions in fact from a wide range of cultural humanist sources, most explicitly in modern times for by Henri Poincaré and Maurice Merleau-Ponty, or in the personal space (Proxemics), discussed by Edward T. Halland, or more mundanely in the still popular urbanist conception of "defensible space". Peripersonal space is not simply some loosely defined and imagined approximation, or an effect produced through copied cultural behaviour. It is rather precisely mapped in the brain as an extension of our body, in a way that is not differentiated from the physical body, but is instead defined as the potential space of the body:

> ... the same neuron that discharges when we brush the monkey's arm also becomes active when we move our hand close to the animal's forearm, entering its visual receptive field. If you find this hard to believe, bring your hand close to your cheek: you will feel it before your fingers actually touch the skin. It is almost as if the personal (ie cutaneous) space of your cheek reaches out to embrace the visual space that surrounds it.[69]

The posterior parietal lobe is where a number of feedback loops from both the senses and muscles converge. There are several multimodal[70] maps in this area which combine them; in particular there is an important map in the fold at the rear of the parietal lobe that brings together visual and touch sense loops, and has what is called a bimodal

receptive field – that is, it responds both to actual touch on a given body part and to activity in the space immediately around that body part. This is not to say that it is necessary to call upon the use of “morphic fields” or anything like that. Peripersonal space is mapped and felt either via vision or other senses responding to an object enter the field. As Eric Kandel describes it, “the visual receptive fields of these neurons ... appear to have been transformed from a retinal frame of reference to a reference frame centred on the position of the [relevant limb].”[71] We are needless to say not actually conscious of these processes as processes. However, we use and feel them in our actions at every moment. Indeed it is these processes that form the basis of tool use.

6.10 Tools and the Extensions of Peripersonal Space

> ... the useful object would be the highest achievement, an anthropomorphised 'thing', the reconciliation with objects no longer closed off from humanity and which no longer suffer humiliation at the hands of men... Mankind would no longer suffer from the 'thingly' character of the world, and likewise 'things' would come into their own. Once redeemed from their own 'thingliness', 'things' would find their purpose. But in present society all usefulness is displaced, bewitched.[72]
> [Theodore Adorno]

There is of course a long history of propositions from cultural theory concerning the ways in which tools and environments act as prosthetics, whether as extensions or reformations of the human body, through projection, cognitive mapping, alienation, empathy and so on. Certainly they have been commonplace since the discourse of the empathy theorist Robert Vischer in the mid-nineteenth century. However, there was until recently little opportunity to test whether the notion of prosthetic tools was just a metaphorical description, or whether tools really are incorporated into the cognitive maps of the body and its surrounding peripersonal space, in the sense that we have been discussing. It was only in 1996 that Atsushi Iriki at the RIKEN Institute in Japan[73] started to explore this area, with the help of some macaque monkeys.

The macaque monkeys were trained by Iriki to use a rake to recover fruit. Brain scans showed that once these tools were being used, they were indeed incorporated as extensions of the body. The motor maps that the space of the tool became completely

Extending the Body

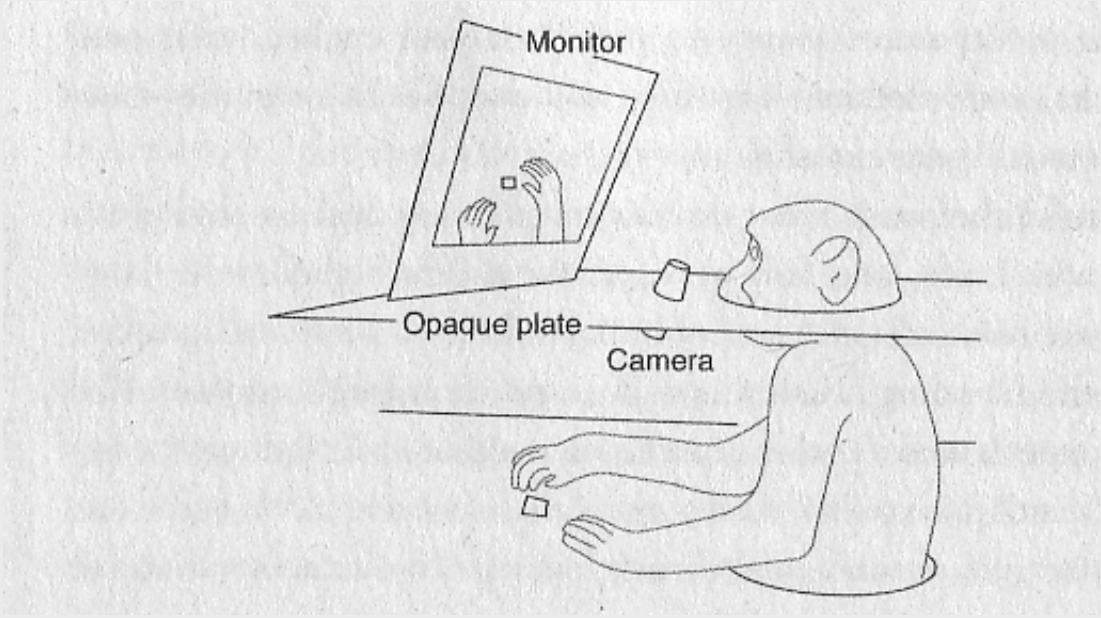
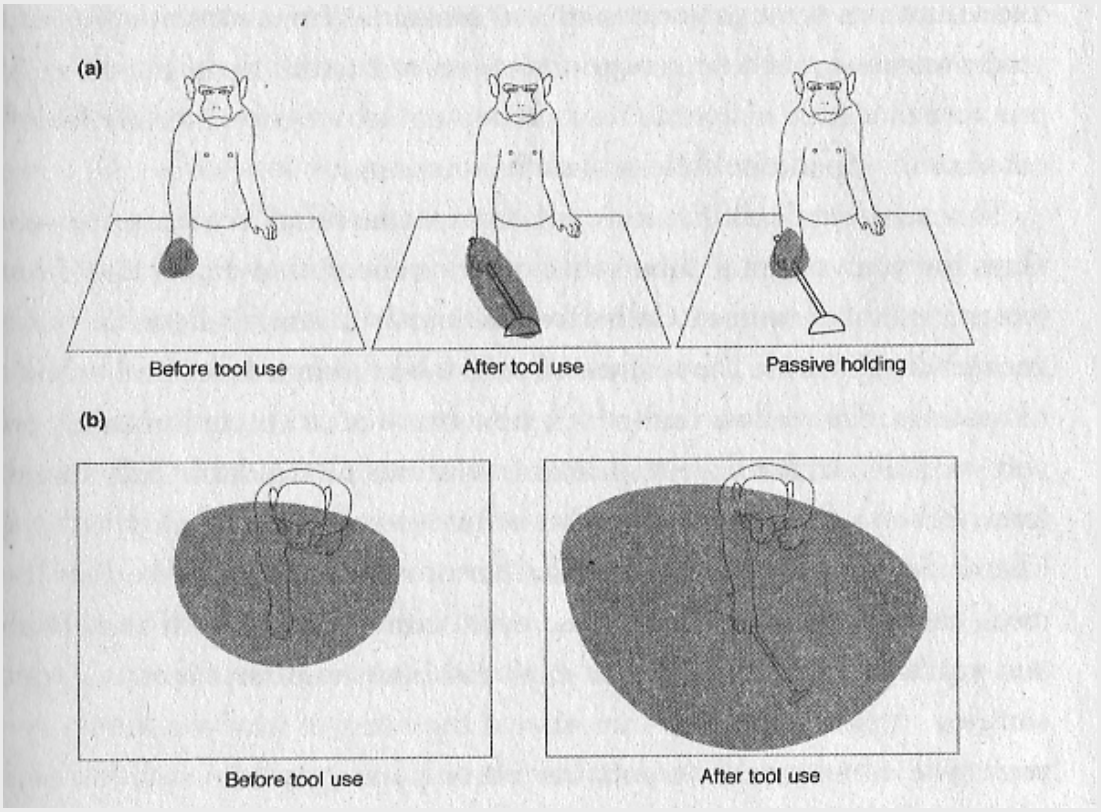


Fig. 6.27-8. Iriki's experiments with macaque monkeys are amongst the clearest demonstrations that, as far as certain cognitive maps in the brain are concerned, tools really do serve to extended the body.



integrated into the map of the monkey's hand when used, and similarly the space described by the moving tool extended the peripersonal space being mapped.

Iriki has engaged the macaque monkeys in an ever more complex series of tool experiments, using mounds, mirrors, rakes of different lengths, video cameras and joystick, and even abstract representations – such as seeing the fruit represented by a white dot, or the rake by a white line, on a video screen. In all cases the monkeys were firstly able to learn how to use the tools to get the fruit, and secondly were shown to extend their cognitive maps in the ways described.

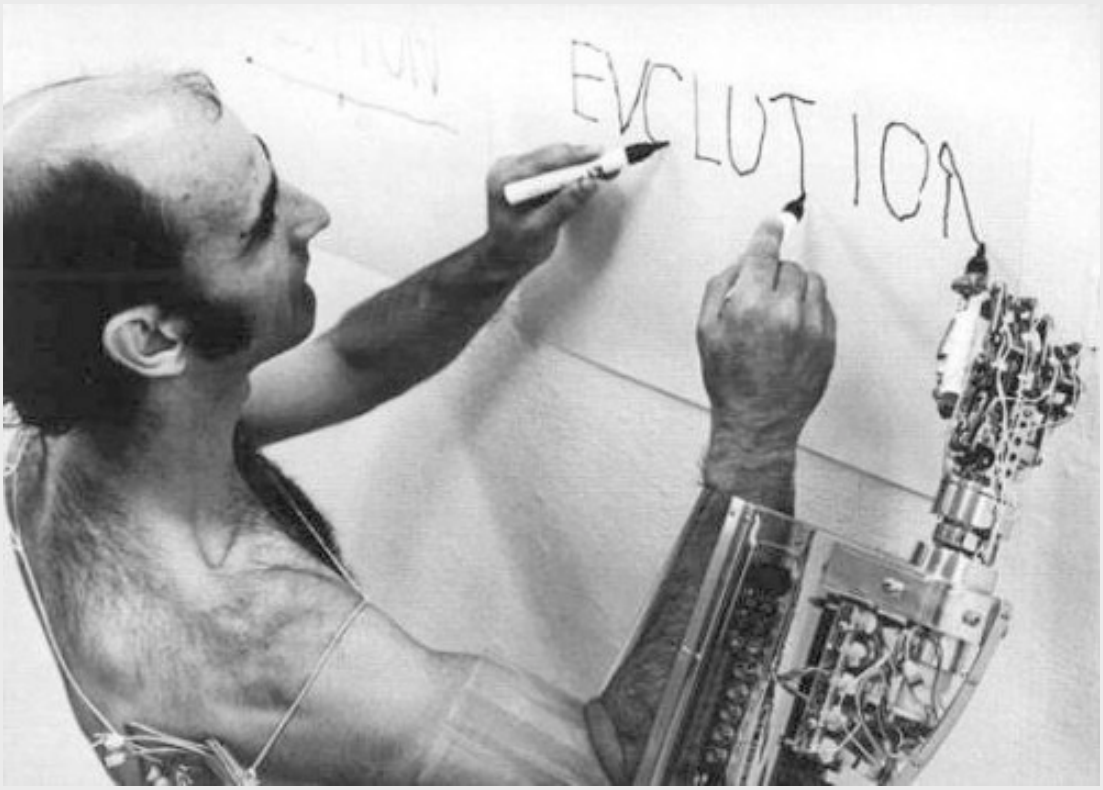
In an analysis of the brains of some of these monkeys, Iriki was able to show that the tool use displayed was not simply a case of "learning" through the use of existing pathways, but was full-blown neural plasticity – i.e. the growth of new pathways. This is why it always took some weeks to train the monkeys to use the tools in question. It is suggested that the kinds of connections between maps that were produced through this new plasticity in the monkeys are already much more present in more evolved apes, and even more interconnected in humans. It is thought that the adoption of an upright gait was the most important change to the plasticity of the brain in humans, in that it massively increased what we could do with our hands, and the mapping of this new activity in turn transformed the human brain.[74]

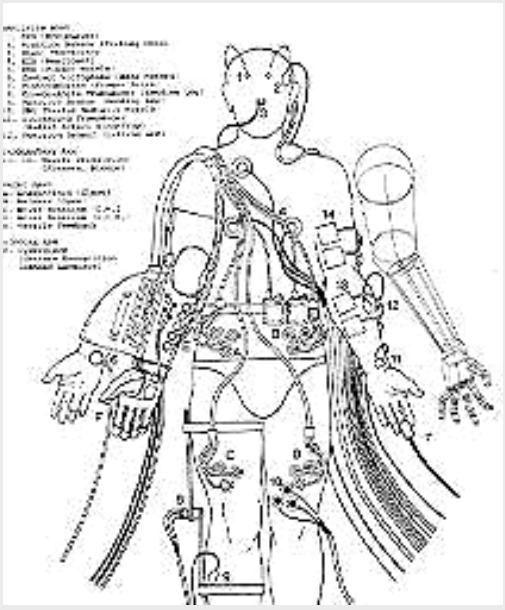
For Andy Clark, it is this plasticity regarding incorporating tools into the flows of the mind that is at the core of the extended mind thesis. He states that:

> ... advanced biological brains are by nature open-ended opportunistic controllers. Such controllers compute, pretty much on a moment to moment basis, what problem solving resources are readily available and recruit them into our problem solving wholes. Neural plasticity, exaggerated in our own species, makes it possible for such resources to become factored deep into both our physical and cognitive problem solving routines."[75]

In fact, for Clark, it is not simply that tool use was something novel, that the distinctly plastic human brain was able to do, but rather that tool use is all that any organism does. For Clark, ultimately there are no selves; instead, "it is tools all the way down."[76] As I have argued in different ways over several chapters, the study of prosthesis

Extending the Body





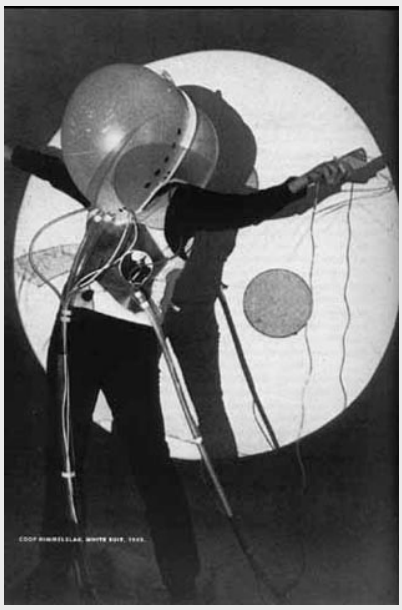


Fig. 6.29-30. The performance artist, Stelarc, has been a leading experimenter of post-human cyborg reconfigurations and extensions of the body, adding both internal and external elements - this project: Amplified Body/Third Hand/ Virtual Arm (1995) Mark Wigley has suggested that in “the reconfiguration of architecture on ecological principles ... Prosthetic extension is a form of ingestion. As the body expands, the environment is literally brought inside. Space gets reconstituted. Architecture is what you swallow.”
Fig.6.31 An early Coop Himmelblau performance.
Fig.6.32 David Greene’s well-known “attempt to mate with a photocopier” in 1980.

and body extension can tell us a great deal about the experience of architectural form and space – for as Marquand Smith has noted, prosthesis is always in complex ways about place.[77]

The fields or maps that surround our body are, then, both experiential and representational. They exist as extended systemic relations between our minds and bodies and the external world. They affect the way that we behave and experience, although at the macrocosmic or classical scale they have no “independent” physical reality.[78] They also have no obvious independent sensory capacity – that is to say, were all of your other senses (such as sight, sound, smell and touch) to be disabled, then it seems that you would not sense in these maps any object entering your peripersonal space.[79] However, these outer maps do affirm a radical ecological mind position in which the organism is absolutely coupled to its environment. There is no single boundary splitting the two, but rather a series of what we might call mentally-mapped metabolisms.

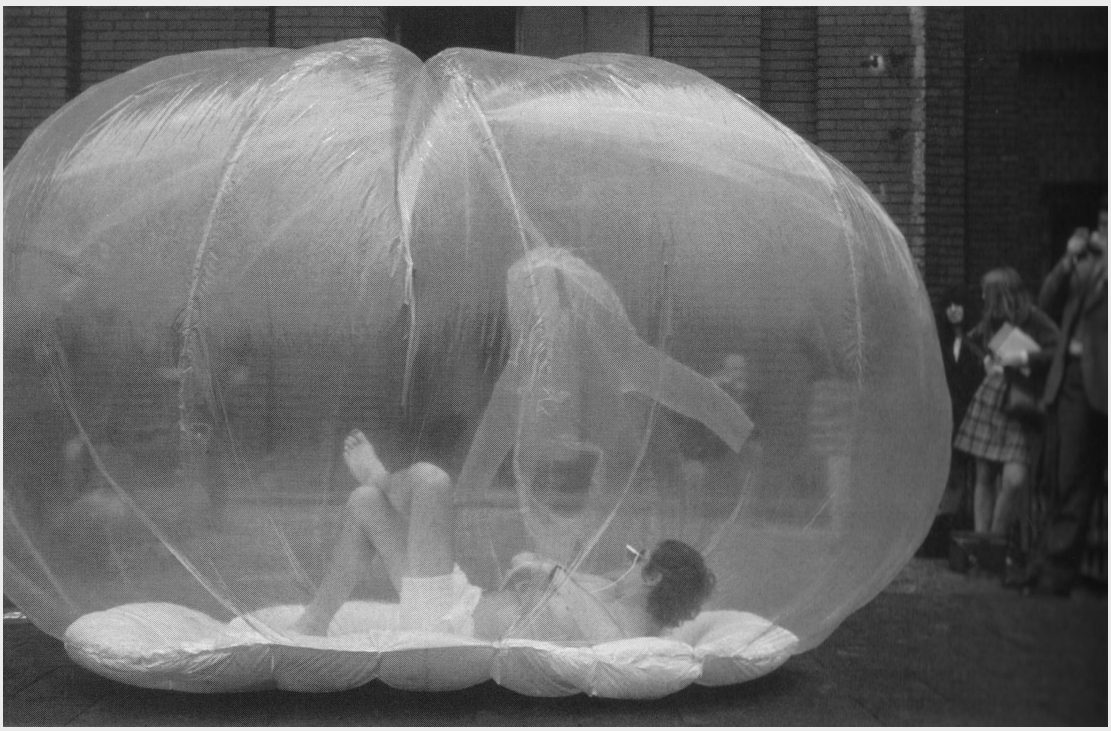
Under particular social and cultural conditions, these maps can be shared between people, in that your maps can extend to include the bodies of others. Whilst for modern western subjects this normally only happens at a non-conscious level, it can enter into phenomenal experience in certain states of consciousness – for example under the effects of certain drugs, or in certain cultural situations, such as sports stadiums or nightclubs or in revolutionary practice, etc.

It also emerges in certain neurological conditions, such as particular forms of synesthesia, such as vision-touch synaesthesia, where (it is presumed via mirror neurons), some individuals can see auras around other people – although this is presumably a projection peripersonal space maps, made visible.[80]

6.11 Architecture as a Dissociative Mapping

The Himba people of Namibia have achieved, it would appear as a cultural condition, a sense of space that is similar to vision-touch synaesthesia. The Himba are particularly conscious of their sense of peripersonal space. They say that they are aware of each others body-field bubbles, and that they feel a direct sense of socially mixing fields whenever they meet anyone. They say that this is a key part of their social existence, and

Nomadic Spatiality and the Experience of Peripersonal Fields



The is a relationship between a nomadic rejection of the normal extended body that architecture provides, and the becoming-visible of the sphere of peripersonal space that surrounds the body – both in the stories of the Himba, and nomadic architectural research by some members of Archigram.
Fig. 6.33. David Greene carries his space around in the 1968 Suitaloon project.
Fig. 6.34. A temporary Nimba Hut.

that they can't imagine how lonely it must be for others who do not experience this as a conscious daily event. According to Blakelee, "the Himba say they are never alone because their space maps fuse with others' throughout the day."[81] It seems also that the shamans among the Iatmul of New Guinea are also able to see a cloud or aura – what they call *ngglambi* – surrounding people.[82]

The Himba people live a nomadic pastoral existence in the Kunene region (formerly Kaokoland), and so there might well be a relationship between their nomadic lifestyle, and the intensified apperception of peripersonal body space. Specifically, I wonder whether there is also a relationship to the lack of actual buildings in their environment for them to project themselves onto, and the fact that they seem to channel some peripersonal space maps through their visual cortex. In this regard, it is striking that in several radical streams of architectural imagination, during the 1960s and 70s, there was an imagining of the individual surrounded by a bubble of space. Typically, this was found in the work where there has been a sustained meditation on a nomadic condition of spatial existence, as a way of theorising a nomadic modern technological condition. We thus can see the emergence of the bubble in the projects of David Greene and Mike Webb of Archigram, in for example the Cushicle and Suitaloon projects. These architects, having rejected the tectonic building as an appropriate medium for the future of architecture, meditated on other technologies that can extend and mediate the social (though typically individual) body and its environment and in their imagination – and, I would argue, once again start to intuit the existence of their own peripersonal space as a potential unit of architecture. For Greene et al, their peripersonal space, once again glimpsed, became reified into a physical bubble.

The reflection upon the particular social and environmental spatial experience of the nomad is vital here. We should remember that we all have peripersonal space maps (and many others) networked in our brains. However, for most of us, our peripersonal maps are not available to our conscious awareness. They are but one of many mental processes that we draw upon within consciousness in all kinds of ways, but which we do not experience as a physical bubble in normal situations.

In fact, one tentative hypothesis, is that it might be the experience of architecture in general, which overrides our peripersonal fields in our conscious awareness? I wonder

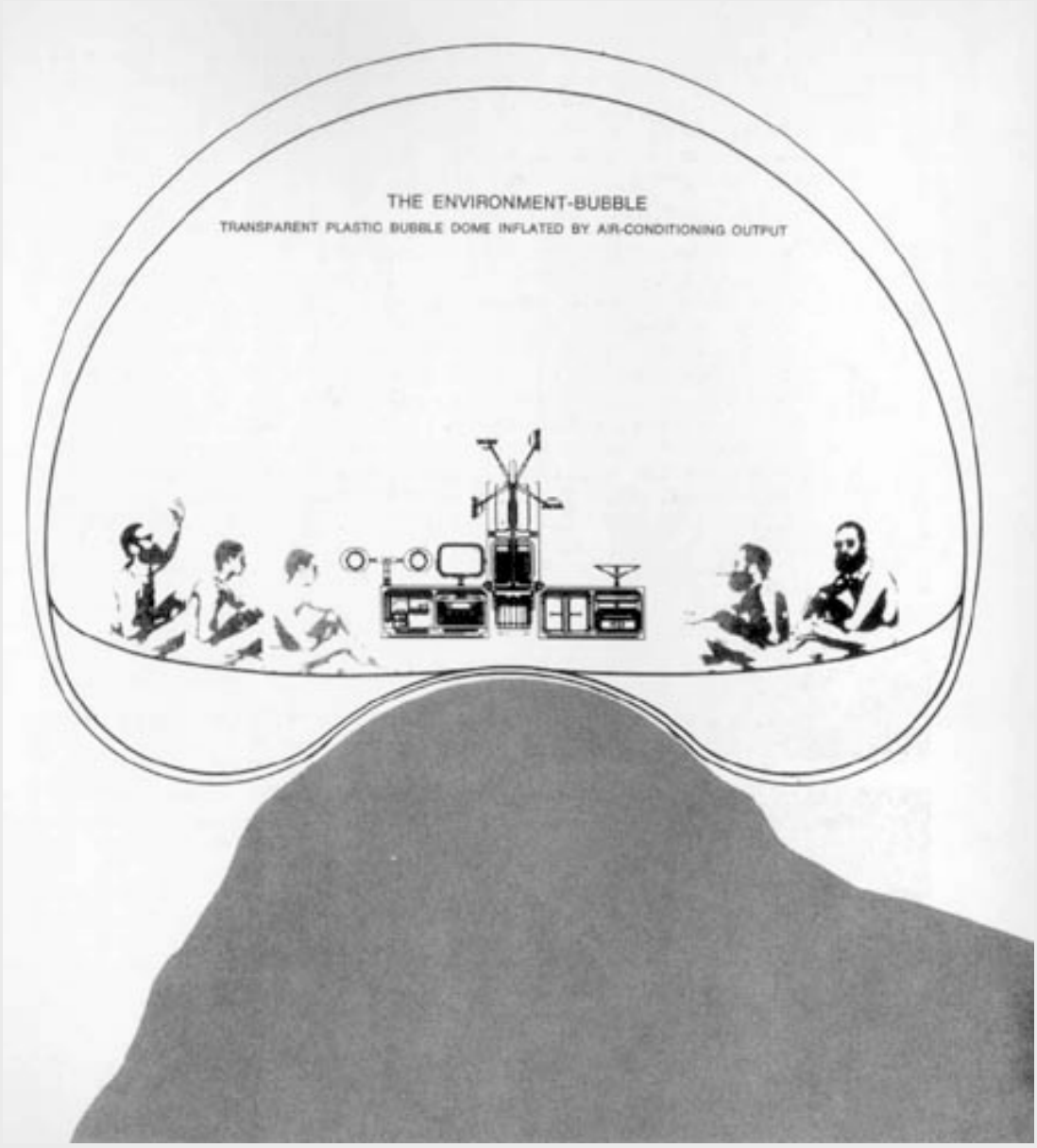


Fig.6.35. Reyner Banham, The Environment Bubble (1968). One of the rare examples of a collective bubble.
Fig. 6.36 Buckminster Fuller's proposed bubble over central Manhattan. Struggling towards a collective peripersonal space?
Fig. 6.37 Haus Rucker, at Documenta V 1972.
Of course, the image of the "Spaceship Earth" from Apollo 8 (see Fig. 3.9) might be the largest collective bubble study of this period.

then, if our building activity is quite simply the transformation of this sense of space, into a state of dissociation or alienation? In urban cultures, peripersonal space fields have to undergo constant adjustment and projection through a range of other spaces, and which prefigures in a general sense what Simmel came famously to identify as the blasé condition needed to survive the specific intensity of the modern city. If we live in buildings and cities, our spatial experience is such that our peripersonal space is distorted, extended and overwritten to such an extent that it is not available to conscious experience in any recognisable form (although it is still there in our minds, and we constantly use it in all other kinds of extended ways). However, perhaps for individuals in some human cultures which have not reified their peripersonal space fields into built structures, some of these maps are available to experience consciously as fields, and even to be incorporated into vision. This might suggest that the loops and mirrors within which conscious experience can play is in fact plastic – a point that I will return to again.

There are of course equally big differences between the peripersonal space bubbles of the Himba and the imagination of the 1960s cybernetic architectural avant-garde, and a critique of the later position is all too easy to make. Whereas the Himba are situated within an open “natural” field, Archigram and other architects were imagining an open “post-natural” field – using modern industrial materials and technology – and set within a degrading planetary ecology. Whereas the peripersonal space bubbles of the Himba are mental and social, the Suitaloon project, for instance, is physical and personal. Whereas the Himba people talk about how they experience the mixing of body maps as a primary social experience, the kinds of technological bubbles produced by the 1960s generation of techno-nomadic explorers suggest a quite different social experience. Typically, we find in the latter an expression of a much more isolated and self-defined individual. This time, the individual is in some sense isolated from his or her environment, and is often unable to intermingle and join with the bubbles of others. If anything in these 1960s visionary projects, the primary coupling is not social, but with the stylised commodity of the bubble itself, and perhaps the network of information systems that the bubble is then connected into.[83] It is as if the socio-economic forms of the Himba allow a visceral and visual socio-subjective experience of peripersonal space sharing, whilst

Fig.6.38 NOX, H2Oexpo Pavilion (1999). Lars Spuybroek has explicitly conceived of his projects in terms of prosthesis and cognitive mapping. He states that "with practice and training, the movements of the prosthesis can become second nature, regardless of whether it is flesh, wood or – a little more complex – of metal, as in the case of the car. That is the secret of the animation principle: the bodies inner phantom has an irrepressible tendency to expand, to integrate every sufficiently responsive prosthesis into its motor system, its repertoire of movements, and make it run smoothly ... movement can only be fluent if the skin extends as far as possible over the prosthesis and into the surrounding space, so that every action takes place from within the body, which no longer does things consciously but relies totally on ‘feeling ’… the body forms itself by action, constantly organising and reorganising itself motorically and cognitively to keep 'in form.'"[111]

under capitalist relations – as we know from Marx (and Archigram) – all social relationships are mediated by and embodied in privately-owned commodities.

6.12 Extrapersonal Space and Affordances

Our peripersonal, or near space, is thus mapped as a direct extension of our body, which in turn is defined by a series of overlapping fields based on vision, and on various body parts. The space beyond that, our extrapersonal or far space, is also mapped, but again separately. This is made clear through examples of the condition of "spatial neglect" which have been documented in individuals with damage to either their near or far spatial mapping. For example, Anna Berti and Francesca Frassinetti have patients with right hemisphere lesions which affects their left peripersonal space. This showed up when asked to indicate the midpoint of a given line. The individual could not do this by hand, in peripersonal space, but they could do it at a distance using laser pen! Revealingly, they could not repeat this same exercise at the same distance using a rod, confirming that the point of the laser was *seen* and thereby in their far space field, but the end of the rod was *felt* as an extension of their body, so was incorporated into their near space! [84]

Rizzolatti (via multiple references to Henri Poincaré and Maurice Merleau-Ponty) notes that because we are mobile beings rather than animals fixed to a location (like say sea-polyps), our extra-personal space always has the potential to become our peripersonal space – i.e. it is always space that we might move into. More than that, he argues that we are constantly surveying both near and far space, using both visual and motor neuronal circuits, looking for opportunities for physical engagement. He quotes Ernst Mach's 1905 paper on "Knowledge and Error", stating that:

> ... 'the points of physiological space' are nothing other than 'the goals of various movements of grabbing, looking and locomotion.' These movements are the starting point from which our body maps the space that surrounds us, and it is due to their goal directedness that space acquires form for us.[85]

This is a very interesting statement in terms of the way that it sets out a series of relations between *form* and *space* as a function of embodied and enacted goals. More broadly

Fig.6.39. Much of the rustication of the Palais Ideal was formed by Facteur Cheval's hand. Such technique necessarily produces a surface articulation which is rich in hand affordances (i.e. groves that one can hold).
Fig.6.40. Rebecca Horn's work has explored the extended active body, in pieces such as "I can touch both walls at the same time."

Fig.6.41. Borromini's *Church of San Carlo alle Quattro Fontane* (1638-41), the kind of interior that *feels* particularly prosthetic and full of affordance at all kinds of scale, and which Wölfflin would describe through an empathetic extension of the mind and body. I am suggesting that when we see decorated and articulated surfaces such as these, we are immediately firing off all kinds of affordance based pre-motor circuits

here, Rizzolatti, like many of the present generation of neuroscientists, makes use of J.J. Gibson's concept of "affordance'" to describe the process that his team have uncovered.

Gibson described himself as an "ecological psychologist", which for him meant that the organism could only be defined and understood in relation to its environment. Gibson's work parallels some cybernetic approaches and prefigures many aspects of extended mind thinking, and provides a key component for the approach that I am promoting in this thesis.

Gibson argued that we see the world in terms of what he called the affordances of objects, by which he meant the actions that they facilitate. Our perception is tied to potential action – whenever we see objects, we also see things that we can do with them – and hence we see affordances that facilitate our interaction and "not only abstract physical [or geometrical] properties."[86] We perceive by observing whether we can sit on, pick up, hold, grasp, throw, etc. these objects, and thereby bring forth our particular species-world. This insight by Gibson into our interaction with the external world is increasingly backed up by neurological evidence, which show that we have maps that do indeed chart such affordances. There are a set of feedback loops between visual and premotor maps that do this. When we look at a cup, our hand is ready to pick it up, and similarly, when we see a step, our legs are ready to step up.[87] The particular network of neurons that are responsible for this have been called mirror neurons, and they are responsible for a whole series of similar projective and mimetic tasks.

As well as responding to objects that the body can engage with in different ways, there are also motor-neuron-based maps which respond to specific three-dimensional forms: "one of the most important properties of the visual dominant and the visual and motor AIP motor neurons is that they respond selectively to specific 3D stimuli. Some respond to spherical objects, others to cubes, others again to flat objects, etc"[88]

It is perhaps worth noting that Bruno Latour has suggested that Gibson's conception of affordance helped him to think about the ways that objects have some kind of immanent agency. Latour states that

> ... there might exist many metaphysical shades between full causality and sheer inexistence. In addition to 'determining' and serving as a 'backdrop', things might

The (impossible) Cognitive Maps of Architectural Form

Fig.6.42-6.43 John Portman's Bonaventure Hotel, Los Angeles (1974-76). Mirrored space has, as I have mentioned on several occasions, been key to grasping something of the mind and body in space. In *Postmodernism*, Frederic Jameson describes the Bonaventure Hotel as a mirrored container that produced a distinctly post-modern phantom body experience. For Jameson, in this interior the very spatiality of late capitalism “has finally succeeded in transcending the capacities of the individual human body to locate itself, to organize its immediate surroundings perceptually, and cognitively to map its position in a mappable external world” (Frederic Jameson, *Postmodernism, or the Cultural Logic of Late Capitalism* Durham: Duke University Press, 1991),p.44). For Jameson, “the alienated city is above all a space in which people are unable to map (in their minds) either their own positions or the urban totality in which they find themselves” (ibid., p.51).

authorise, allow, afford, encourage, permit, suggest, influence, block, render possible, forbid, and so on.[89]

6.13 An Affordance-based Theory of Architectural Pattern and Decoration

If our basic peripersonal space maps inform one kind of architectural and spatial experience, albeit often below consciousness, I think that the *oscillation* between peripersonal and extrapersonal space – as activated and initiated through our constant projection of affordances – is of much more immediate importance to architectural experience. In particular, I suggest that Gibson's theory of affordances might form a key component of an architectural theory of pattern and decoration.

Rizzolatti finds much in the phenomenology of Merleau-Ponty to help him describe the conditions of an affordance based, perception-through-potential-action model of spatial cognition. To be sure, when Merleau-Ponty suggests that "in the action of the hand which is raised is contained a reference to the object ... as that highly specific thing towards which we project ourselves, near which we are, in anticipation, and which we haunt,"[90] we have it seems a fairly accurate description of the processes that Rizzolatti is dealing with. One of the cognitive or empathetic mechanisms through which we respond to architecture is I think precisely in the manner described here by Merleau-Ponty, and clearly, particular kinds of architectural texturing or embellishment will activate this sensibility more or less intensely. I suggest that when we see a moulding, or an articulated surface, we first explore it in our imagination through the haptic affordances that it does or could offer. This can be a conscious activity, but need not be so. It is often semi-submerged in our consciousness, I suspect. We can, if we reflect upon our perceptual activity, sense these projections going on, but often they are transformed into – or joined with – all kinds of other parallel readings that architectural and urban environments initiate (including other cognitive maps and of course symbolic messages).

These processes of engagement with architectural pattern and decoration are similar then to the more mundane affordance calculations that are enacted by our muscles and pre-motor cortex areas, every time that we see, say, a cup on a table. We do not consciously think about picking up every cup that we see, although it can be shown that

Spatial Affordance

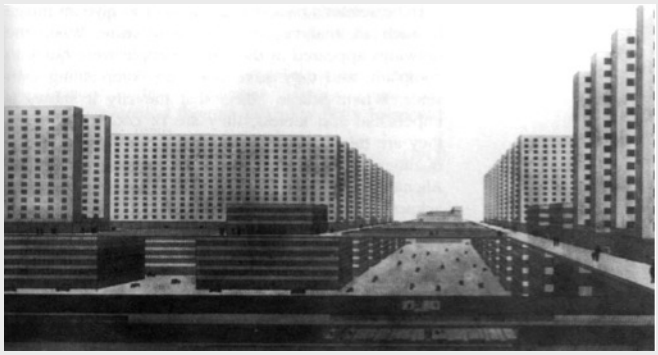


Fig.6.44. Extension to the Museum of Childhood, Bethnal Green, London, by Caruso St John (2002–2007). Although patterned and carefully made, the tension between the resolute flatness of this facade and the geometric suggestion of a patterned depth, make this object strangely frustrating.
Fig.6.45. *Grossstadt Architekture*, by Ludwig Hilbersheimer, 1921. The repetition of the mass building cell, it was proposed, would initiate a new kind of collective empathy.
Fig.6.46 A vernacular Italian rooftop. The tiles, made by shaping clay around the tiler's thigh, is irreducibly full of affordance, and is therefore easy to empathise with.

precisely this is in fact happening in our minds. Anticipating some of the discussion in the next chapter, we can say that a theory of architectural affordance and cognitive mapping suggested here, describes actual modes of spatio-formal empathy.

Affordance also I think work at several scales. It is likely that vernacular, hand-made buildings do by necessity offer more affordances, simply because they are, by definition, entirely composed of components that are hand-held (this is not necessarily to make any kind of value judgement here.) Whilst decorative or constructional patterning often activate these hand-based affordances, there are also I think a whole series of affordances based upon the body as a whole: steps, frames, platforms, and changes in levels. These kinds of spaces take on individual whole body affordances, and also start to multiply them into multi-body affordances too in terms of social space. In this way, affordances define what might be thought of as archetypal architectural elements such as stairs, door openings, windows, etc.

It is important to consider that the perception of affordance is not only a question of practical engagement, or, as I am arguing, aesthetic sensuousness. It might actually play a much more important role in cognition more generally. As Rizzolatti notes:

> ... motor vocabulary ... requires continual interaction between perception and action. However 'pragmatic' it may be, this interaction still plays a decisive role in constructing the sense of objects; without it the majority of the so called 'higher order' cognitive functions could not take place.[91]

Drawing once again upon Lakoff and Johnson's conception of the embodied basis of cognition, and my previous comments upon the potential of our extended bodies to provide the basis of extended concept forms, I suggest that architectural affordances might be key to understanding the role that architectural environments play in extending the metaphors available for adaption to higher cognitive faculties.[92]

It is interesting to consider how affordances might be used in discussing the conditions brought forth by some contemporary structures. The smooth surface of many of the "first generation" of computer-generated "hypersurface" images – and as realised in much recent work by Gehry, Hadid et al – brings forth an ambiguous haptic imaginary. Often a seamless smoothness denies all hand-based affordance, and perhaps thereby

prevents any potential for cognitively “grasping” the object, even whilst their spectral reflectiveness might attract other libidinal sensibility. In a very different way, the facade of the extension to the Bethnal Green Museum of Childhood by Caruso St John offers an image of abstraction, in that it seems to offer a possible visual affordance, yet its flatness denies any need for the motor circuits to engage, and as such it feels strangely frustrating – even whilst this very sense of frustration might be all too accurate an account of the possibility of grasping the contemporary commodity, whether as object or spectacle.

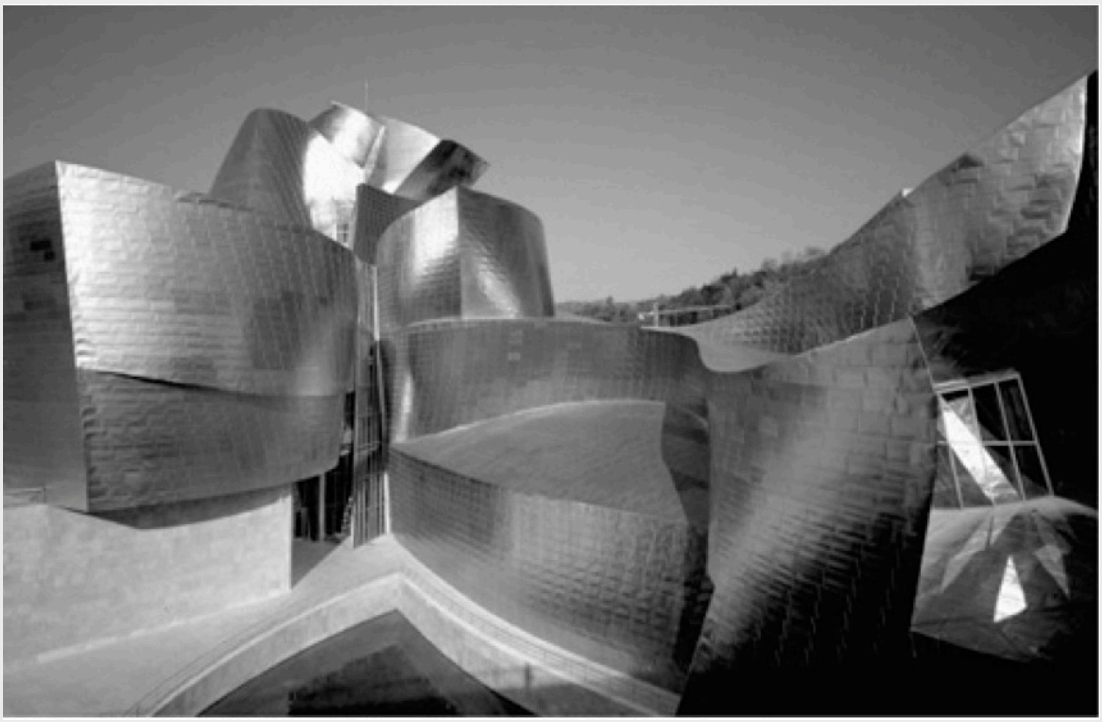
If highly decorated environments can provide places that are full of affordances for humans, is this in fact necessarily stimulating? Might it be just as cognitively radical to be in an environment that is devoid of such possibilities? The large expanses of unarticulated and un-ornamented surfaces that describe the archetypal modernist environment are typically lacking in affordance. Whilst, as aesthetic objects, such environments (classically rendered in for example Hilbersheimer’s early sketches) have a painfully therapeutic quality, does one need to have an already highly abstracted sensibility to appreciate this? Would immersion in such an environment result in a restricted extension of cognitive potential, or does it free up the mind for plastic re-conception?[93]

The architecture of Frank Gehry presents a particularly paradoxical case study in haptic affordances. Gehry famously designs his buildings by working with small physical models, like a sculptor. These are then digitised in 3D, and scaled up into buildings. These buildings are thereby shaped into highly plastic-morphic forms, yet the experience of inhabiting these spaces can often remain rather empty. There is I suggest very little scope for affordance-based projection in a Gehry designed structure, as the surfaces are typically smooth and unarticulated. In fact, whilst there can be occasional moments of full body empathy – such as surfaces to sit on or lean against, etc – these too are rare and occur somewhat by chance, as the spaces do not seem to have been designed to be inhabited at all. Gehry’s buildings are clearly most effective and engaging when looked at from a distance, or in a photograph. This is because, I would suggest, in those modes of engagement, the viewer is most able to experience an affordance-based relationship with the building as a visual object which has some abstract relationship to its original mode of production – we can imagine holding the small initial model, feeling its contours in our hand. However, whilst making these kinds of objects is a process that is probably good for

Over-scaled Handwork

Figure 6.47 and 6.49. Frank Gehry, Bilbao Guggenheim.
Figure 6.48. Frank Gehry's design method is lampooned in *The Simpsons*

As hand-made models, Gehry's architecture makes some kind of "sense": a bit like the sensation models that are used by visually impaired children. When scaled up into buildings, however, it is less clear what responses might be expected from the viewer or user.



the brains of the architects and clients involved, as they explore affordance with the original hand-held models, it is in fact ultimately creating a new and extreme form of spatio-mental elitism?

6.14 Mirror Neurons and Empathy

In recent research it has been suggested that what have become known as mirror neurons are actually the neurological correlate of the empathy-type spatial sensibility of the mind discussed above. It is these neurons that bring together much of the cross-over between haptic, motor and visual systems, and it is these neurons that initiate the mimetic projections that mean that when we confront the world, we confront an array of affordances.[94]

According to popular anecdote, mirror neurons were discovered by chance in the laboratory of Giacomo Rizzolatti, when they realised that certain motor circuits were activating in monkeys when they were watching the scientists pick things up. According to Rizzolatti:

> ... [the] recognition of the actions of others, and even of their intentions, depends first of all on our motor repertoire ... the mirror neuron system is indispensable to that sharing of experience that is at the heart of our capacity to act as both individual and as members of a society. Forms of imitation, both simple and complex, of learning, of verbal and gestural communication, presuppose the activation of specific mirror circuits ... emotions, like actions, are immediately shared. The perception of [the emotions of others] activates the same areas of the cortex that are involved when we experience these emotions ourselves.[95]

The theatre director, Peter Brook, has commented that mirror neurons have done no more than explain what was “common knowledge” in the theatre world: that performances are always collaborations between audience and actor. Again, for Rizzolatti:

> ... the study of mirror neurons appears to offer, for the first time, a unitary experimental and theoretical framework within which to decipher this form of shared participation and ... the basis of our common experience.[96]

The same comments that Brook has made regarding theatre can I think be applied to architecture. In the case of architecture, mirror neuron systems play roles in many of the processes that will be discussed in the next chapter regarding the aesthetics of empathy. In both of these aesthetic models (i.e. architecture and theatre) there is some kind of feedback loop set up in which mind emerges as a system of projections out from the human subject, as well as sensory inputs in from the external world.

In an important sense, these aesthetic epistemologies are more in line with contemporary cognitive models than many of models that characterised twentieth-century biological schema, which tended to imagine a linear connection between perception producing cognition producing movement.

6.15 Grid Cells, Place Cells and Entoptic Pattern Projection

The final modes of cognitive mapping of space to be considered are in some ways not grounded directly in body-based action at all. They are in fact surprisingly abstract and geometrical mappings, and form the basis of our large scale comprehension of space. Grid cells and place cells are located in one of the “oldest” parts of the brain – the hippocampus – and provide a very different type of spatial cognitive mapping to those so far discussed.[97] However, just like our peripersonal space mappings, I suggest that we can find projected abstractions of these neuronal structures within our built environments, just as we can interpret our neuronal structures as interiorised mirrors of our environments.

Most of the body maps discussed so far have been egocentric: they are based in the human body, and are key to any sense of self. Place and grid cells, however, are more geocentric, and as such are two-dimensional. Place cells are organised according to the actual place and space that the body is in.[98] They are formed as a particular permutation of cells each time you visit a new space-place, and seem to be an important component in the mechanism by which we recognise places. Equally, although place cells seem to exhibit strong metric properties, the cognitive map of the place cells can be informed by the dynamic body based cognitive maps discussed above.[99]

Grid cells are located in the entorhinal cortex in the hippocampus, at an organisational level above place cells.They fire as the body moves in space, although the grid that they describe is an hexagonal co-ordinate system (not our more familiar orthogonal grid).[100] In addition, “head direction cells” work with place and grid cells, and fire whenever the head is facing a particular direction. They seem to form the basis of an innate sense of cardinal direction, whilst “spatial view cells” are attached to significant objects or views in an environment.[101] Like almost all brain regions, the hippocampus has a significant ability to plastically re-organise itself on the basis of lived experience and practice, and a recent study by Eleanor Maguire has shown that London cab drivers have enlarged posterior hippocampi, with experienced drivers show greater enlargement than new drivers.[102] It would be interesting to see what the hippocampi of architects are like, although I can find no studies of this as yet!

The hippocampus, as well as dealing with these spatial tasks, plays an important and related role in memory formation. There is in fact some debate concerning what emphasis should be placed on the specifically spatial role of the hippocampus, as opposed to viewing abstract spatial cognition as just one case of a broader provision of *relational* memory.[103] It has been demonstrated that the hippocampus is involved in cognitively mapping non-spatial relationships, such as family and social relationships, and indeed in positioning ideas within relational frameworks. Indeed, the mnemonic power of the hippocampus in managing spatial relationships has been consciously used at least since the time of the Roman Republic, when orators were taught to remember their speeches by imagining that they were walking through a building, with each room representing a particular point. Recent research seems to be concluding that the hippocampus is primarily concerned with space, and it is through our lived spatial relationships that we have developed a broader capacity to organise memories, and think relationally.[104]

6.16 Embodiments of Mind

> Knowing is an action of the knower ... all knowing depends upon the structure of the knower ... it is rooted in the very manner of his lived being, in his organisation. We hold that

> the biological roots of knowing cannot be understood only through examining the nervous system; we believe it is necessary to understand how these processes are rooted in the living being as a whole.[105]
> [Humberto Maturana and Fransisco J. Varela]

Clearly, the relative spatial abstraction of grid cells and place cells creates a very different basis for cognitive mapping than the empathetic-prosthetic relationships with external world that the network of body-based cognitive mappings discussed earlier in the chapter facilitate. Still, in all cases the human organism and its environment are co-constituted through a mapping process, and in terms of our experience, a "world is brought forth" through spatial practices of various kinds. Importantly then, it is not simply that the body and its various spaces are mapped in the human mind, but rather, the human mind and human consciousness, are in large part *produced through* these spatial practices and the associated network of mapping processes. Understanding the experience of this dialectical relation between organism and environment is what Varela and Thompson have described as neurophenomenology. Clearly, by definition such a conception contains no implication of a "natural" or stable human condition

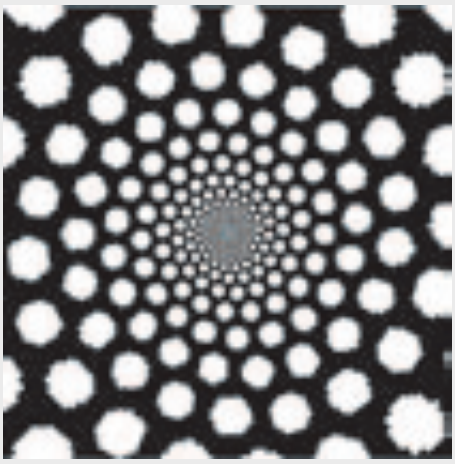
I have also introduced another conception of cognitive mapping, a critical-theory-based extrapolation of an urbanistic concept developed by Kevin Lynch, which was later used by Frederic Jameson to rethink concepts of totality found in Lukacs and Hegel. These two conceptions of cognitive mapping share more than a relation to urbanism (interesting though that is). They also seem to reflect in some way something that seems to happen in the hippocampus – a spatialising moment that structures our ability to organise both abstract mental concepts and our own biophysical bodies.

Spatial practice and the consciousness it produces would seem to be a likely precondition for advanced relational memory and abstract conceptualisation. The organising of stones in space by humans, and the experience of recognising patterns of organised matter in the external world, is a precondition for, or perhaps co-emergent with, the conscious organising of abstract thoughts. The sociological thinker Georg Simmel, and the architect-turned-social-commentator Siegfried Kracauer – both of whom I will discuss in the next chapter – noted that something interesting happens when the "external" space that is mapped "internally" in the mind, consists of a space that is already

Let’s get these stones organised!

Might it be that the organisation of stones in Carnac are in fact a drug-induced projection of grid cells? Does the placing of stones in a line co-evolve with the ordering of ideas or even words in a sequence?

Fig.6.50 Field of standing stones at Carnac, France.



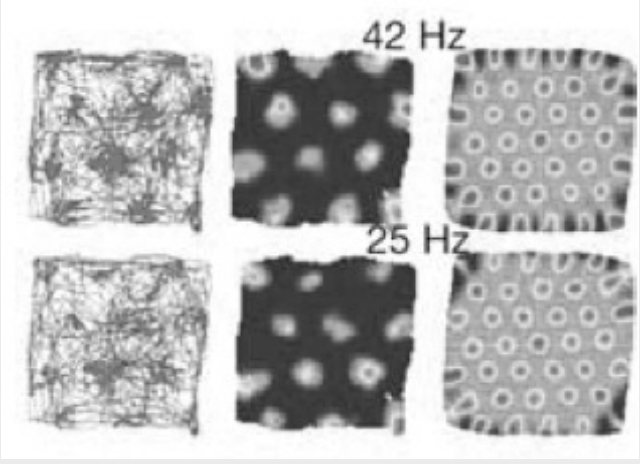


Fig.6.51 The kind of entoptic pattern most frequently reported in psychadelic experience, interpreted as neuronal structures with recursive feedback through the visual cortex.
Fig.6.52 EEG mapping of grid cells in rats.

an externalisation or alienation of the human mind – that is to say, when the space or object mapped is not simply “found” by the subject, but has already been socially produced.

In the megalithic grid structures of Carnac in Brittany, it could well be that we are seeing the first steps towards social forms of human conscious abstraction via a projection of internal grid cells in the human brain. The organisation of the stones is a necessarily social act, as indeed is their experience. Once externalised and manifested as objects, these become visions of a rational space. They act as mirrors of the mind’s structures and can be mimetically reintegrated into consciousness. Grid cells, with their apparent prefiguring of something like a Cartesian grid, seem to provide an unexpected neurological basis for what Lefebvre would later refer to as abstract space. When we look now at the grids of modern city planning are we really just looking at a socialised extension of our hippocampus?

Whilst highly speculative, David Lewis-Williams has suggested that similar processes might be responsible for the emergence of modern human intelligence. Lewis-Williams argues that the patterns that can be found in Palaeolithic petroglyphs (and indeed in the production of extant shamanic and nomadic cultures, and especially in San rock art), show strong signs of being related to the induced experience of entoptic patterns – that is to say, patterns which are based in the structures of neurological organisation.[106] For Lewis-Williams, as for the even more speculative Terrence McKenna, ingested psychoactive botanics are suggested as a possible stimulus for this process.

Entoptic phenomena are geometric patterns that emerge under particular conditions, and consist of two types.[107] These are phosphenes and form constants. Whilst phosphenes are induced by physical pressure on the eye, or entophthalmic structure within the eye, form constants derive from the structures of the bigger optic system. Lewis-Williams summarises the condition as follows:

> ... there is a spatial relationship between the retina and the visual cortex: points that are close together on the retina lead to the firing of comparably placed neurons in the cortex. When this process is reversed, as following the ingestion of psychotropic substances, the pattern in the cortex is perceived as a visual percept. In other words, people in this condition are seeing the structure of their own brains.[108]

Externalising the Mind

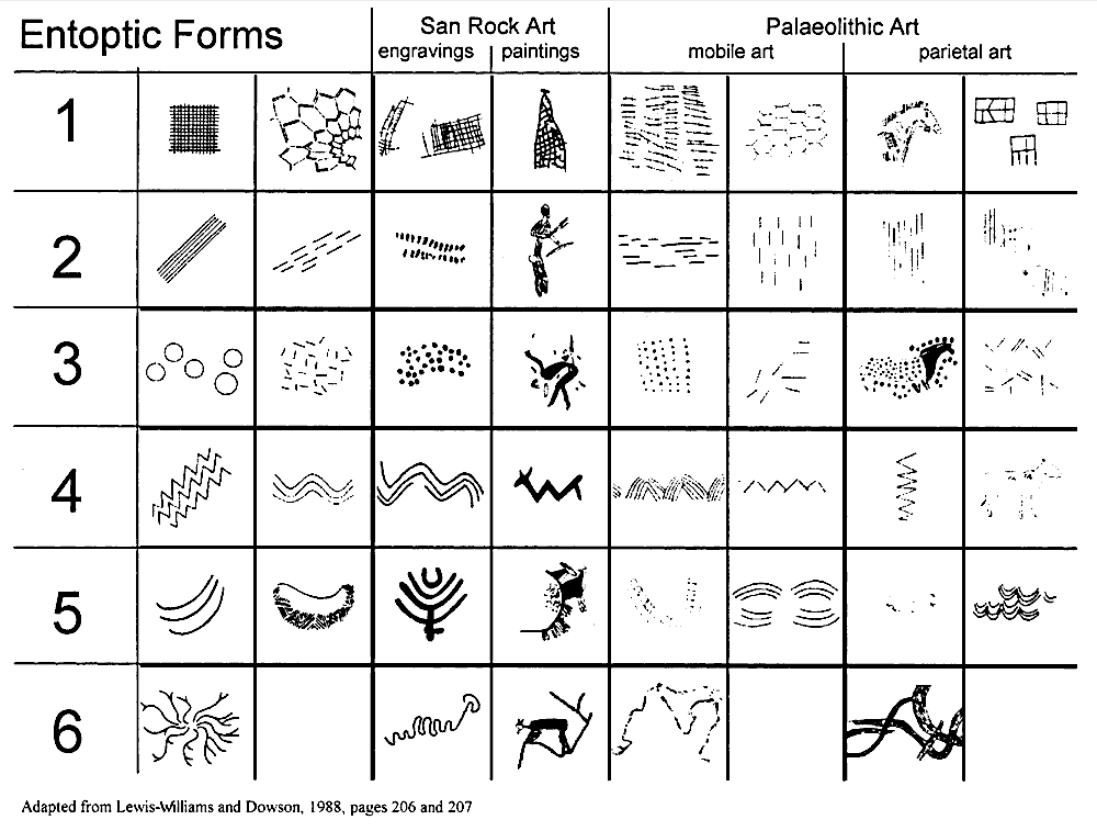


Fig.6.53 A matrix diagram comparing entoptic patterns, San rock art and Paleolithic art.

Fig.6.54 Petroglyphs showing entoptic patterns in Grapevine Canyon, Nevada.

Fig.6.55 The oldest known example of abstract human thinking is a pair of iron ore stone ochre, decorated with abstract criss cross designs, and dated to 70-75,000BC. These were found in the Blombos Cave in South Africa.

These initial projections of internal mental objects out into the external world, create a distinctly mirrored condition. Whilst, as noted in the previous chapter, we are in a sense only able to engage with or empathise with anything in the world in so far as it too has aspects of mind – i.e. it is in some way patterned. For Gregory Bateson of course, recursive mental patterning characterised all living material systems, and was the basis of our initial apperception of, and ecological mental extension into, our environments. However, the more that we have structurally-coupled ourselves to our environments, and the more that we have re-shaped and re-patterned our world, then the more it is the case that the objects that we empathise with are in fact externalisations of our own minds, and have been made with our own bodies (and thus are thereby especially full of affordances) a particularly intense feedback mechanism occurs. This mirrored feedback between the body-mind and a projected environment creates the recursive pre-conditions for the emergence of modern self-consciousness and complex language, with all of the benefits and delusions that these brings. It is hard, then, not to see the urge to create architecture coming out of these processes.

In the next chapter I will turn to consider ideas associated with nineteenth-century empathy theorists in Germany, in terms of the realisation that there was something happening in space, some kind of extended feedback relationship between our minds, our bodies, the environments with which we co-evolve, and the objects that we make, use and find. Empathy theory can even be said to have constituted an early form of extended mind theory. Whilst there have been both idealist and materialist constructions of empathy theory at different stages of the historical development of the concept, there has not yet been an explicitly modern, political and ecological formulation. It is intended therefore that that these two chapters might provoke further research work in that direction.

7 Aesthetics, Technology, and the Spirit of Matter[1]

> So by 'aesthetics' I mean responsiveness to the pattern which connects. The pattern which connects is a meta-pattern. It is a pattern of patterns. It is that meta-pattern which defines the vast generalisation that indeed it is patterns which connect.[2]
> [Gregory Bateson]

7.1 Empathy, Mind and Aesthetics

In the previous chapters, it was noted that the concept of *empathy* has been turned to on several occasions by thinkers within the cognitive sciences. For George Lakoff and Mark Johnson, as for Evan Thompson, some concept of empathy is necessary to grasping both the nature of inter-subjectivity, and – as part of the same process – recognising the specific process by which our environment itself is productive of and constituting some kind of subjectivity. Empathy thereby contributes to an active extended component of our subjectivity as humans. For Gregory Bateson, empathy suggested a route by which patterns (which for him are mental processes, or the traces thereof) might be recognised in very different kinds of organised differential material systems. Once recognised, patterns might then be seen to be related to each other by other patterns, seen through a process of abduction which itself shares something with empathy so as to reveal endless higher, lower and transversal levels of patterned abstraction. For Bateson, the process of projecting ourselves into the world "with recognition and empathy" is essential if we are to gain what might be described as a living feeling for the specific forms of rationality produced by the ecologies within which we produce ourselves.

So what, then, is meant by empathy? I will need to approach this question from several directions over the coming pages, but we can start with a standard dictionary definition, that the everyday meaning of empathy describes "the ability to sense and understand someone else's feelings as if they were one's own," while also noting that it is an anglicised form of the Greek *empatheia,* meaning affection or passion.[3] In fact, the word *empathy* is a fairly recent addition to the English language, being coined by Edward Titchener in 1909 as the translation of the German word *Einfühlung*[4] (literally 'feeling into'), which he found used extensively in the work of the aesthetic-philosopher-turned-psychologist Theodore Lipps (whose work he was translating).[5] There is in fact an

important history of concepts that lie behind this seemingly innocent word, which connect it directly – and no doubt surprisingly – with the formulation of the concept of "space" in modern architectural aesthetics and phenomenology.

Empathy as a concept has indeed an irreducible basis in spatial aesthetics, and its use as a fundamental component of some contemporary cognitive philosophies brings architecture into the heart of discussions about human consciousness. What is so fascinating about this etymological history is that it also appears to be an accurate reflection of neurological relations. Recent research into what have become known as mirror neurons (discussed in the last chapter) suggests that they play key roles in what are now seen as three interrelated processes. Firstly, mirror neurons are involved in the cognitive mapping of the space of the body, and the body's technological extensions through the use of tools. Secondly, mirror neurons are central to constructing our theories of mind regarding other people (i.e. recognising other minds). Thirdly, mirror neurons play key roles in language. This suggests that the historical development of the concept of empathy, from spatial aesthetics to psychology and the cognitive sciences, is not merely a linguistic accident, but actually reflects a socio-biological relation: i.e. an extended network or system in which space and language are socially produced. Architectural knowledge concerning spatial aesthetics might have a real contribution to make here, then, in understanding and working out an extended theory of mind in broader terms.

Titchner's choice of empathy as a translation for *Einfühlung* makes clear the word's relationship to *sympathy*, and in particular the old alchemical or medicinal sense of this word, as a sympathetic attraction between things as well as people.[6] It was in fact this sense, as a way to understand the "alchemy" of art – or, how it is that "form" might be related to, and found attractive or beautiful by viewers – that *Einfühlung* had initially been used by the German art theorist, Robert Vischer, in 1871, in its first modern aesthetic use. However, the underlying concept of *Einfühlung* – that we are in constant physical and mental feedback or dialogue with the entire world around us – was deeply rooted in both esoteric philosophy and mainstream German thinking, and had been for instance clearly expressed in the aesthetics of German Romanticism.

The first published use of the term *Einfühlung* was by Johann Gottfried von Herder, in *This Too: a Philosophy of History for the Formation of Humanity* of 1774. In his essay,

Herder proposed the concept of empathy as a historical-critical method: that is, a way of feeling oneself into the mindset or spirit of other times and places, in order to understand the meaning of their works of art. Importantly, as Joseph Rykwert points out, for Herder processes of *Einfühlung* were essential to his elaboration of the notion of organic principles in political life and community.[7] Herder also frequently suggested empathy-like, psycho-physiological readings of formal expression, such as in his sentence stating that "the beauty of a line is movement, and the beauty of movement, expression."[8]

Herder's colleague, Johann Wolfgang von Goethe, also developed a method of "feeling-into" as the basis of his organicist and proto-phenomenological "living science". Goethe's experiential scientific method, as elaborated in texts such as *The Experiment as Mediator between Subject and Object* (1772) and *The Theory of Colours*(1810), was based upon the proposition that the "holistic scientist" should feel themselves into the object of study, until a sudden organic and "intuitive" understanding of the whole living process at hand occurred.[9]

Like Titchner, Sigmund Freud was indebted to Lipps' subsequent development of the concept of empathy, seeing it as "essential for establishing the rapport between patient and analyst that makes interpretation possible".[10] The term *Einfühlung* first appeared in his paper on "Jokes and their Relation to the Unconscious" (1905). In this paper, Freud noted the close relation between empathy and "mimesis", a move that was to have significant influence.[11] Both Walter Benjamin and Theodor Adorno referred to this paper of Freud's when developing their own ideas around mimesis as an art-philosophical concept, and there is an under-acknowledged, although direct, connection between the aesthetico-critical concepts of empathy and mimesis. It is, for example, wholly in a sense derived from empathy that Adorno said that "by means of the mimetic impulse, the living being equates himself with objects in his surroundings."[12] Benjamin's use of mimesis to unpick the commodity could similarly be considered to be an unknowing return to the young Marx (whose 1844 *Paris Manuscripts* were not published until 1927) and the emergence of empathy within associated young Hegelian circles, as we shall see. It is also worth noting that recent work by Neil Leach, for example, has – by drawing on Benjamin and Adorno – used mimesis and empathy together.[13]

Lipps' development of empathy, firstly in an aesthetic sense, and then later to "explain how we discover that other people have selves",[14] has been very important in the development of modern psychological discourses: it can be said to have constituted psychology's first theory of mind. Today, our recognition of other minds is broadly known in psychology as having 'a theory of mind' (also known, confusingly, as "theory theory"), and is often referred to as cognitive empathy. In embodied mind thinking, as discussed in Chapter Five, empathy constitutes a key third moment in describing the essentially inter-subjective nature of self. As Thompson describes it, "self and other enact each other reciprocally through empathy."[15]

7.2 Empathy and Spatial Prosthesis

What, therefore, can be said to be the basis of this aesthetic concept of empathy? Empathy is the idea that we experience physical form through processes of relational projection, imagining ourselves onto the shapes, or into the spaces, of the world. Empathy suggests that architectural experience, or at least the physical, kinaesthetic, phenomenological and non-iconographic components of architectural experience, might be thought of as a fundamentally prosthetic impulse. Consider for instance the experience of driving a car or riding a bike, or even just using a tool. Our cognitive map of the limits of our body quickly expands to include the vehicle or tool as a prosthesis, almost as soon as we start to work with it. We are, for example, acutely aware of the limits of the vehicle, and feel any potential collision as an impingement upon our own self. We feel it by extension as a part of our body. Empathy theory asserts that we experience form and space in precisely this way. We imagine the building and our spatial environment as a second skin, an extension or projection of our body and our psychology: we wear spaces and morphology like clothing or a membrane, an interface or prosthesis, physically and psychically, and indeed socially and collectively. Hermann Lotze, in one of the earliest formulations of this concept, suggested that "no form is so unyielding that our imagination cannot project its life into it."[16] The cognitive map or body-image that we carry around with us is constantly adapting to the environment that we find ourself in, and for all of these empathy theorists, the moving, active body was key to understanding these dynamic

processes of adaptation. When in a building or a city, one expands into and empathises with it. Empathy theory describes space (and the objects contained by space) as an alienated, yet recoverable organ of our individual and social bodies. It is the medium through which mind and matter connect through pattern and form, a “utopian” joining of subject and object. Empathy, in Bateson’s language, is the meta-pattern that connects patterns in the subject with patterns in the object.

Empathy developed thus as one of a three closely interrelated terms: empathy, form and space. And as soon as we start to investigate the interrelated developments of these concepts, we find that we are engaged in a distinctly second-order systems discussion of pattern/matter relations in cybernetic terms. By second-order, I mean that there are patterns immanent in the organisation of the object matter (in this case, architectural objects) and there are also patterns immanent within the subject matter, which is the perason using the building. Empathy, I suggest, must be understood as the study of the meta-pattern that connects these co-evolving patterns.

The concepts of empathy, form and space underwent an extraordinary development in the final decades of the nineteenth century and the first decades of the twentieth. These ideas continued to develop throughout the twentieth century, although were increasingly articulated in architecture through a more abstract discourse on “space” and “form” rather than “empathy” as such. The history of the development of these concepts has finally started to be written in recent decades, and I am indebted here to a series of texts. The first important and most encyclopaedic review was produced by Cornelis van der Ven in 1978,[17] although it is not clear how much influence this book had at the time of writing. However, just over a decade later, in 1991, a paper by Mitchell Schwarzer in *Assemblage*[18] seems to have been much more successful in bringing into contemporary critical theory and architectural history a recognition of the role that the aesthetic discourse on empathy had in the formation of the modernist concept of space in architecture. The success and influence of the Schwarzer paper was no doubt in part due to the fact that a couple of years later, in 1994, Harry Francis Mallgrave and Elephterios Ikonomou published an important edited collection of translations into English of the major texts of nineteenth-century German aesthetics, including the key papers by Robert Vischer, Heinrich Wölfflin, Adolf Hilderbrand and August Schmarsow on empathy, form

and space. The publication of Mallgrave and Ikonomou's collection opened up a new phase of research amongst Anglophone architectural historians, notably including Adrian Forty's substantial entries on "Form" and "Space" in his book on *Words and Buildings* (2000).[19]

"Space" and "form" have had a fairly continuous ongoing development during the last few decades. Most notably perhaps, thinking around space has been dramatically extended through the translation in the early-1990s of ideas from the French Marxist philosopher Henri Lefebvre, which has not only impacted upon the associated disciples of urbanism and geography, but has also been brought into architecture directly through (albeit in very different ways) the writings of architectural theorists like Bernard Tschumi and Iain Borden. "Form", too, I would say, has continued to undergo development, in for example certain attempts to theorise and talk about emergence and parametrics.[20] At the same time, empathy also underwent a period of renewed conceptual development in design theory and practice, as a way of thinking about movement in animation and parametric design, by for example Lars Spuybroek and Kari Jormakka.[21]

7.3 Space and Mimesis

When reading architects talk about space, it often seems like they are referring to a mystical, metaphysical substance. This for instance is Le Corbusier on the subject:

> ... the architect, by his arrangement of forms, realises an order which is a pure creation of his spirit; by forms and shapes he affects our senses to an acute degree, and provokes plastic emotions; by the relationships which he creates he wakes in us profound echoes, he gives us a measure of an order which we feel.[22]

In recent decades, post-modern critics have often attacked this kind of discourse around space in modernist architecture, suggesting that it is an obscurantist attempt by architects to be elitist, to confuse clients and to confuse each other, and reflects a social desire amongst architects to be able to talk about something higher than the banalities of everyday construction. Whilst there is no doubt some truth in all of these assertions, I would argue that what appears to be a rather mystical and esoteric discourse, describing

obscure projections between mind and matter, is in fact simply and precisely that, and needs to be taken seriously as such (rather than merely dismissed as elitist *per se*). The architectural-aesthetic concept space does indeed have some very rhizomatic roots through a series of panpsychic and theological concepts.[23]

Even whilst various concepts of space have had a long history in the natural sciences, philosophy and mathematics, as Adrian Forty notes, "outside a small circle of German aesthetic philosophers ... 'space' simply didn't exist in the architectural vocabulary until the 1890s."[24] The concept of space was introduced into architectural discourse by August Schmarsow and Adolf Hilderbrand, and was intended as a supplement to the already established concept of form and as a tool of art historical analysis.[25] Further developed by fellow historians Alois Reigl and Paul Frankl, Schmarsow's proposition that "the history of architecture is the history of the sense of space"[26] was to be used to understand the formed spaces of different times and places as the traces or manifestations of different social, mental and cosmological sensibilities. As architectural historians they tried to empathise with the spatiality of other times. However, the term "space" quickly started to operate as a synthetic and propositional concept as well. Space was felt by modern architects as a complex concept which was able to express and manifest the emerging sensibilities and aspirations of modernity, in particular the concept of abstraction. The conception of architectural space developed by the empathy theorists was disseminated widely through the writings of Wilhelm Worringer, Siegfried Giedion, and by Walter Gropius who, van der Ven suggests, "adopted the idea of space as the core of the artistic research of the Bauhaus"[27] – the *leitmotiv* of an abstract yet *sachlich gesamtkunstwerk* led by architecture as the "mother art".

For these modernist architectural thinkers, it was through working with space that architecture might be able to contribute to and articulate a new international language, grounded in what humanity shared – our bodies and their spatial practices – rather than struggling with what Adolf Loos had famously dismissed as the impossibility of forming a modern metropolitan collective language based upon old or local symbolic ornamentation.[28]

In the account of empathy and space that follows, I wish to focus on three areas of analysis that are missing from the existing literature. The first primarily concerns the

historical interpretation of the emergence of the aesthetic discourse around empathy. Specifically, I argue that important strands of this discourse emerged from Young Hegelian circles, and, in addition, had a "panpsychic" component.[29] This historical account is in fact quite novel: the existing literature has almost exclusively emphasised the importance of Kantian aesthetics to these later German thinkers.[30] The Kantian interpretation is important to be sure, but it is also incomplete.[31] Importantly, I think, a consideration of the Young Hegelian tendencies within empathic aesthetics allows relations to emerge with other thinkers from this tradition, notably Karl Marx. In fact, just as Schmarsow suggested that the sense of space underwent historical development (an obviously Hegelian and not Kantian idea), Schmarsow's near-contemporary Karl Marx developed a number of ideas precisely about the historical production and social development of the human body and senses (not long after he had read Hegel's *Aesthetics*). It is useful therefore, I think, to read these two thinkers together. Furthermore, as already noted, some aspects of a later Marxian aesthetics in and around the Frankfurt School – notably the concept of mimesis of Benjamin and Adorno – develops directly out of the psychological aesthetics of empathy.

A consideration of these questions opens up questions concerning the relationship of an empathic phenomenology to technology, and the applicability of this approach to thinking about the new forms of spatiality which emerged throughout the twentieth century – in particular network architecture – and to considering how ideas concerning empathy are now playing an increasingly active role in interaction design today.

Finally, I will conclude the chapter as I started, tracing the relation between the origins of empathy in spatial aesthetics and the contemporary deployment of a conception of empathy in the theories of embodied mind philosophers and cognitive scientists. This connection has until recently been entirely missing from architectural accounts, and whilst work involving empathy in psychology or the cognitive sciences often provide accounts in passing of the origins and resonance of the term, these are often incomplete or simply incorrect. Getting this matter right is important, as I am asserting that empathy has a specifically spatial contribution to make to extended and embodied mind approaches to theorising mind and consciousness. Just as importantly perhaps, in terms of Bateson's

account, is that it is the distorted form, or even lack, of a modern empathy with ecological systems, that instantiates what Marx described as our “metabolic rift” with nature.

7.4 Pantheism and the Young Hegelians

> Germany is now the fertile soil of pantheism. This is the religion of our greatest thinkers, of our best artists ... Pantheism is the open secret of Germany.[32]
> [Heinrich Heine]

As mentioned above, the standard interpretation of the emergence of the German aesthetics of empathy typically describes it in terms of Kantian aesthetics. Adrian Forty, for example, repeats this interpretation of the origins of empathy, stating that Kant was “effectively the founder of this philosophical tradition.”[33] For Kant, of course, space was an *a priori* category, something which was structured into the mind, and which in turn structured bodily and mental experience of the world. Mallgrave and Ikonomou describe Kantian categories as:

> ... the presumption that we actively constitute form and space in our schematization of the world. They are, in effect, mental constructions of the observer, the subjective condition under which sense perception operates. They are less an image corresponding to an external reality and more a mode under which we arrange the objects of perception, a transcendental ideality.[34]

Whilst this clearly captures something of the active role of the observer in producing empathic spatial and formal experience, this remains on the whole, I think, fairly unconvincing as the primary source of empathy. Empathy was, right from the start, a much more systemic and mutually dynamic conception of relations between mind and matter. As we shall see, empathy is not at all accounted for simply as a theory of observation. Empathy is always a system, and always a reflexive or dialectical relationship between a mutually constituting subject and object. In empathising, there are projections connecting the imagination of the observer and the object, but these projections in a complex way subjectify the object, and are projected back, completing the loop. In the earliest roots of empathic thinking, these projections are imagined to be real spiritual

processes, and are as such immersed in a very non-Kantian set of discourses that were very much alive in eighteenth- and nineteenth-century European and specifically German culture – which, as Heinrich Heine suggests in the quote above, had more to do with pantheism (everything is god) and panpsychism (all matter has mental properties) than with Kantian critical philosophy.

Specifically, then, I suggest that we need to understand the development of the concept of empathy in relation to, on the one hand, the philosophy of Hegel, which was perhaps the first major modern dynamic systems theory, and, on the other, broader tendencies in German culture, in which organicist, panpsychic, animist, gnostic, romantic and neo-platonic philosophies were never far from the surface of intellectual debate – whether articulated through vernacular organicist conceptions of nature, or the substantial philosophical tradition of panpsychism, most notably including Leibniz, Herder, Goethe, Schopenhauer, Lotze and Spinoza (who whilst not German exerted a major influence there).

In fact, Hegel's system can be seen itself as a particular form of idealist panpychism, describing a universe pregnant with mind striving towards self-consciousness, a subject/object continuum in which these two poles are not entirely separate and discrete – i.e. this is me here, and that object over there is not me – but rather are connected areas of intensity within unfolding and evolving systems of mind and matter (objectified mind), or fields of alienation and relational abstraction. It is within this context of both vernacular and philosophical traditions of panpsychist thinking, and more specifically of course the legacy of Hegelian thought, that the Young Hegelians emerged around the University of Berlin, in the early-to-mid nineteenth century. Of this group, Ludwig Feuerbach, Karl Marx, Friedrich Engels and Frederich Theodore Vischer are of particular interest here.[35] All of these writers were to develop theories of projective alienation. Feuerbach first directly attempted a materialist reworking of Hegel, and specifically attempted to reverse Hegel's emphasis on the role played by religion in understanding mind and matter. In *The Essence of Christianity* (1841), he argued that rather than some universal spirit being present in and realised though man, it was rather man that created God and religion, as projections – and thus as alienated forms – of himself. The importance of Feuerbach's influence upon Marx is well documented, not least by Marx himself. Less well documented

– in fact almost completely un-commented upon within Marxian scholarship – is the influence of Frederich Theodore Vischer, whose major work, the four volumes on *Aesthetics* (1846-56), we know was read and returned to by Marx at various times in his life.[36] Vischer's *Aesthetics* was a massive study based upon Hegel's own book on *Aesthetics.* For Vischer, the subject of aesthetics is important as he finds in it a more advanced stage of spiritual development than religion, and it provided for him something similar to what Marx had in parallel described as "making the world philosophical."[37] In the words of William J Brazill, the role of aesthetics for Vischer is seen as:

> ... the overcoming of alienation, a progressive fusion of human consciousness with matter that was itself the meaning of history. Thus for Vischer aesthetics was the key to human development, for man fashions his own consciousness in historical forms so that he might know as an object the spirit inherent in himself.[38]

Whilst, no doubt, Marx would have been influenced by Hegel's text on *Aesthetics*, rather than by that of Vischer *per se*, it is clear nonetheless that he maintained an interest in Vischer's book. It is this that constitutes, I suggest, a link between two revolutionary new discourses of the nineteenth century: on the one hand that of Marx, and on the other that of the architectural and aesthetic concepts of space and empathy. In both of these discourses, as arguably in Hegel himself, subject and object co-evolve in dynamic systems and relational networks that display immanent or what we would today describe as emergent or animated properties.

Hegel stated that "art spiritualizes, it animates the mere outward and material object with a form that expresses soul, feeling, spirit."[39] However, if for Hegel the aesthetic object is really an expression or objectification of mind, and for F.T. Vischer it was rather more like humanised matter, for the latter's son, Robert Vischer – who as I noted used the term *Einfühlung* – it was more clearly, as van de Ven describes it, "that the soul was no longer innate in the object observed, as Hegel maintained, but it was rather a projection from the individual observer."[40] In other words, Hegel's spirit was now becoming space itself.

In his essay *On the Optical Sense of Form* (1873), Robert Vischer builds upon an panpsychic phenomenology and aesthetics taken from the elder Vischer's work,[41] but developed through a cross-reading with the insights of the proto-Freudian Karl Albert

Scherner, whose work on *The Life of the Dream* (1861) was acknowledged by the younger Vischer when he wrote:

> ... here it was shown how the body, in responding to certain stimuli in dreams, *objectifies itself in spatial forms*. Thus it unconsciously projects its own bodily form – and with this also the soul – into the form of an object. *From this I derived the notion of empathy*.[42]

In this ambitious text, Robert Vischer outlined the major components of a sophisticated theory of architectural empathy, developing a socio-biological thesis on beauty through a series of descriptions of different types of formal empathy. These ranged from speculations about correspondences between material form and the physical biological structures of our senses and nerves – through statements such as "the horizontal line is pleasing because our eyes are positioned horizontally"[43], and even "light produces an agreeable vibration in the respective nerve group through the regular form of its wave movement"[44] – to general statements about the projecting of the sensations of the body in the process of establishing aesthetic relations with matter:

> I can without difficulty place myself within its inner structure, at its centre of gravity. I can think my way into it, mediate its size with my own, stretch and expand, bend and confine myself to it.[45]

In a particularly interesting passage in relation to Marx's conceptions of tool-organ prosthesis and technology (remembering the discussion in Chapter Three), Robert Vischer described the particular type of empathy at work when we use tools:

> We invent working, driving, primordial figures, derived from the created world, figures who treat things as such simply as an appendage of themselves, very much as I feel a stick to be an extension of my arm and an increase of my power. This is a special sense of form [*Formgefühl*], which, like a foreign shoot grafted onto pure self-feeling, can be described as a continuation of it.[46]

In this passage Vischer directly anticipates some of the mirror neuron cognitive mapping research discussed in the last chapter, which shows how our mental maps of the space of our body, and the space around our body, is literally incorporated in tool use.

If Vischer was here recognising the extent to which our conception of self is an active process of production, for Marx, too, there was no "natural" or "normal" condition of humanity. He too sees the species as being self-consciously productive in the world. That is to say, humankind produces itself as species, it produces its world: as such, it produces its own self-consciousness. This consciousness is the opposite of matter, but also identical with it. This is because for Marx consciousness emerges out of productive material sensuous activity. He states that "production thus not only creates an object for the subject, but also a subject for the object."[47] Again, Marx paraphrases the elder Vischer's book on *Aesthetics*, noting "the beautiful exists only for consciousness … beauty is necessary in order that the spectator may merge with it [matter]"[48] – and, again, "that the enjoyment of the beautiful is immediate, and that it requires education would seem to be contradictory. But man becomes what he is and arrives at his own true nature only through education."[49] Quoting Schiller, Marx notes that "beauty is simultaneously an object, and a subjective state. It is at once form, when we judge it, and also life when we feel it. It is at once our state of being and our creation."[50]

When Marx asserts that "man is affirmed in the objective world not only in the act of thinking, but with all his senses,"[51] he is returning to an aesthetics of the human body as a way of developing Feuerbach's materialist critique of Hegel beyond the limits of either materialist and idealist philosophy. The objectification of reality, the projection of man's subjective forces and abilities, is itself a material process for Marx. So when he declares, "all *objects* become for man *objectifications of himself*,"[52] and "the sense of an object for me goes only so far as my senses go,"[53] he seems to be thinking in ways very close to Schmarsow. This can be seen when he writes "the spatial construct is, so to speak, an emanation of the human being present, a projection from within the subject."[54] Similarly, when Marx suggests that "the senses have their own history. Neither the object of art nor the subject capable of aesthetic experience comes of itself"[55], and again "the senses have become theoreticians in their immediate practice"[56], and "the forming of the five senses is a labour of the entire history of the world down to the present,"[57] he seems to be laying

the philosophical basis for why, as Schmarsow noted, there is a dialectical history of the sense of space. Equally, the empathy theorists were in effect engaged in the kind of intellectual work – i.e. a detailed historical study of our historical forms of body sensibility – that Marx seems to call for (think for instance of his comments regarding the need for "a critical history of technology"), and which, in terms of the sense of space, Lefebvre would later interpret as "rhythmanalysis".

More generally, it was in unravelling the animistic nature of the commodity that the structures of a panpsychic aesthetics would be so productive for Marx. The commodity is for Marx "a very queer thing, abounding in metaphysical subtleties and theological niceties,"[58] which has, he suggests, "a mystical character."[59] The commodity, Terry Eagleton notes, is:

> ... a kind of grisly caricature of the authentic artefact, at once reified to a grossly particular object and virulently anti-material in form, densely corporeal and elusively spectral at the same time. The commodity for Marx is the site of some curious disturbance of the relations between sense and spirit, form and content, universal and particular: it is at once an object and not an object.[60]

Marx developed this analysis in order to establish the basis from which to rewrite history, economics and philosophy, this time starting from the experience of the sensuous human body – as a naturalism – into its extensions and prosthetics in the form of (class) society. These extensions of the body are for Marx *organically* produced and reproduced by technology (as discussed in Chapter Two), which takes on the "aesthetic" task of engaging with matter. Technology and art therefore play a similar aesthetic role here. Both mediate or bridge the gap between subject and object, between consciousness and matter.

Heinrich Wölfflin states, in line with empathy theory in general, that "our own bodily organisation is the form through which we apprehend everything physical"[61] and that "architecture, as an art of corporeal masses, can relate only to man as a corporeal being."[62] If, as Mark Wigley has observed, "the evolution of technology is the evolution of the human body,"[63] then we might expect that as our bodies are extended and transformed by what Marx describes as "the productive organs of man in society, of

organs that are the material basis of every particular organisation of society,"[64] so too is our sense of space. This is not to suggest that our sense of space, and thereby architecture, simply reflects in some linear relationship other socio-technological forces (such as are described by the more mechanistic versions of the Marxist base/ superstructure model), but, rather, are better understood as a part of a cybernetic system of mind. Indeed, as Paul Frankl – one of the second generation of historians to come out of the German empathy school – observed, architectural form is semi-autonomous; we can look to changes in architectural form as the basis for local and temporal changes in metaphysical ideas, as much as the other way around. If, for Marx, it is through the new material organs of industrial technology, and the new immaterial organs of the networks (or ecologies) of capital flows and commodity exchange, that the human being has been most clearly extended and the commodity form "animated", then it is towards these aspects that we should we should turn in search of the next stage of development in thinking about empathy and space.

7.5 Global Networks: Making the Invisible Visible

> We could create the universality of consciousness foreseen by Dante when he predicted that men would continue as no more than broken fragments until they were unified into an inclusive consciousness. In a Christian sense, this is merely a new interpretation of the mystical body of Christ; and Christ, after all, is the ultimate extension of man ... I expect to see the coming decades transform the planet into an art form; the new man, linked in a cosmic harmony that transcends time and space, will ... become an organic art form. There is a long road ahead, and the stars are only way stations, but we have begun the journey.[65] [Marshall McLuhan]

Roy Ascott has suggested that art in the twentieth century was preoccupied with the question of making the invisible visible.[66] *Locally Available World unseen Networks* certainly matches that description. Better known by its acronym, *LAWuN* is a project that Archigram member David Greene has been working on for the last forty years. It is work that seeks to project architecture away from matter – i.e. away from building and towards pure network, pure event-information-space. Recent manifestations of the work have for example been based upon live performances and mobile phones. Older manifestations

Electronic Empathy

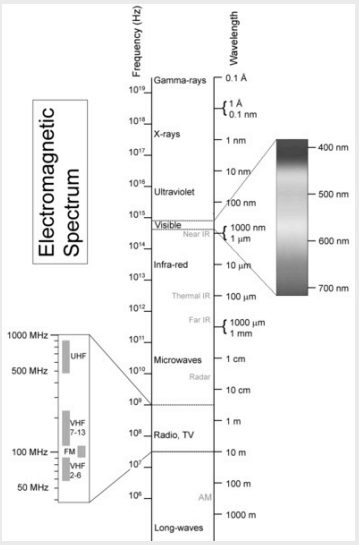


Figure 7.1. The electromagnetic spectrum. Architecture has tended to focus on frequencies of visual light, but this starts to expand in the work of David Greene and others.
Figure 7.2. David Greene and Michael Barnard, Invisible University-The Infraneutral Electrical Aborigine, 1974.

Figure 7.3. A scaffolding frame in a field, adjusted photograph by David Greene, LAWUN Project 2 (1972): “The nearest thing to a village or town or building that should be allowed.” It is I think significant with regard to Greene’s project that the Hegelian, Alexandre Kojève, would suggest that if post-historical man became animal again, he would build like a spider, constructing networks, cages, scaffolding, and bridges.

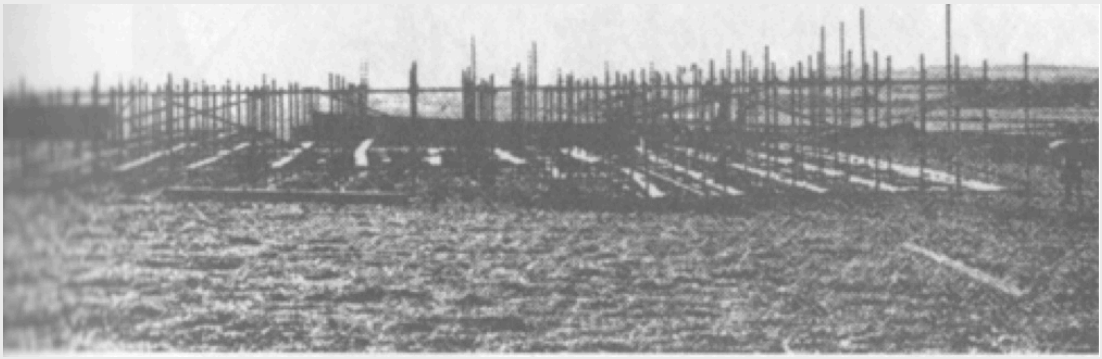
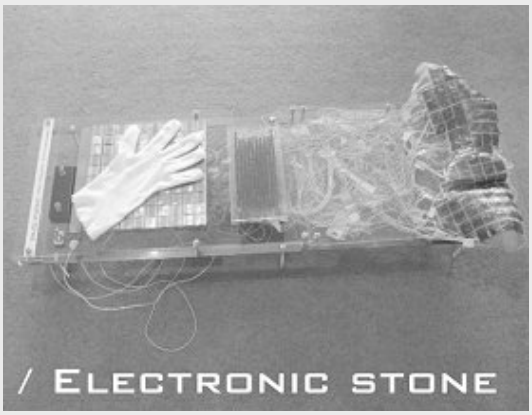


Figure 7.4. Greene continues to develop LAWUN projects, and in the 2004 exhibition in a window of the Selfridges store on London’s Oxford Street, included the work of several digital artists and students, including research from my Polytechnic design studio: Fig. 7.5. *The Electronic Stone* by Chris Gotsis (2005).



typically featured “Electric Aborigines”: technologically-extended nomads who would travel with their own prosthetic environments.

According to Greene, fixed, permanent architecture will be reduced to “a servicing frame in a field waiting to be used or built upon. Very concentrated. The nearest thing to a village or town or building that should be allowed.”[67] For him, the real architecture here happens at the interface of the body and the ether of communication networks encompassing the planet.

LAWuN remains a highly contemporary project,[68] even whilst this work is very openly indebted to mid-twentieth-century communications theorists such as Marshall McLuhan, who in turn was indebted to Gregory Bateson’s ecological conception of communications media. At the same time, we can explore the pre-occupations within LAWuN and find useful affinities that are much older. If the medieval cathedral used the experience of one immaterial medium – light – in conjunction with matter to ask theological questions through architectural experience, is Greene perhaps just doing the same but with a three-fold increase in wavelength from visible light waves to the realm of invisible radio waves?

In order to approach this question, it is useful to return briefly to Hegel’s theory of aesthetics. For Hegel (simplifying enormously), art was an expression of the development of spirit/mind through time. For the Hegelian “Idea” to be fully expressed, it was necessary for it to overcome matter, which is why for Hegel architecture was the lowest of arts.[69] Hegel suggested that the last stage of architectural development was the Gothic interior, which he described as a chamber of mind, and “the concentration of essential soul life which thus encloses itself in spatial relations.”[70]

In fact, it is in relation to Hegel that Cornelis van der Ven makes what is I think his most suggestive observation, which is that if architectural theorists took Hegel’s hierarchy to heart – and so long as architecture only thought of itself as an empathic relation between the corporeal human body and the mass of a building – then architecture would stay at the lowest level. However, to the extent that architecture is able to re-theorise itself as being primarily about the empathic relation between the living body and *space*, architecture might perform a dramatic dialectical jump! By redefining architecture as not just an, but *the,* art of space, rather than an art of substance, the way can be found to

Pantheistic images within contemporary culture

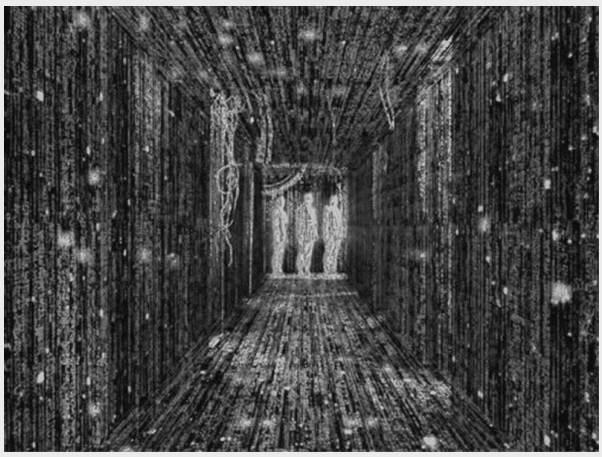


Figure 7.6.The Emperor, from Star Wars (1977).
Figure 7.7 The Matrix (1999)
Figure 7.8 Discredited (though very popular) images of Kirlian field photography.

position architecture as the highest rather than lowest of art of a Hegelian aesthetics. Within such a schematic, we can conclude, immaterial architectural projects, such as Greene's LAWUN, are the most Hegelian architectural projects of all!

There is, however, yet more at stake in these issues than might at first appear. Greene is not alone in working with what I argue are the *spiritual forms* of invisible networks or fields. A pantheistic cosmology, which in its general form imagines the universe of matter to be interpenetrated with fields or networks of energy or spirit centred upon the active human body, is a surprisingly frequent image in contemporary global culture, and can be found in manifestations as varied as the 'Jedi force' in the Star Wars films to the dominance within contemporary management theory of what we might (following Slavoj Zizek) call 'Wall Street Buddhism'.[71] More than just a by-product of entertainment technology, or a commodification of eastern religions, this panpsychism has had, as I have suggested, a particularly productive and interesting history, drawing together in perhaps unexpected ways the philosophy of Karl Marx and the emergence of the discourse around space in architecture. In Marx, a form of panpsychism is used to describe the quasi-mystical properties of the commodity. In modern architecture, spectres of Hegel's *Geist* still animate the concept of space.

7.6 Empathising with Abstraction - Metropolis and Mind

If Worringer, Giedeon and Gropius developed and disseminated one spatial discourse out of empathy theory into architecture, then a second related discourse – also grounded in a "post-Hegelian" theory of formal alienation – emerged in sociology. Georg Simmel, perhaps more than any other thinker, took on the relation that empathy thinking had articulated between architectural and urban form and mental form. He conceived of the city as "an objective mind", an expression of what he described as "the great project of the mind, to overcome the object as such by creating itself as an object, and, thereby enriched, to return to itself."[72]

For Simmel, there are important correspondences between the forms of experience, the forms of society and the forms we make – specifically the form of the modern metropolis.[73] Simmel suggests that "the city is not a spatial entity with sociological

consequences, but a sociological entity that is formed spatially,"[74] and hence the metropolis provided the particular conditions in which the 'space' of concrete experience (superindividual 'society') and the 'space' of inner experience (individual subject) are mapped onto each other. This mapping is a 'pattern that connects' if ever there was one. In fact, we might add to our previous definition of the metropolis as the pattern that connects nature and culture, a second definition: the metropolis today is the pattern that connects the individual and the multitude.[75]

Frankl's suggestive remarks concerning the active role that physical form (as material concepts) might have in producing metaphysical ideas were given further resonance by Simmel, and were soon tested for political potential in the cauldron of Weimar Germany, where the concept of form oscillated headily between aesthetic and sociological registers. For an activist architect like Bruno Taut, this socio-aesthetic opening of form suggested that "architecture will thus become the creator of new social forms."[76] Taut was no doubt encouraged in this approach by the (heavily Simmel-influenced) architectural theorist, Adolf Behne, who, as Forty puts it:

> ... attempted to reverse the prejudice against form as inherently asocial by suggesting that 'form' was the means by which individuals would acquire consciousness of the collective nature of the society to which they belonged.[77]

In a fascinating passage that captures many of the possibilities and problems associated with modernist architectural theory's attempt to work through the demands placed upon it, in part through this dual conception of form, Behne stated:

> ... form is nothing more than the consequence of establishing a relationship between human beings. For the isolated and unique figure in nature there is no problem of form ... The problem of form arises when an overview is demanded. Form is the prerequisite under which an overview becomes possible. Form is an eminently social matter.[78]

We could easily replace "form" with "pattern" in the above passage and make out of it an interesting cybernetic reading. What really stands out is the phrase about "the problem of an overview." This really is a problem, and in fact it is a first-order error: for anyone to

imagine that form or pattern can in itself provide an overview, in and of itself, presumes the kind of detached and transcendental viewing position that so alarmed Bateson when regarding first-order systems approaches. As suggested previously, what is interesting about empathy theory is that it is a second-order aesthetic discourse, in that the observer is always necessarily "in the circuit". However, the kind of formulation that Behne slips into above directly anticipates (and no doubt encourages) the kind of non-reflexive instrumental and determinist use that the concept of form was indeed put up to within certain strands of modernist practice.[79] As Forty concludes with regard to form:

> ... developed in the nineteenth century as a solution to certain specific problems – in particular the nature of aesthetic perception, and the processes of natural morphology – 'form' was an extraordinarily productive concept ... But whether it has been so successful an aid to thought about the different problems confronting architecture in the twentieth century is more doubtful ... it might be said to have had disastrous consequences through its part in sustaining the belief in architectural determinism.[80]

Although, then, as Behne suggests, it is indeed possible to see "a form in humanity, a pattern articulated in time and space,"[81] the challenge would seem to be precisely not to objectify pattern, whether in theory or practice. Although I cannot pursue this point in detail here, it is important to note that Simmel's conception of society as a formal pattern did not just influence architectural and urban thought, but provided the basic premise of sociology in general. As Adrian Forty again notes, "Simmel was promoting sociology as a science of forms."[82] It seems to be a commonplace in recent sociology readers to observe, for example, that Ruth Benedict's seminal anthropological work on *Patterns of Culture* (1934), produced the equivalent of Simmel's metropolitan analysis for pre-industrial social form.[83] Bateson and Mead were of course personally associated with Benedict and her work, and this is one route through which we can connect some aspects of Bateson's ecology of mind approach to social form back to Simmel.

There are also other parallels. The spatial separation that occurs for Simmel between inner and concrete experience is, he argues, repeated within the psychic space of the metropolitan individual. It creates exactly the kind of recursive and self-obscuring pathology produced by the messages (including messages transmitted through the media

of money) between the individual body and the social environment that so preoccupied Bateson half a century later. Simmel famously described how the intensity of nervous stimulation that the metropolitan individual is subjected to leads to the emergence of the blasé attitude of the city dweller. This is best understood as the "growth" of an "extra organ" – i.e. a "distancing organ" in the psychological switch from emotional to rational thought that occurs as a defensive mechanism in the individual to cope with living in what Baudelaire, in a memorable and important phrase for both Benjamin and Simmel, had described as a "kaleidoscope equipped with consciousness."

McLuhan too refers to Baudelaire, suggesting that the latter:

> ... had in mind the city as corporate extensions of our physical organs. Our letting go of ourselves, self-alienations, as it were, in order to amplify or increase the power of various functions, Baudelaire considered to be the flowers or growths of evil. The city as amplification of human lust and sensual striving had for him an entire organismic and psychic unity.[84]

It should come as no surprise, then, that something closely associated to Simmel's blasé attitude formed the starting point for media theorist Marshall McLuhan's analysis of "the extensions of man", in the next phase of metropolitan development in the post-war period.[85]

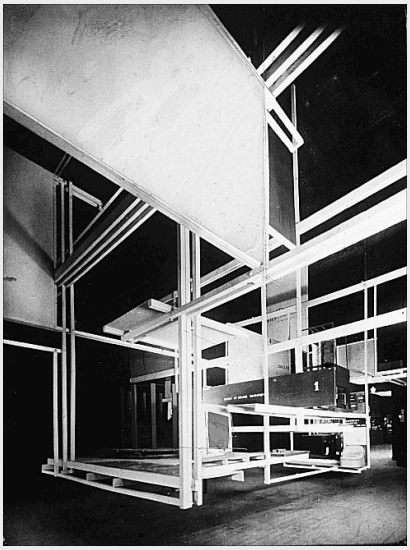
7.7 Network Spatiality

> A building today is interesting only if it is more than itself; if it charges the space around it with connective possibilities.[86]
> [Alison and Peter Smithson]

As Mitchell W. Schwarzer has noted, by the mid-1940s the architectural and art historian, Paul Zucker, felt able to reformulate:

> ... the spatial divisions that Schmarsow had previously given to the three visual arts. Alongside architecture (shaped space and formed mass), Zucker rehabilitated sculpture as a spatial art (formed masses and spaces shaped by them) and added the new category of urbanism (shaped space and organized directions).[87]

Network Imaginaries



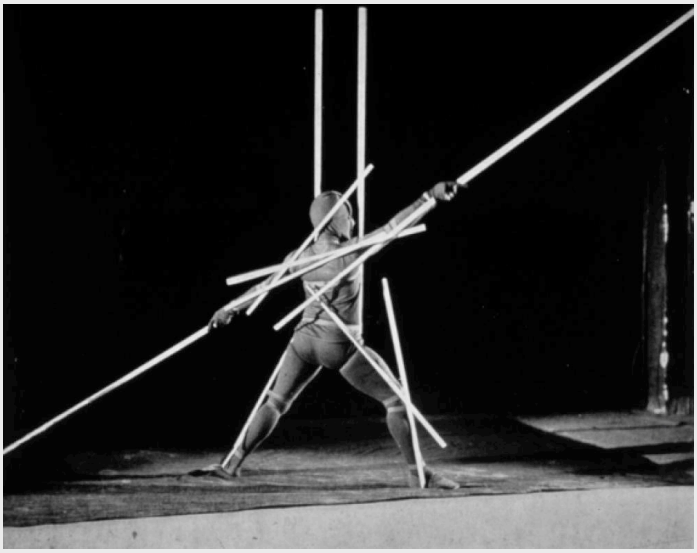


Figure 7.9 Frederick Keisler, ‘Future City’ installation (1937)
Figure 7.10 Oskar Schlemmer, ‘Dance of Slats’, Bauhaus stage (1927)

In these network projects shown above we find an architectural web that ultimately encompasses the planet, in the guise of an interface to, a framework for, or a reification – a making visible and material – of the immaterial networks of modernity. And just as the initial experience of immaterial networks radically develops and extends through processes of alienation the sensuous human body, these environmental interfaces continue to ask questions of subjectivity in modernity, the separation of subject and object, as a dialectic of mind and matter.

However, it is not at all clear, I think, how we should conceive of the utopian architectural network projects. Should these be understood as actual propositions, or should they be understood as ways to use the architectural imaginary to think about things, and to produce concepts, that cannot be formulated in any other way?

Schmarsow's spatial divisions have in fact been revised several more times since being expanded into urban theory in the first half of the twentieth century. Perhaps one of the most important reinterpretations – in that it still very much pertains to aspects of our sense of space – is that already anticipated in the earlier discussion of Greene's LAWuN project: that is, the network.

The network can be seen as a structural figuration of space consciousness in modernity, one of the forms through which we currently imagine and reproduce our relations to society and the world. Indeed, following Manuel Castells, we might say the network is *the cultural form* of global capitalist metropolitan modernity. As an idea, and a conceptual figure, the network has a long intellectual history. As we have seen in Chapter Two and Chapter Three, the network emerged as a concept in eighteenth-century biology, and, by the nineteenth century, images of networks could be found structuring abstract scientific diagrams in physics, biology and chemistry as atomic structures, force fields and bodily circulation systems, and increasingly as concrete realities in the form of town and regional plans, or as transportation, communications and infrastructure systems.

The figure or concept of the network has been very productive in modern times as a tool, as a piece of technology, partly because of the complex formal properties of the network figure: it is potentially endless, isotropic, heterotropic, dynamic, non-centred, centred, multi-centred. And these formal properties allow us to use the network to describe and analyse and produce phenomena as varied as those listed above. We can clearly see the ecological usefulness of the modern conception of the network in Fritjof Capra's description of living systems:

> ... whenever we encounter living systems – organisms, parts of organisms, or communities of organisms - we can observe that their components are arranged in network fashion. Whenever we look at life, we look at networks ... the first and most obvious property of any network is its non-linearity – it goes in all directions. Thus the relationships in a network pattern are non-linear relationships. In particular, an influence or message, may travel along a cyclical path, which may become a feedback loop. The concept of feedback is intimately connected with the network pattern ... self organisation has emerged as perhaps the central concept in the systems view of life, and like the concepts of feedback and self-regulation it is

Network Imaginaries

Figure 7.11 Superstudio, “In the future there will be no need for roads or squares” (1971)

Using concepts that can be productively turned to think upon this utopian network imaginary, Manuel Castells has argued that today our condition might be describes as “increasingly structured around the bipolar opposition of the Net and the Self”, as played out within and between an “opposition between global and local” – or what he calls “the space of flows” and “the space of places”. The “space of flows” is the abstract and yet very real dynamic networks of capital, communications, transport, technology, commodities, etc. circulating around the planet. The term also encompasses our mind’s experience and mapping of this space, and the real physical places dedicated to enabling these flows: “the corridors and halls that connect places around the world”. The “space of places”, by contrast, is the specific, physical, local, historical material world that we live in everyday. Although the space of flows sits “above” and in relation to the space of places, they map onto each other unevenly (see Harvey et al), and unequally.

Cities, argues Castells, are artefacts uniquely and problematically positioned as a mediating interface between these competing spaces: “Cities, as communications systems, are supposed to link up the local and the global, but this is exactly where the problems start since these are two conflicting logics that tear cities from the inside when they try to respond to both, simultaneously.”[113]

Nonetheless, he argues that we need to build between the space of flows, and the space of places, a series of “cultural, political and physical bridges.”[114] These projects anticipate Castell’s demand, for an architecture that connects, mediates, provides an interface between the space of flows and the space of places.

> closely linked to networks. The pattern of life, we might say, is a network pattern capable of self-organisation.[88]

Beyond the descriptive and analytic power provided by its formal properties, the network's importance as a socio-cultural gestalt figure is no doubt also due to its resonance or correspondence with the dominant organisational forms within capitalist society: in other words, the production, circulation and exchange of capital and commodities. Quite simply, mental images or cognitive maps of global networks are produced through the experience of the circulation of capital and commodities, and through communication patterns. For the modern metropolitan subject, our lived everyday encounters with these network environments fundamentally and radically changed our understanding of ourselves in relation to objects, environments and each other. For Simmel, they produced a distinctly extended body and mind:

> A person does not end with the limits of his physical body or with the area to which his physical activity is immediately confined but embraces, rather, the totality of meaningful effects which emanates from him temporally and spatially.[89]

These experiences are something to do with the way we *produce* our own sense of space. In pre-industrial society, every object that an individual was likely to encounter in their lives would come from their immediate world. Each object would thus have a local history, meaning, use value and so on. For the individual in modern industrial society, however, the relationship through exchange to every other object on the market network is radically different in kind. The market network came to be experienced as an extension of the local environment, and experienced as a transformation of the individual's sense of space. Developments within communications technologies, as noted by Marshall McLuhan, similarly intensify our experience of the extensions of the local environment created by market networks, more specifically as extensions of the individual themselves, and are equally radical in transforming our experience of, and sense of space. He suggests that "any extension, whether of skin, hand, or foot, affects the whole psychic and social complex."[90]

Immersion in Networks

Figure. 7.12-15 Stills from Reyner Banham's documentary film "Reyner Banham Loves LA" (1972).

The obsession of architectural historian Reyner Banham ("I learned to drive in order to read Los Angeles in the original") and his contemporaries with the automobile could be seen as an outdated form of object worship, and in a sense it was. But it was also an expression of something else – in fact the clearest possible expression of a particular modern condition: that of occupying a network, in this case a network of roads. We should not, then, think of the object "car" as the actual machine, the end game. The car is just the first level immersive interface to a much bigger assemblage: the entire road network. The car is a means by which man could immerse and extend himself into the network organism as an experiential system: the *man - car - road network*.

McLuhan was influenced by Gregory Bateson in all kinds of ways, and for "media ecologists" such as Paul Ryan,[91] or artists such as Dan Graham, this pair of thinkers constituted the twin columns of a whole new way of thinking about modern global environments. In many ways, McLuhan's conception of the way that media construct messages – for McLuhan, "the 'content' of any medium is always another medium"[92] – owed much to the communicational theories that Bateson (and indeed many others) were working on in the 1950s. For Bateson, it was useful to think about the nature of messages through a theory of logical types, in which "human verbal communication can operate and always does operate at many contrasting levels of abstraction"[93], and "every metacommunicative or metalinguistic message defines, either explicitly or implicitly, the set of messages about which it communicates."[94]

McLuhan made an innovative reading of this basic conception from information theory that a message always contains multiple levels of meaning, some of which concern clues about how to contextualise and interpret a signal. Essentially, I suggest that he used the same structure to think about the way that new media and technology work as new forms of metacommunication themselves, recontextualising the existing field. Like Bateson, and like Marx before that, McLuhan insists that because technologies – which for McLuhan are media – are real extended organs, then it is new media which constantly *reorganise* the entire personal and social body. He suggests that:

> ... the effects of technology do not occur at the level of opinions or concepts, but alter sense ratios or patterns of perception steadily and without any resistance. The serious artist is the only person able to encounter technology with impunity, just because he is an expert aware of the changes in sense perception.[95]

Buildings and cities, too, can be interpreted as media, but they seem to occupy a particularly complex position in McLuhan's model. He notes in general that cities support what the young Marx described as our "species being", our life processes. McLuhan states, in an essay on "Housing: New Look and New Outlook", that:

> ... if clothing is an extension of our private skins to store and channel our own heat and energy, housing is a collective means of achieving the same end for the family or the group. Housing as shelter is an extension of our bodily heat control

Figure 7.16 Moscow Metro Station (1930s)
Figure 7.17 Gants Hill station, east London, on London Underground Central Line (1930s).
Public transportation systems offered similar potential for systemic immersion, as a collective subject, and carried with them, through their shared and non-consumerist interface a potential for a quite different social imaginary, as Frank Pick and Charles Holden on the London Underground, and of course the designers of the Moscow Metro, understood clearly.

> mechanism – a collective skin or garment. Cities are an even further extension of our bodily organs to accommodate the needs of large groups.[96]

Whilst buildings and cities are in this basic sense extensions of our metabolisms and our bodies, the other media that buildings and cities frame and enable are also extensions of our nervous systems, and our minds, and some must in a complex way (according to McLuhan's own conception outlined above) take architecture as their content. Interestingly, this reflexive condition of architecture seems to get played out in a very particular set of formulations that can only be understood as concerning a shift in the sense of space. Remembering that, for McLuhan, language in general had initiated a fragmentation in consciousness, he suggests that:

> ... literate man, civilised man, tends to restrict and enclose space, and to separate functions, whereas tribal man had freely extended the form of his body to include the universe. Acting as an organ of the cosmos, tribal man accepted his bodily functions as modes of participation in the divine energies.[97]

However, for McLuhan, the fragmentation that he associates with the technologies of mechanisation starts to be reversed with electronic media. He suggests that "electric circuitry is Orientalizing the West. The constrained, the distinct, the separate – our Western legacy – are being replaced by the flowing, the unified, the fused."[98] This suggests for McLuhan that "the aspiration of our time for wholeness, empathy and depth of awareness is a natural adjunct of electric technology."[99]

There is, I suggest, an important connection between the emerging sensibility that McLuhan is trying to describe in these quotes, and the role that the network played (and continues to play) in the modern architectural imaginary. McLuhan is no doubt astute in associating these shifts in spatiality with the immaterialisation and transformation of production, and social relations more generally, through electronic media. However, given that this shift can be traced back, as I have argued, to the nineteenth century, it seems plausible that what the "electric" presents in a pure and experientially immaterial form (forgetting for a moment that there is an enormously real and material production machine

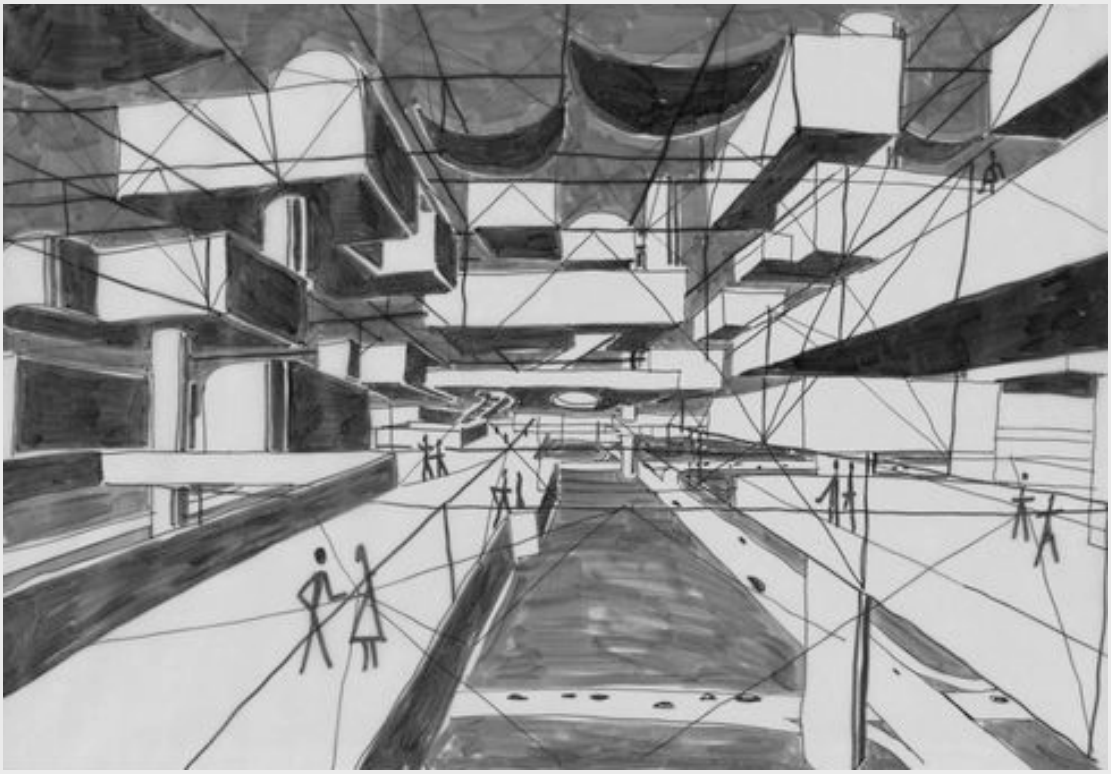
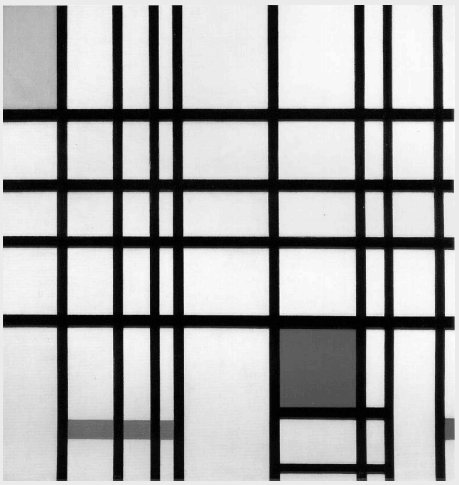
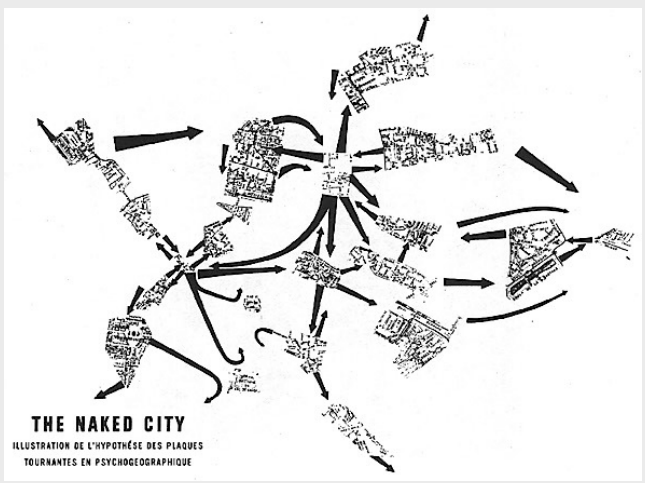


Figure 7.18 Yona Friedman, three dimensional future city studies (1950)
Figure 7.19 Mondrian, Composition with Red, Yellow and Blue (1921)
Figure 7.20 Guy Debour, The Naked City (1969)





that makes “electricity”) is the product of immersion in global production, exchange networks and social relations.

In fact, it seems to me that it is absolutely clear that this shift in the sense of space – through the way that individuals produce cognitive maps to describe their relations to their social and physical environments – can be clearly seen in modernist architectural and artistic production. Whilst there are of course a few major typological precedents for the network which can be found in pre-modern art and architecture, suddenly by the early-twentieth century the network is everywhere. We can feel the presence of infinite networks for instance in the painted grids of Mondrian, where we can find expressed, as van der Ven suggests, “the new spirit, that of space itself, as the visible immaterialisation of form.”[100] We can empathise and project ourselves into dynamic networks in the force-field forms of the Futurists and Expressionists. We can plug ourselves into and wear the endless megastructural frameworks of post-war architects ranging from Constant to Soleri, Archigram to the Metabolists, Friedman to Superstudio. Ultimately, these various endless three-dimensional gridwork studies are I think spectres associated with Alexandre Kojève’s suggestion that if post-historical man became animal again, he would build like a spider, constructing networks, cages, scaffolding, and bridges.[101]

7.8 Ecological Empathy

I started this chapter with a discussion of the concept of empathy as a theory of mind in the work of Lipps, and its shift of the concept into new areas of psychology and philosophy, where it continues to undergo interesting development whilst retaining its original spatial component. One of these strands of development led into phenomenology, where it was taken up in particular by the philosopher, Edmund Husserl, to form the basis of key phenomenological conceptions of perception and inter-subjectivity. For example, Evan Thompson makes a series of observations, following Husserl, along the lines that empathic processes are initiated in every act of perception – in that, whenever we observe an object, we are aware that we cannot see all sides of it. We imagine, at some level, what it must be to perceive the object from other subject positions, in a process described in phenomenological philosophy as *appresentation*.

In fact, Thompson argues that empathy is an extremely significant concept, and is nothing less than "the precondition of the science of consciousness."[102] He states that:

> ... if the phenomenological analysis of empathy and the open intersubjectivity of consciousness is on the right track, then it follows that the naturalistic perspective of cognitive science presupposes empathy as its condition of possibility, in particular the reciprocal empathy by which self and other are concretely co-determined. By this assertion I do not simply mean that cognitive science is an intersubjective enterprise that depends on the shared, pre-theoretic, lived experience of the scientists themselves. I mean something more radical, namely, that the very object of cognitive science – the embodied mind as a natural entity – is constituted as a scientific object through reciprocal or reiterated empathy in the human life-world.[103]

Lakoff and Johnson put the concept of empathy to a related albeit different task. They started in territory normally outside of the scope of naturalistic accounts, although on similar ground to Bateson's later work, by observing that "imagined empathic projection is a major part of what has always been called spiritual experience." They added that:

> ... the capacity for imaginative projection is a vital cognitive faculty. Experientially, it is a form of 'transcendence'. Through it, one can experience something akin to 'getting out of our bodies' – yet it is very much a bodily capacity.[104]

They also suggest that empathy must play a role in what they describe as a theory of "embodied spirituality", recognising what Bateson would insist is the "mental" character of the environment. Here they declare:

> ... the environment is not an 'other' to us. It is not a collection of things we encounter. Rather, it is part of our being. It is the locus of our existence and identity. We cannot and do not exist apart from it. It is through empathic projection that we come to know our environment, understand how we are a part of it and how it is a part of us. This is the bodily mechanism by which we can participate in nature, not just as hikers or climbers or swimmers, but as part of nature itself, part of a larger, all-encompasing whole. A mindful embodied spirituality is thus an ecological spirituality ... [and] requires an understanding that nature is not inanimate and less than human, but animated and more than human ... embodied spirituality is more than spiritual experience. It is an ethical relationship to the physical world ... it is thus

> an activist moral attitude not just towards individuals, but towards society and the world.[105]

I think that this ecological extension of empathy is extremely important and useful in many ways. However, we are essentially talking about complex forms of cognitive mapping, and it is useful at this point to recall the provocative suggestions that Frederic Jameson has made in this direction. This is doubly significant, as Jameson also brings to the fore the role of ideological critique in regard to cognitive mapping, reminding us that there is always a politics behind the maps that we produce, and the individual and collective selves that we thereby bring forth.

Jameson, in his often referenced essay on "Cognitive Mapping", sets out some "possibilities for a new kind of Marxist aesthetic"[106] – one which ideologically examines spatial sensibility, looking for what Louis Althusser described as "the Imaginary representation of the subject's relationship to his or her Real conditions of existence," via what Jameson calls "an extrapolation of [Kevin Lynch's] spatial analysis to the realm of social structure." [107] For Jameson, there is – as Simmel, Kracauer, Worringer, Behne and the second generation of empathy theorists suggested – some kind of correspondence between the forms of society, the forms of individual experience, and the forms of the environment. In fact, I would suggest that the network, as considered above, can be understood as a specific historical form of spatial sensibility, acting in different manifestations as both the "real conditions of existence" and as "imaginary representations". Even more than that, it is also in some way the *ur-form* of spatiality itself, making visible the concept of space and viability of socio-spatial cognitive mapping. The experience of networks help to bring spatiality in general to our cognitive minds.

Returning to the "ecological aesthetics" suggested in different ways by Bateson, Lakoff and Johnson, and Thompson, there are now a few things that can be said. I would suggest that there is an important sense in which the so-called Gaian impulse in general might be thought of as an "inverted global totemism". As McLuhan observed, "the aspiration of our time for wholeness, empathy and depth of awareness is a natural adjunct of electric technology."[108] That is to say, I think, in my view it is our empathy with the metropolis, our "second nature,"[109] and even our empathy with the global abstraction of

the systems and networks of capitalism, that allows us now to see the planet as a single global ecosystem. This is the same condition, albeit reversed, that Bateson described with regard to totemism[110] in certain pre-industrial societies:

> Anthropologically, it would seem that from what we know of the early material, that man in society took clues from the natural world around him and applied those clues in a sort of metaphoric way to the society in which he lived. That is, he identified with or empathised with the natural world around him and took that empathy as a guide for his own social organisation and his own theories of his own psychology. This was what is called 'totemism'. In a way, it was all nonsense, but it made more sense than most of what we do today, because the natural world around us really has this general systemic structure and therefore is an appropriate source of metaphor to enable man to understand himself in his social organisation.[111]

Our technological ecologies – such as cities, production systems and so on – with which we have "as cyborgs grown" can thus also experienced as extended or external minds, just in the same way as "natural" ecologies. Our ability to form simulations of other minds (people, ecologies, economies) to create internal maps or representations, seems to be critical to the emergence of our self-consciousness as a historical species, and yet it is continually repeated in our individual production of ourselves. We might say that today, paradoxically, the global metropolis "really has this general systemic structure", however pathological, and that we are indeed using it as the basis of "metaphors" that enable us to see, however inadequately, the natural world around us.[112] The challenge facing modern human culture is to find ways to examine and work with the metaphors that we embody, given that the mismatch between consciousness and mind is becoming more ideologically distorted than ever, through the operations of advanced capitalism.

Footnotes to Chapter Six

[1] Max Horkheimer, *Critical Theory* (New York: Herder and Herder, 1972) p.200.

[2] Alva Noë in interview with Ginger Campbell, June 5, 2009, Transcript of *Brain Science Podcast No. 58*, accessed on 1.7.09 at www.brainsciencepodcast.com

[3] In fact, this is not only in relation to architectural thinking. The various strands of body/space research have not been brought together in one place as neurological and psychological research (as far as I am aware).

[4] See footnote 64 in Chapter Five for a brief discussion of the emerging discourse of neuroaesthetics.

[5] With the exception of sponges. However, sponges are better understood as a community of single cell organisms, that have a collective emergent behaviour.

[6] See Carl Sagan, *The Dragons of Eden - Speculations on the Evolution of Human Intelligence* (NY: Ballantine Books, 1977), pp.62-63.

[7] And in particular the so called limbic system is not really seen as a single coherent system any longer.

[8] There has in the past been a lot of debate about whether to approach the brain and the mind through a modular understanding or an holistic approach. To some extent these reflect different disciplinary interests. AI researchers have tended to focus on certain kinds of functional modularity – for example. V.S. Ramachandran has argued that both approaches seem to be correct, for different sub-brain regions, or different processes; he suggests that the oldest parts of the brain, in evolutionary terms, are largely modular, whereas the newest parts of the brain, and in particular the frontal cortex, which is where most of the most distinctively human activity takes place, is largely massively cross-wired and a plastic whole.

[9] V.S. Ramachandran and Sandra Blakeslee, *Phantoms in the Brain - Human Nature and the Architecture of the Mind* (London: Harper Perennial, 2005) p.177.

[10] J.A. Armour and R. McCraty have been, in very different ways, amongst those who have led research into neurocardiology, and their findings can be read as a provocative addition to embodied and extended mind (in McCaty's case) thinking.

[11] Researchers suggest that there are neural connections from the heart to the brain running through the medulla into the amygdala, and into the spinal column through the vagus nerve.

[12] Again, it is important to note that neural-net-type processes (i.e. a particular kind of relational organisation), are not only found constructed through actual neurons in the body. Other related forms of *computation* occur through all kinds of other chemical systems within the body, and between the body and its environment.

[13] See, for example, J.A. Armour, *Neurocardiology: Anatomical and Functional Principles* (New York, NY, Oxford University Press, 1994), and J.A. Armour and Jeffrey L. Ardell (eds.), Neurocardiology (New York, NY, Oxford University Press, 1994)

[14] See McCraty R, Bradley RT, Tomasino D, 'The Resonant Heart' in *Shift: At the Frontiers of Consciousness* No. 5 (2004) pp.15-19.

[15] For a (very "new age") discussion of the cognitive role of the heart in relationship to external living environments, see Stephen Harold Buhner, *The Secret Teachings of Plants -The Intelligence of the Heart in the Direct Perception of Nature* (Rochester, Vermont: Bear and Co., 2004).

[16] There appears to be remarkably little experimental research being done in this area, and it is difficult to tell whether this is because it is such a potentially career limiting area for scientists to be associated with, or because there is just nothing there to research.

[17] Ramachandran and Blakeslee, Phantoms in the Brain, p.34.

Footnotes to Chapter Six

[18] Gregory Bateson, *Mind and Nature - A Necessary Unity* (New York: Bantam Books,1980), p.118.

[19] The point is that if extant, whilst these 'new' senses might be considered to be in some way operating at a lower and more direct level, they are nonetheless ultimately just more mediated senses that need to be treated according to the general discussion of empathy, mental representation and cognitive mapping that follows. They amplify and intensify perhaps the extent of the mind's environmental extension and ecological immersion, but no more than that.

[20] See E.C. Tolman, 'Cognitive Maps in Rats and Men', in *Psychological Review,* 55 (1948), pp. 189-208.

[21] See for example, Robert M. Kitchin, 'Cognitive Maps: What are they and why study them?', *Journal of Environmental Psychology,* 14 (1994), pp.1-19.

[22] See for example Kevin Lynch, *The Image of the City* (Cambridge, MA, 1960).

[23] See Wilder Penfield and Theodore Rasmussen , *The Cerebral Cortex of Man* (New York: Macmillan, 1950)

[24] See Catherine Brahic 'Birds can 'see' the Earth's magnetic field' in New Scientist 30 April 2008, accessed 1.7.09 from http://www.newscientist.com/article/dn13811-birds-can-see-the-earths-magnetic-field.html

[25] The somatic senses are the oldest evolutionary senses, and include touch, temperature, nocioception (pain), proprioception (the location and movement of body parts,) and balance.

[26] Ramachandran and Blakeslee, *Phantoms in the Brain,* p.33.

[27] See Sandra Blakeslee in conversation with Ginger Campbell in Brain Science Podcast no. 23 (accessed on 1.5.09 at http://docartemis.com/brainsciencepodcast/previous-episodes/transcripts/, and Sandra Blakeslee and Matthew Blakeslee, *The Body Has a Mind of Its Own* (NY: Random, 2007), p.11.

[28] Regarding the use of the body and emotions in cognition, see Antonio Damasio, *The Feeling of What Happens: Body and Emotion in the Making of Consciousness* (New York: Harcourt, 1999).

[29] Ramachandran and Blakeslee, *Phantoms in the Brain,* p.77.

[30] Sandra Blakeslee and Matthew Blakeslee, *The Body Has a Mind of Its Own* (NY: Random, 2007), p.37.

[31] This experiment is widely reported, but most famously perhaps in Richard L Gregory, *Eye and Brain - The Psychology of Seeing* (London: World University Library, 1966)

[32] The extraordinary extent to which our vision is haptic and multisensory is, in my view. brought out by recent experiments with blind individuals where video cameras have been linked up to sensory patches on their arms. Initially these experiments did not work at all. However, apparently in frustration, one of the test subjects picked up the camera (it had been static on a tripod), and practically as soon as he did so, as soon as he could correlate body movement with the signals that he was feeling on his arm, his visual cortex was able to start to make sense of the information, and start to 'construct an image'. After a while it has been possible for individuals to engage in complex and fast feedback activities, such as catching a ball thrown to them, just on the basis on 'images' formed on the basis of video to skin. Using similar methods, the US Navy SEALs are working with deep underwater cameras feed onto touch pads connected to the divers tongues, for conditions where it is too dark to see. In general it seems to me that this discussion reveals the problem of accusing contemporary culture of being too visual – it could not be visual without other senses. To see something as too visual in some way is to misunderstand how the senses are working. For a further discussion of seeing with the hand, see Giacomo Rizzolatti and Corrado Sinigaglia, *Mirrors in the Brain: How our minds share actions and emotions* (Oxford: OUP, 2006), p. 50.

Footnotes to Chapter Six

[33] It is I think extremely instructive to reflect upon the accuracy of the insights of the empathy theorists with regard to anticipations of recent neurological research. Consider for example now the following passage from August Schmarsow: “Psychologically, the intuited form of three-dimensional space arises through the experiences of our sense of sight, whether or not assisted by other physiological factors. All our visual perceptions and ideas are arranged, and ordered, and unfold in accordance with this intuited form ... The intuited form of space, which surrounds us wherever we may be and which we then always erect around ourselves and consider more necessary than the form of our own body, consists of the residues of sensory experience to which the muscular sensations of our body, the sensitivity of our skin, and the structure of our body all contribute. As soon as we have learned to experience ourselves and ourselves alone as the centre of this space, whose co-ordinates intersect in us, we have found the precious kernel, the initial capital investment so to speak, on which architectural creation is based.” (August Schmarsow, ‘The Essence of Architectural Creation’, in Harry Mallgrave and Eleftherios Ikonomou (eds.), *Empathy, Form, Space: Problems in German Aesthetics 1873-1893* (Santa Monica, CA: Getty Centre, 1994) p.286.) This statement is interesting because it is typical of the “accuracy” that can be found in many artistic and introspective first person accounts of first person processes, and indeed, as Varela, Thompson and Rosch noted (see previous chapter), in other traditions based upon rigorous first person interio-reflection. This is in fact a reason for some optimism concerning the possibility of new forms of what neurophenomenologists such as Francisco Varela, Shaun Gallagher and Evan Thompson have described as “first person science”.

[34] Rizzolatti and Sinigaglia, *Mirrors in the Brain*, p.xi.

[35] V.S. Ramachandran and Sandra Blakeslee, *Phantoms in the Brain - Human Nature and the Architecture of the Mind* (London: Harper Perennial, 2005) p.70.

[36] See Marvin Minski, *The Society of Mind* (New York, 1988). Jerry Fodor, has in ‘The Modularity of Mind’, argued for a modular conception of the brain, that, whilst problematic for reasons discussed above more broadly, does have something useful to say regarding the conception of the mind as an assemblage, network or society of sub-brains. He has elsewhere stated: “if, in short, there is a community of computers living in my head, there had also better be somebody who is in charge; and, by God, it had better be me.” Jerry Fodor, *In Critical Condition* (Cambridge: MIT, 1998) p.207.

[37] Sandra Blakeslee and Matthew Blakeslee, *The Body Has a Mind of Its Own* (NY: Random, 2007), p.109.

[38] Ibid., p.41.

[39] Ibid.

[40] Ibid.

[41] Charles Dickens, *Hard Times* (Leipzig, Elibron classics, 2006). See end of Chapter 9.

[42] Although most typically found in cases of amputation, there are also phantom limb cases in people born without limbs. This suggests that the phenomenon has something to do with feedback problems in different maps, and that whilst most commonly these maps are constructed through practical activity, Ramachandran suggests that there are also some maps ‘hardwired’ into the brain. Other explanations would be in these cases that other ‘full body’ maps are imported through processes of empathy with other bodies via mirror neurons, or even perhaps through Sheldrake’s concept of “morphic resonance”?

[43] Lord Nelson as quoted in Ramachandran and Blakeslee, *Phantoms in the Brain,* p.22.

[44] Ibid., p.29.

[45] It is worth noting that prior to Ramachndran’s experiments on the role that body maps played in this condition, the mainstream response had been to work on the basis that there was a physical neurological failure, and would experiment with further amputations, try to severe nerve connections etc – which would often just make the problem worse.

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[46] Although it is beyond the scope of this work here, I am now working on some future research projects exploring and theorising mirrors further.

[47] He further notes a case of a lower leg amputee who reported that his phantom limb took the form of a massively increased sense of "phantom arousal" and orgasm.

[48] See, for example, the work of Bud Craig, whose research into interoception mapping in relation to other maps is increasingly widely seen as the first strong explanation in terms of western medicine of why some alternative and eastern medical practices work. Craig argues that many disorders arise from mapping problems in the autonomic nervous system (with bad maps literally producing physical illnesses), and that alternative medicine techniques such as acupuncture and meditation can be explained as driven by re-mapping. More broadly, this research discusses how experiences based in tai chi, yoga, energy therapy etc are too extensive to be dismissed, yet no actual detectable energy fields have been found. Perhaps then, these practices are working with cognitive maps, that is to say, with peripersonal, body and space maps, and their interrelations, thereby creating real changes and experiences. See for example AD (Bud) Craig, 'Interoception: the sense of the physiological condition of the body', *Current Opinion in Neurobiology* 2003, 13, pp. 500-505, and Hugo D Critchley, Stefan Weins, Pia Rotshtein, Arne Ohman, Raymond Dolan, 'Neural systems supporting interoceptive awareness', *Nature Neuroscience* 7 (2004), pp.189-95.

[49] I met Henrik Ehrsson at the 'Towards a Science of Consciousness' conference in Tucson, Arizona in April 2010. He – like some other neuropsychologists present – was interested in the architectural readings that I was making out of their material, and has agreed to support a joint funding bid for an installation proposal that I have developed, which is to explore a variation of the rubber hand illusion at the scale of a building!

[50] Ramachandran and Blakeslee, *Phantoms in the Brain,* p.59.

[51] Sandra Blakeslee in conversation with Ginger Campbell (Brain Science Podcast): "And so, you see this motion and you feel this motion, and then you leave your body. You move out of your body toward the virtual reality representation of your body. It's a dissociation." My thesis here is that this dissociation, or alienation, is closely related to the aesthetic experience of spatial empathy as a 'dissociative' experience'.

[52] Olaf Blanke is a neurologist at Ecole Polytechnique in Lausanne, Switzerland who also published with the team working on VR based out of body projection.

[53] See for example Michael M Persinger, 'The neuropsychiatry of paranormal experiences', *Neuropsychiatric Practice and Opinion*, Vol. 13, No. 4 (2001), pp.521–22.

[54] Although apparently this failed on Richard Dawkins when tried!

[55] See for example, Bigna Lenggenhager, Tej Tadi, Thomas Metzinger and Olaf Blanke, 'Video Ergo Sum: Manipulating Bodily Self-Consciousness' in *Science* (vol. 317. no. 58414 August 2007), pp.1096-1099. Their synopsis states that:
"Humans normally experience the conscious self as localized within their bodily borders. This spatial unity may break down in certain neurological conditions such as out-of-body experiences, leading to a striking disturbance of bodily self-consciousness. On the basis of these clinical data, we designed an experiment that uses conflicting visual-somatosensory input in virtual reality to disrupt the spatial unity between the self and the body. We found that during multisensory conflict, participants felt as if a virtual body seen in front of them was their own body and mislocalized themselves toward the virtual body, to a position outside their bodily borders. Our results indicate that spatial unity and bodily self-consciousness can be studied experimentally and are based on multisensory and cognitive processing of bodily information." (p.1069)

[56] Olaf Blanke and Shahar Arzy, 'The Out-of-Body Experience: Disturbed Self-Processing at the Temporo-Parietal Junction', in *Neuroscientist,* Vol 11 No.1 (2005) pp.16–24.

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[57] There are numerous accounts of soldiers who have risen above the battlefield they are in, and see their positions and those of others, and claim that this saved their lives. There are many accounts of athletes who have had OBEs in Michael Murphy and Rhea A White, *In the Zone - Transcendental Experience in Sport* (NY NY: Penguin Arkana, 1995), such as the long-distance swimmer who claimed that whenever he was exhausted while swimming he would recharge by floating above his swimming body for a while! There are of course vast numbers of reported cases of OBEs from people in altered states of consciousness such as meditation and shamanism. Researchers scanning the brains of Buddhist Monks have shown that activity in their parietal lobes (normal body maps) decreases dramatically during meditation. OBEs are a frequent component of near-death experience, and have been documented by Pim van Lommel in The Lancet (van Lommel P, van Wees R, Meyers V, Elfferich I. 'Near-Death Experience in Survivors of Cardiac Arrest: A prospective Study in the Netherlands', in *Lancet*, December 15, 2001,pp.2039–45.) It is probably the near-death experiences and OBEs in patients who are on record as having no brain activity, that is currently the biggest challenge to the thesis that consciousness requires a brain: "there is a well documented report of a patient with constant registration of the EEG during cerebral surgery for an gigantic cerebral aneurysm at the base of the brain, operated with a body temperature between 10 and 15 degrees, she was put on the heart-lung machine, with VF, with all blood drained from her head, with a flat line EEG, with clicking devices in both ears, with eyes taped shut, and this patient experienced an NDE with an out-of-body experience, and all details she perceived and heard could later be verified." (Pim van Lommel, 'A Reply to Shermer - Medical Evidence for NDEs' in *Skeptical Investigations*, accessed on 1.7.09 at http://www.skepticalinvestigations.org/whoswho/vanLommel.htm) In this regard a three year experimental programme started in 2008 run by Dr Sam Parnia of the Human Consciousness Project. The experiment consists of a series of images that have been places at high level out of view in operating theatres and the like, in several university hospitals in Europe and the USA, which can only be seen from the ceiling.

[58] Blanke's research suggest that in the case of his patients with electrically-induced out-of-body experiences, although their experiential account is of a coherent visual field from a position near the ceiling, when questioned about details, they do not seem to be able to clearly see anything that cannot be seen from their position in the hospital bed. This suggests that their feeling of being pressed against the ceiling might be a projection of the sensation of their back on the bed, and that the rest of the scene is filled in by their brain, using a combination of visual and non visual clues perhaps. In this sense, even the "battlefield" type projections (mentioned in footnote above) might be based upon the brain actually assimilating auditory or other clues as to "enemy locations" but which are typically unavailable to consciousness, but which in an emergency situation it organises into a useful holistic representation through the adoption of an out-of-body projection viewpoint. This suggests, in accordance with much current research, that an enormous amount of what we think of as "vision" is actually produced or imagined by the visual cortex. For a discussion of the construction of vision in this sense, see Ramachandran op. cit. pp 96-103. Particularly interesting is the account of the patient called Josh, who suffered from a large scotoma (hole) in his retina, but of which he was not normally aware. However, Ramachandran devised experiments whereby Josh was able to watch his visual cortex filling in patterns in real time. There is also much interesting work produced by Beau Lotto's LottoLab regarding the construction of visual experience.

[59] Ramachandran and Blakeslee, *Phantoms in the Brain,* p.61-62.

[60] Andy Clark, 'Soft Selves and Ecological Control', in Don Ross, David Spurrett, Harold Kincaid and G. Lynn Stephens (eds.) *Distributed Cognition and Will - Individual Volition and Social Context* (Cambridge MA: MIT, 2007), p.114.

[61] Some connectionist accounts of the extended mind thesis tend to oversimplify this, and devolve all cognitive faculties out in ways that do not seem to fully account for experience.

[62] For Bateson's discussion of maps, difference and information, see Gregory Bateson, 'Form, Substance and Difference' in *Steps to an Ecology of Mind* (Chicago: University of Chicago Press, 2000), p.454-71.

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[63] It seems that it had been thought – in the sciences, if not in the humanities – that we mapped space as a single field. However, as Rizzolatti makes clear, "far from taking the form of a unitary map, the cortical representation of space in both humans and monkeys appears to be based on the activation of distinct sensory-motor circuits, each of which organises and controls motor acts (such as reaching) that require objects to be specifically located with respect to a given body part (hand, mouth, eyes etc.).. the presence in both neural circuits [f4-VIP and F5 -AIP] of visual responses connected to motor activation suggests that what is true for objects is equally true for space." Rizzolatti and Sinigaglia, *Mirrors in the Brain,* p.66.

[64] Michael Grazino and Charles Gross at Princeton University, found that each part of the body has its own spatial map, with local co-ordinates of a bubble of potential action space attached. There are also similar maps for sounds around the body.

[65] Rizzolatti notes that infants up to three months old can only see 20 cm in front of them, and refers to Jean Piaget observation that in this period infants spent much time watching their hands. He ascribes this to "calibrating peripersonal space in addition to that of measuring object sizes according to their graspability." Rizzolatti and Sinigaglia, *Mirrors in the Brain*, p.71.

[66] According to Blakeslee, "your self does not end where your flesh ends, but suffuses and blends with the world, including other beings. Thus when you ride a horse with confidence and skill, your body maps and the horse's maps are blended in a shared space." Blakeslee and Blakeslee, *The Body Has a Mind of Its Own*, p.3.

[67] Ibid., p.5.

[68] Ibid., p.136.

[69] Rizzolatti and Sinigaglia, *Mirrors in the Brain*, p.55.

[70] There are three different types or 'modalities' of neurons involved in these proceses. Basic somatosensory neurons, somatosensory and visual neurons (bimodal), and somatosensory and visual and auditory neurons (trimodal.) For Rizzolatti, "the most interesting functional aspect of f4 bimodal neurons is that they respond to visual stimuli only when these appear in the vicinity of their tactile receptive field; more precisely, within that specific space portion which represents their visual receptive field and appears to constitute an extension of their somasensory receptive field." Rizzolatti and Sinigaglia, *Mirrors in the Brain*, p.54-5.

[71] Eric R. Kandel , *Psychiatry, Psychoanalysis, and the New Biology of Mind* (Washington, D.C.: American Psychiatric Publishing, 2005) p.296.

[72] Theodore Adorno, 'Functionalism Today' in Neil Leach (ed.), *Rethinking Architecture - A reader in cultural theory* (London: Routledge, 1997), p.17.

[73] See http://www.brain.riken.jp/en/a_iriki.html

[74] Increasingly, it seems that there is agreement with the thesis first proposed by Engels in his essay on 'The Part played by Labour in the Transition from Ape to Man,' Stephen Jay Gould has stated that had Engels' essay been more favourably disseminated, a century of work might have been advanced.

[75] Clark, 'Soft Selves and Ecological Control', p.101.

[76] Ibid., p.111.

[77] See Marqand Smith, 'The Uncertainty of Placing: Prosthetic Bodies, Sculptural Design, and Unhomely Dwelling in Marc Quinn, James Gillingham, and Sigmund Freud', in *Phantom Limb: A Neurobiological Diagnosis with Aesthetic, Cultural and Philosophical Implications* (2004), published online at http://www.artbrain.org/category/journal-neuro-aesthetic-theory/phantom-limb/

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[78] At least, not at the classical level – it is certainly not completely implausible that macrocosmic systems produce real fields at a quantum scale, supported by non-local quantum effects (of the kind suggested by the work associated with Stuart Hameroff for example) or a more basic fundamental interconnectedness of matter-field processes in the way proposed by David Bohm for example, but that does not concern us here directly.

[79] There are all kinds of results that claim to challenge that. See, for example, Rupert Sheldrake,*The Sense of Being Stared At, and other aspects of the Extended Mind* (London: Arrow, 2003).

[80] For a discussion of this see Blakeslee and Blakeslee, *The Body Has a Mind of Its Own*, p. 120-21.

[81] Ibid., p.134.

[82] According to Peter Harries-Jones, *A Recursive Vision: Ecological Understanding and Gregory Bateson* (Toronto: University of Toronto Press, 1995), p.49.

[83] One exception to this is Reyner Banham's 'well-tempered environment' proposal with Francois Dallegret, where we do find a larger collective bubble, containing a group of individuals and with some media technology.

[84] Referred to in Rizzolatti and Sinigaglia, *Mirrors in the Brain,* pp.62-74.

[85] Ibid., p.67 (contains a quote from Ernst Mach's 1905 paper, 'Knowledge and Error').

[86] J.J. Gibson, cited in Rizzolatti and Sinigaglia, *Mirrors in the Brain,* p.34.

[87] Ramachandran tells of a patient whose phantom hand would automatically respond to nearby affordances, and reach out and "hold" cups etc. He even felt pain if a cup was picked up by someone else, as if it was snatched from his hand! See Ramachandran and Blakeslee, *Phantoms in the Brain,* p.43.

[88] Rizzolatti and Sinigaglia, *Mirrors in the Brain,* p.34.

[89] Bruno Latour, *Reassembling the Social - An Introduction to Actor-Network-Theory* (Oxford: OUP, 2007) p.72

[90] Maurice Merleau-Ponty, *Phenomenology of Perception* (1945) p.162, as cited in Rizzolatti and Sinigaglia, *Mirrors in the Brain,* p.52.

[91] Ibid., p.51.

[92] Of course, many natural environments too would have provided highly complex spatial structures, and in many ways human construction would have provided a somewhat abstracted and simplified foil to the complexity of natural environments. Again, one wonders if there is a relative simplicity to the spatial morphology of the desert that might allow an experience of peripersonal space fields to come to the fore in Himba consciousness. Equally, I wonder whether our assumptions that the metropolitan condition is one of intensified nervous stimulation is always the case. Even when taking into account the wildness of modern media, for many inhabitants the city might still represent a form of sensory deprivation, compared to the spatial richness that a life more engaged with a living landscape might offer.

[93] I think that my insight here that a development of Gibson's concept of affordance offers a way to re-theorise architectural pattern and decoration is important, and I plan to explore this further in future research.

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[94] The quote is as follows: “the [motor] system is composed of a mosaic of frontal and parietal areas that are very closely linked to the visual, auditory and tactile areas... [and] is also endowed with functional properties that are much more complex than was previously thought... there are neurons that become active in response to goal-directed motor acts (such as grasping, holding, manipulating, etc.) and not just to simple movements; not only, they also respond selectively to the shapes and sizes of objects both when we interact with them and also when we just observe them. These neurons appear to be able to discriminate sensorial information, coding it on the basis of the range of potential acts offered, independently of whether they subsequently evolve into a concrete action.” Rizzolatti and Sinigaglia, *Mirrors in the Brain,* p.x-xi.

[95] Rizzolatti and Sinigaglia, *Mirrors in the Brain,* p.xii.

[96] Ibid., p.xiii.

[97] See Edvard I. Moser, Emilio Kropff, and May-Britt Moser, ‘Place Cells, Grid Cells, and the Brain's Spatial Representation System’ in *Annual Review of Neuroscience*, Vol. 31, 2008: pp. 69-89. For a broad seminal survey of the role that the hippocampus plays in spatial awareness and cognitive mapping, see John O'Keefe and Lynn Nadel, *The Hippocampus as a Cognitive Map* (Oxford: OUP, 1978). This is available online at http://www.cognitivemap.net

[98] Discovered in 1971 by John O’Keefe and John Dostrovsky. See also recent work at UCL by Hugo Spiers (http://www.ucl.ac.uk/spierslab/).

[99] See Kathryn J. Jeffery, ‘Integration of the Sensory Inputs to Place Cells: What, Where, Why, and How?’, in *Hippocampus* No.17 (2007) p.777.

[100] It is presumed that the geometry of grid cells is based upon the mathematics of hexagonal close packing (a geometry that occurs frequently in both the brain and natural organisation). It is easy to derive an orthogonal grid from a hexagonal grid, by just joining every other row/column.

[101] For a discussion of the relations between place, grid and head direction cells see Kathryn J. Jeffery, ‘Integration of the Sensory Inputs to Place Cells: What, Where, Why, and How?’, in *Hippocampus,* No.17, (2007) p.775-85.

[102] See Eleanor A. Maguire, David G. Gadian, Ingrid S. Johnsrude, Catriona D. Good, John Ashburner, Richard S. J. Frackowiak, and Christopher D. Frith, ‘Navigation-related structural change in the hippocampi of taxi drivers’ in *PNAS (Proceedings of the National Academy of Sciences)* Vol. 97, No. 8 (2000) pp.4398–403.

[103] See Eichenbaum H, Dudchenko P, Wood E, Shapiro M, Tanila H, ‘The hippocampus, memory, and place cells: is it spatial memory or a memory space?’, *Neuron,* No. 23 (1999), pp.209 –26.

[104] Dharshan Kumaran and Eleanor A. Maguire, ‘The Human Hippocampus: Cognitive Maps or Relational Memory?’, *The Journal of Neuroscience*, No. 25, Vol. 31 (2005) pp.7254 –259.

[105] Humberto Maturana and Fransisco J. Varela, *Autopoiesis and Cognition* (Dordrecht, Holland: D. Reidel, 1980), p.34.

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[106] This argument was first advanced in J.D Lewis-Williams and T.A. Dowson, 'The signs of all times: Entoptic Phenomena in Upper Palaeolithic Art', *Current Anthropology* 29 (1988), pp.201-45. Lewis-Williams makes two moves in this direction. Firstly, drawing upon work by cognitive psychologist Colin Martindale (See Colin Martindale, *Cognition and Consciousness* (Homewood, Illinois: Dorsey Press, 1981)), Lewis-Williams argues that "need to think of consciousness not as a state, but as a continuum or spectrum." (David Lewis-Williams *The Mind in the Cave - Consciousness and the Origins of Art* (London: Thames and Hudson, 2002). p.122.) Secondly, he argues that the range of human conscious experience was extended and intensified through psychoactive plant ingestion.

For Martindale, the spectrum of consciousness ranges through waking (various problem oriented thought levels), realistic fantasy, autistic fantasy, reverie, hypnagogic (falling asleep states), dreaming (various states), and finally a total absence of consciousness.

Consciousness, is indeed, as Charles Laughlin notes, a "fragmented" phenomenon. During day we typically shift between inward and outward oriented consciousness, normally based upon 90-120 min cycles (See C. Laughlin, D. McManus and E.G. d'Aquili, *Brain, Symbol and Experience: Towards a Neurophenomenology of Human Consciousness* (New York: Columbia University Press, 1992.) and more recently the excellent Jeff Warren, *Head Trip: A Fantastic Romp through 24 Hours in the Life of your Brain* (Oxford: One World, 2008). However, consciousness is also culturally and historically variable, and is socially produced. Different societies valorise the various forms of consciousness very differently. Some societies see inward states as pathological, whilst others see them as others divine. Within contemporary western society, different forms of consciousness are seen as more or less appropriate at different times and in different places. Commodity consumption relies upon high levels of non rational consciousness, and equally, at certain moments, the embracing of altered forms of consciousness has had political importance for certain groups. As William James has noted (quoted by Lewis-Williams), fully rational waking consciousness is just one form, "whilst all about it, parted by the flimsiest of screens, there lie the potential forms of consciousness, entirely different."

Lewis-Williams develops a discussion around consciousness partly in order to attack some of the theories advanced by evolutionary psychology. In particular he criticises Mithen's work (see Stephen Mithen, *The Prehistory of the Mind, A Search for the Origins of Art, Religion and Science* (London/New York: Thames and Hudson,1996)). In this work, Mithen draws upon modularity based models of mind (especially Jerry Fodor's account, and Nicholas Humphrey's "reflexive consciousness" theory of mind.) Lewis-Williams argues that what for Mithen et al is a "social intelligence module" is actually an emergent socio-systemic effect: "what today constitutes acceptable human consciousness - 'the consciousness of rationality' - is an historically situated notion constructed within a specific social context... it is not simply a function of interacting intelligences" (Lewis-Williams, *The Mind in the Cave,* p.121.) He argues that evolutionary psychology is based on an assumptions that intelligence is primarily rational, and that evolution is a process leading "people to become more and more like western scientists!" (Lewis-Williams, *The Mind in the Cave,* p.111).

[107] See, for example, Paul C. Bressloff and Jack D. Cowan, 'Spontaneous pattern formation in primary visual cortex', in S. J. Hogan, A. Champneys and B. Krauskopf (eds.) *Nonlinear dynamics: where do we go from here?* (Bristol: Institute of Physics, 2002), pp.269-320.

[108] Lewis-Williams, *The Mind in the Cave,* p.127.

[109] Jeff Hawkins interviewed by Ginger Campbell for Brain Science Podcast, accessed on 4.5.10 from accessed from http://docartemis.com/brain%20science/38-JeffHawkins-OnIntelligence.pdf.

[110] Mark Wigley, 'Recycling Recycling' in Amerigo Marras (ed.), *Eco-Tec, Architecture of the In-Between* (NY: Princeton Architectural Press, 1999) p. 46

[111] Lars Spuybroek, 'Motor Geometry', in Stephen Perrella (ed.) *AD Hypersurface Architecture* (London: Wiley, 1998),p.49.

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[1] Some sections of this chapter were first given as a paper at the 'Material Matters' conference at the University of East London in 2005, and a version was then published as an essay in the book that followed of the same name, edited by Katie Lloyd Thomas, as 'Marx Matters'. The text here, however, has been substantially edited, extended and amended, and contains many more images that the 'Material Matters' chapter, and in that respect is closer to the original lecture. The main changes in those sections, as far as content is concerned have been to reduce the overstated emphasis that was given in the original text to the influence of German Orientalism. In the original, I often described ideas as manifesting an "orientalist cosmology", when what I wanted to emphasise was the presence of explicit or underlying panpsychic and systemic models of matter. See Jon Goodbun, 'Marx Matters, or Aesthetics, Technology, and the Spirit of Matter', in Katie Lloyd Thomas (ed.), *Material Matters: Architecture and Material Practice* (London: Routledge, 2007), pp.67-78.

[2] Gregory Bateson, Box 6 Manuscripts 'Mind in Nature', 17 November 1977 (unpublished), quoted in Peter Harries-Jones, "Gregory Bateson's 'Uncovery' of Ecological Aesthetics" in Hoffmeyer (ed.), *A Legacy for Living Systems*, p.158. There is a published though slightly different version of this in Gregory Bateson, *Mind and Nature*, p.10.

[3] *Collins English Dictionary*, accessed on 1.7.08 at http://www.collinslanguage.com/

[4] Titchener states: "Not only do I see gravity and modesty and pride and courtesy and stateliness, but I feel
or act them in the mind's muscles. This is, I suppose, a simple case of empathy, if we may coin that term as a rendering of *Einfühlung*." Edward B. Titchener, *Lectures on the Experimental Psychology of Thought Processes* (New York: Macmillan, 1909), pp.21–22.

[5] Lipps produced one of what Adrian Forty describes as "three remarkable essays [which] appeared almost simultaneously – and apparently independently of each other – in the year 1893." Adrian Forty, *Words and Buildings: A Vocabulary of Modern Architecture* (London: Thames and Hudson, 2000), p. 259. The other two authors were Adolf Hilderbrand and August Schmarsow. Each of these essays synthesised in new ways the ideas of empathy, form and space.

[6] "The term emerged in roughly its current sense during the seventeenth century in English, French, and German. Initially, its meaning was wider, referring to some kind of affinity between not only people but also things. The latter related chiefly to a medical context, such as the "sympathy" regarded as linking a medicament with a specific disease (e.g., Digby, 1669), or different parts of the body, or people when illnesses were said to be passed on "sympathetically" (Whytt, 1765). The psychological meaning of sharing the feelings of another person or being affected by their suffering existed in parallel. An early example is cited in the *Oxford English Dictionary*: "Out of faithful and true simpathy [sic] and fellow-feeling with you" (1662)."
Gustav Jahoda, 'Theodor Lipps and the shift from "sympathy" to "empathy"', *Journal of the History of the Behavioural Sciences* Vol. 41, No. 2 (2005), p.152.

[7] See Joseph Rykvert, 'Organic and Mechanical', in Wiliam W. Braham and Jonathan Hale with John Stanislav Sadar (eds.) *Rethinking Technology - A Reader in Architectural Theory* (London and New York: Routledge, 2007), pp.337-49.

[8] Quoted by Melvin M Rader, *A Modern Book of Esthetics* (New York: Henry Holt, 1935), p.287.

[9] Goethe's posthumous editor, Rudolf Steiner, set out in books such as *Goethean Science* (1897) and *The Theory of Knowledge Implicit in Goethe's World Conception* (1886), what remain some of the clearest instructions about how to consciously empathise with objects – however problematic Steiner's thought might be in some other regards. More recently, there has been a revival of interest in the possibility of a Goethean Science, largely in relation to Gaia Theory, with scientists such as Stephan Harding, Stephen Harold Buhner and Henri Bortoft using and describing empathy-like methods as a way of holistically describing natural systems. Harding's work is particularly useful I think – see Stephan Harding, *Animate Earth: Science, Intuition and Gaia* (White River Jct., Vermont: Chelsea Green Publishing, 2007). There is no small relation between Bateson's ecological aesthetic project and Goethe's holistic science, and this has been explored to some extent in the recent publication: Noel G Charlton, *Understanding Gregory Bateson: Mind, Beauty and Sacred Earth* (New York: State University of New York Press, 2008).

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[10] G.W. Pigman, 'Freud And The History Of Empathy', *International Journal of Psycho-Analysis,* 76 (1995), pp. 237-56. Pigman notes that in the English Standard Edition of Freud's work, however, *Einfühlung* is not consistently translated as *empathy*.

[11] The correspondence between the concepts of empathy and mimesis is made clear by Lakoff and Johnson, who state that "in preparing to imitate, we empathically imagine ourselves into the body of another ... cognitively simulating the movements of the other ... which results in the 'feel' of movement without moving. The experience of such a 'feel' is a form of empathic projection. There is nothing mystical about it. It is what we do when we imitate. Yet this most common of experiences is a form of 'transcendence', a form of being in the other." George Lakoff and Mark Johnson, *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought* (New York: Basic Books, 1999), p.565.

[12] Theodor Adorno, 'Functionalism Today', in Neil Leach (ed.), *Rethinking Architecture: A reader in cultural theory* (London: Routledge, 1997), p.9.

[13] See, for example, Neil Leach, 'Mimesis*', Architectural Theory Review,* Vol. 10, No. 1 (April 2005), pp. 93-104; and Neil Leach, *Forget Heidegger* (Bucharest: Paideia, 2006). In the latter, Leach makes many statements along the lines of: "For Adorno ... mimesis overcomes the alienation of conceptual thought, and offers an alternative, more empathetic model of human interaction" (p.80). An extension of empathy into mimesis offers more clearly a way to conceive of what in Chapter Five was noted as the difference between kinaesthetic and iconographic, or connectivist (emergent) and computational (symbolic) meaning: "mimesis … allows one to forge a symbolic relationship with one's environment. Mimesis may help to explain how we identify progressively with our surroundings in general. We read ourselves into our surroundings ... The subject creatively identifies with the object, so that the object ... is appropriated as part of the symbolic background through which individuals constitute their identity" (pp.82-83).

[14] Pigman, 'Freud And The History Of Empathy,' pp.237-256.

[15] Evan Thompson, *Mind in Life: Biology, Phenomenology and the Sciences of Mind* (Cambridge, MA: Belknap Press of Harvard University Press, 2007), p.382.

[16] Herman Lotze, *Microcosmos: An Essay concerning Man and his Relation to the World*, trans. E. Hamilton and E. E. Constance Jones (New York: Scriber and Welford, 1886), p.584.

[17] Cornelis van de Ven, *Space in Architecture: The Evolution of a New Idea in the Theory and History of the Modern Movements*, (Assen/Amsterdam: Van Gorcum, 1978).

[18] Mitchell W. Schwarzer, 'The Emergence of Architectural Space: August Schmarsow's Theory of Raumgestaltung', *Assemblage,* Vol.15 (1991), pp.48-61.

[19] The draft of Forty's chapter (and the research leading to it) was a key course component in his History of Modern Architecture masters course at the Bartlett. A reconsideration of these texts also became increasingly important in some architectural research more broadly. Writing in 1999, Anthony Vidler for example notes that: "The return to Simmel has been paralleled in art and architectural history by a rereading of the founding texts of spatial analysis in architecture – Wölfflin, Riegl, Schmarsow, Hildebrand, Göller – as part of a new critical historiography of the discipline. Margaret Iverson on Riegl, Mitchell Schwarzer on Schmarsow, and the anthology of texts assembled and introduced by Harry Mallgrave and Eleftherios Ikonomou have contributed to a history of approaches that is not only much needed in architectural history but also forms part of the intellectual and cultural history of modern architecture itself. Their work thus complements from the point of view of architecture the comprehensive survey of modernist spatial ideas in art begun by Linda Dalrymple Henderson in 1983. The question of space, fully historicized, has been tackled in only a few recent monographs..." Anthony Vidler, 'Technologies of Space/Spaces of Technology', *Journal of the Society of Architectural Historians* Vol. 58, No. 3 (Sep., 1999), pp.482-86.

[20] Although it is worth noting that, for Adrian Forty, form has now "outlived its usefulness ... become frozen, no longer in active development, and with little curiosity to what purposes it might serve." Adrian Forty, *Words and Buildings: A Vocabulary of Modern Architecture* (London: Thames and Hudson, 2000), p.172.

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[21] See, for example, Kari Jormakka, *Flying Dutchmen: Motion in Architecture* (Berlin: Birkhaüser, 2002). See also my own teaching-based research on 'Dancing with the Machines' in Chapter Three.

[22] Le Corbusier, *Engineers Aesthetic and Architecture*, in Braham and Hale with Sadar (eds.) *Rethinking Technology,* p.33.

[23] Beyond the panpsychist ingredients that I propose here, van der Ven suggests all kinds of other references that further support such an interpretation. For example, his first chapter notes the resonance between space and Lao-Tzu's Taoist philosophy, and more broadly he shares Max Jammer's suggestion that since the middle ages, via cabalistic thought, there has been an association between god and space. See Max Jammer, *Concepts of Space* (New York: Dover, 1993; originally published 1954).

[24] Forty, *Words and Buildings*, p.256.

[25] Both published their initial papers on space in 1893, and both of which are in the Mallgrave and Ikonomou collection.

[26] August Schmarsow, 'The Essence of Architectural Creation', in Harry Mallgrave and Eleftherios Ikonomou (eds.), *Empathy, Form, Space: Problems in German Aesthetics 1873-1893* (Santa Monica, CA: Getty Centre, 1994), p.296.

[27] van der Ven, *Space in Architecture*, p. xiv.

[28] This aspect of Adolf Loos' essay on 'Ornament and Crime' is often overlooked. He is not simply saying that ornament is wrong, as much as he is saying meaningful symbolic public ornament is *impossible* in a multicultural metropolitan condition, where there is no 'organic' shared language, in the way in which there is in a vernacular or classical condition. Whether we accept that statement is another matter of course, and advertising certainly seems to be able to find common public languages, as Venturi has frequently observed (even if he himself is less able to successfully prove it is possible still in architecture!). Perhaps a more compelling route out of this dilemma, certainly from a modern spatial empathy position, is a possibility that emerges from Kracauer's conception of *The Mass Ornament*. See Sigfried Kracauer, *The Mass Ornament: Weimar Essays*, trans Thomas Y Levin (Cambridge, MA: Harvard University Press, 1995). Here, it is suggested that it is possible to trace 'patterns that connect' between in this instance a kind of rhythm-analysis of the spatial practices of the Tiller Girls' dance group and repetitive mechanised factory labour. In a closely related sense, Charlotte Klonk has suggested that "the art of ornamentation was promoted by many members of European reform movements, from the Belgian Henry van de Velde to Josef Hoffmann in Austria and August Endell in Germany, precisely in order to reach the modern soul directly and effectively. Attention to the principles of abstract pattern-making was intended to attune the sensations of city dwellers in a way that would be appropriate to the pace of modern urban life." Charlotte Klonk, 'Patterns of Attention: from shop windows to gallery rooms in early twentieth century Berlin', *Art History,* Vol 28 No 4 (September 2005), p.469.

[29] This aspect of its origins has not been written about on the whole. The classic treatment of empathy describes this discourse as being based in Kantian aesthetics (which is no doubt in part accurate). However, other contemporary researchers in this area have reacted favourably to my position in this regard. Notably, Susan Lanzoni (Visiting Scholar on the Science Technology and Society Program at MIT) in correspondence wrote: "although I haven't focused on the Hegelian connection to empathy, I always thought there was something in the objectification of spirit that seems consonant with an understanding of empathy. I ... see that there is certainly a fruitful resonance between Marx's notion of commodity and *Einfühlung* theory as put forth by Vischer and Schmarsow ... I like the emphasis on the continuing presence of the theological, or the pantheistic in your paper. The question of presence or projection is key, I think." (email correspondence with author 28th January 2009). Lanzoni was one of the organisers of an invited workshop 'Varieties of Empathy in Science, Art and Culture' held at the University of British Columbia, in October 2008, which brought together cognitive science theorists such as Shaun Gallagher and Evan Thompson (both of whom I have referred to in other chapters here) with empathy scholars from psychology and aesthetics (including Harry Mallgrave), to discuss the implications of mirror neuron research. Although somewhat frustratingly, as I had by this time independently made the same connections, it was useful to see these thoughts confirmed by others.

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[30] Harry Mallgrave and Eleftherios Ikonomou have in particular promoted this interpretation, stating for example that "it was Immanuel Kant (1724-1804) who provided the paradigm for the German philosophical treatment of form and space in the nineteenth century." Harry Mallgrave and Eleftherios Ikonomou, 'Introduction', in Mallgrave and Ikonomou (eds.), *Empathy, Form, Space*, p. 5.

[31] I suspect that the repeated comments that this is a Kantian aesthetics is based upon the many statements by, for example, Schmarsow regarding an 'intuited sense of space'. The obvious association is to Kant, for whom space was indeed an internal mental intuition. However, I am not at all convinced that Kant would have recognised Schmarsow as talking about the same kind of thing. For a start, space for Kant was not an aesthetic category, and secondly, the kind of intuition that Schmarsow describes is a thoroughly embodied one, produced by the active body. This seems very different to Kant's conception of spatial intuition.

[32] Heinrich Heine, *Religion and Philosophy in Germany*, trans. John Snodgrass (Boston: Beacon Press, 1959), p.79.

[33] Forty, *Words and Buildings*, p.258.

[34] Mallgrave and Ikonomou 'Introduction', p.5.

[35] Other prominent Young Hegelians (also known as Left Hegelians, though they called themselves the Doctors Club) included the brothers, Bruno and Edgar Bauer, David Strauss and Max Stirner.

[36] According to Mikhail Lifshitz, *The Philosophy of Art of Karl Marx* (1933), trans. Ralph B Winn (London: Pluto, 1973). Lifshitz notes on p. 83 for example that Marx's notebooks from 1857-58 contain a detailed synopsis of F.T. Vischer's *Aesthetiks*.

[37] From Karl Marx's doctoral dissertation, *The Difference Between the Democritean and Epicurean Philosophies of Nature*, written between 1839 and 1841; excerpt published as 'To Make the World Philosophical' in Robert C Tucker (ed.), *The Marx-Engels Reader Second Edition* (New York: W W Norton and Co., 1978), pp.9-11.

[38] William J Brazill, *The Young Hegelians*, (London: Yale, 1970), p.172.

[39] Georg Hegel, quoted ibid.

[40] van de Ven, *Space in Architecture*, p.80.

[41] F.T. Vischer directly anticipated the concept of empathy, which he described as a process of emotional identification. Furthermore, other empathy theorists were studying this work. Heinrich Wölfflin in particular repeatedly quotes from F.T. Vischer's Aesthetic's in his *Prologomena to a Psychology of Architecture*. In fact, Wölfflin identifies some very interesting formulations from F.T. Vischer regarding a dialectical account of whole/part relations (interesting here in regard to my discussion of organicism and emergence in Chapter Two and Chapter Four respectively). For example, he notes "the last and most mysterious element of form is *harmony*, 'the vital and animated unity of the inner vital force': 'It unifies the parts, for it is the parts' (Vischer). We find the concept of harmony best defined in morphology by the notion of the organism." Heinrich Wölfflin, 'Prologomena to a Psychology of Architecture', in Mallgrave and Ikonomou (eds.), *Empathy, Form, Space*, p.166.

[42] Robert Vischer, 'On the Optical Sense of Form: A Contribution to Aesthetics' in Mallgrave and Ikonomou (eds.), *Empathy, Form, Space*, p.111.

[43] Ibid., p.97.

[44] Ibid., p.96.

[45] Ibid. p.104.

[46] Ibid., p.111.

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[47] Karl Marx, *Grundrisse: Foundations for the Critique of Political Economy (Rough Draft)*, trans. Martin Nicolaus (Harmondsworth: Penguin, 1973), p.92.

[48] Karl Marx, *Notebooks*, cited in Lifshitz, *The Philosophy of Art of Karl Marx*, p.95.

[49] Ibid., p.83.

[50] Ibid., p.96.

[51] Karl Marx, 'Economic and Philosophic Manuscripts of 1844', in Tucker (ed.), *The Marx-Engels Reader*, p.88.

[52] Ibid.

[53] Ibid.

[54] Schmarsow, 'The Essence of Architectural Creation', p.294.

[55] Marx, *Notebooks*, p.78.

[56] Marx, 'Economic and Philosophic Manuscripts of 1844', p.87.

[57] Ibid., p.89.

[58] Karl Marx, *Capital: A Critique of Political Economy Volume 1* (London: Penguin, 1990), p.163.

[59] Ibid., p.164

[60] Terry Eagleton, *The Ideology of the Aesthetic* (Oxford: Basil Blackwell, 1990), p.208.

[61] Wölfflin, 'Prologomena to a Psychology of Architecture', pp.157-58.

[62] Heinrich Wölfflin, *Renaissance and Baroque* (Ithaca, NY.:Cornell University Press, 1966), p.78.

[63] Mark Wigley, 'Network Fever', in *Grey Room 04*, (Cambridge, MA: MIT, Summer 2001) pp. 82-122.

[64] Karl Marx, *Capital*, pp. 493-94, footnote.

[65] Marshall McLuhan, Interview in *Playboy*, March 1969

[66] Roy Ascott, 'Syncretic Fields: Art, Mind and the Many Realities', lecture given on April 30, 2007, at Design Media Arts, UCLA. See Streaming Culture lecture series, accessed on 14.5.09 at http://dma.ucla.edu/events/calendar.php?ID=469

[67] David Greene, 'LAWUN Project No.2: The Invisible University', in *A Guide to Archigram 1961-74* (London: Academy, 1994), p.365.

[68] In the last decade, a new generation of interface artists such as Jason Bruges and Usman Haque have been producing installations and spaces which visualise the invisible networks and fields, both man-made and artificial, that surround us and our planet. Some of these artists have even been collaborating with David Greene, in particular on extensions to the LAWUN Invisible University project - for example the LAWUN Selfridges window display in 2004 (including work by Polytechnic student, Chris Gotsis).

[69] If Marx turned Hegel "back onto his feet", does that mean that for Marx architecture is the now the highest art – or is it still the lowest, but for different reasons?!

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[70] Hegel quoted in van de Ven, *Space in Architectur* , p.37. In many respects Hegel's comments were repeating many other observations that Gothic interior demonstrated a particular and distinct relation between metaphysics and space, and that in fact these interiors arguably initiated the architectural discussion around what would come to be called space. Most notable amongst these for van der Ven would be Witelo's thirteenth-century study of light, in which he discussed Gothic interiors, describing atmospheric qualities of "diaphanitas, densitas, obscuritas, umbria" in the 'Perspectiva Communis' of 1270 (which was quoted by both Alberti and da Vinci). Later, Abbot Suger of St Denis would unite building and metaphysics, in his own essay on light. Otto von Simson similarly suggested that the Gothic cathedral is a direct response to, or expression of, twelfth-century theological metaphysics, primarily based upon the Augustian belief in light as a manifestation of god. For a discussion around these references, see van de Ven, *Space in Architecture,* pp.21-24 in particular.

[71] At the Weimar Nietszche Forum in 2003, Slavoj Zizek described a condition of "Wall St Buddhism", which I am extending here to include the broad drift in management theory today, where a neo-Taoist model has been adopted. Commerce is basically seen as a primary manifestation of the tao chi – an all-pervading energy force.

[72] Georg Simmel, quoted in Henrik Reeh, *Ornaments of the Metropolis: Sigfried Kracauer and Modern Urban Culture*(Cambridge, MA: MIT Press, 2004), p. 32; referenced to 'Der Begriff und die Tragödie der Kultur' in Georg Simmel, *Das individuelle Gesetz,* ed. Michael Landmann (Frankfurt am Main: Surkamp Verlag, 1968), p.147.

[73] Although it has been beyond the scope of this study, it would be interesting to reflect further upon these questions with regard to two architectural theorists who have sought to develop a socio-spatial analysis out of architectural organisation and knowledge, but who have singularly 'side-stepped' any ideological analysis: Bill Hillier (as mentioned previously) and Christopher Alexander.

[74] Georg Simmel, 'Metropolis and Mental Life' in David Frisby and Mike Featherstone (eds.), *Simmel on Culture: Selected Writings* (London and Thousand Oaks, CA.: Sage, 1997) p.143.

[75] We might ask, what does that mean? How the does the metropolis – today a global entity – map onto the individual in any meaningful way. The answer to that is of course that, in this Batesonian sense, the "individual" mind really is the extended into the "metropolis", and co-extensive with it.

[76] Bruno Taut, *Modern Architecture* (London: The Studio, 1929), p.7.

[77] Forty, *Words and Buildings,* p.167.

[78] Adolf Behne, *The Modern Functional Building* (1926), trans. M. Robinson (Santa Monica: Getty Research Institute, 1996), p.137.

[79] It is not that it is wrong to see "social pattern". However, what we also need to see – which is extremely hard – is that we are also a "pattern" in ourselves, and furthermore a pattern that connects to the (in this case) social pattern through another pattern that connects. This can very easily become invisible, and the invisibility of the pattern that connects can be called 'ideology'!

[80] Forty, *Words and Buildings,* pp.171-72.

[81] Behne, *The Modern Functional Building*, p.137.

[82] Forty, *Words and Buildings*, p. 167.

[83] See, for example, Lyn Spillman (ed.), *Cultural Sociology* (London: Blackwell, 2002), p.37.

[84] Marshall McLuhan, *Understanding Media: The Extensions of Man* (London: Routledge, 2001 (originally 1964)), pp. 133-34.

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[85] McLuhan suggests in fact that we are entering a post-blasé period: “Western man acquired from the technology of literacy the power to act without reacting. The advantages of fragmenting himself in this way are seen in the case of the surgeon who would be quite helpless if he were to become humanly involved in his operation. We acquired the art of carrying out the most dangerous social operations with complete detachment. But our detachment was a posture of non-involvement. In the electric age, when our nervous system is technologically extended to involve us in the whole of mankind and to incorporate the whole of mankind in us, we necessarily participate, in depth, in the consequences of our every action. It is no longer possible to adopt the aloof and dissociated role of the literate Westerner.” McLuhan, *Understanding Media*, pp.4-5.

[86] Alison and Peter Smithson, *Architectural Design* July 1969

[87] Schwarzer, ‘The Emergence of Architectural Space: August Schmarsow's Theory of "Raumgestaltung"’, p. 57.

[88] Fritjof Capra, *The Web of Life - A New Synthesis of Mind and Matter* (London: Flamingo 1996), p. 82.

[89] Georg Simmel, ‘Metropolis and Mental Life’, p.74.

[90] McLuhan, *Understanding Media*, p.4.

[91] Paul Ryan studied with both McLuhan and Bateson, and was involved in studying new media and film in particular, and was an important figure in the journal, *Radical Software*.

[92] McLuhan, *Understanding Media*, p.8. McLuhan continues, giving as examples: “The content of writing is speech, just as the written word is the content of print, and print the content of the telegraph.” (ibid., p.8), and elsewhere, “the content of a movie is a novel or a play or an opera” (p. 19).

[93] Gregory Bateson, ‘A Theory of Play and Fantasy’, in *Steps to an Ecology of Mind* (Chicago: University of Chicago Press, 2000), pp.177-78.

[94] Ibid., p.188.

[95] McLuhan, *Understanding Media*, p.19.

[96] Ibid., p.133.

[97] Ibid., p.134.

[98] Marshall McLuhan and Quentin Fiore, *The Medium is the Massage: An Inventory of Effects* (New York: Random House, 1967), p.94-95.

[99] McLuhan, *Understanding Media*, p.5.

[100] van de Ven, *Space in Architecture*, p.39.

[101] See Catherine Ingraham, *Architecture, Animal, Human* (London: Routledge, 2006), p.16.

[102] Evan Thompson, ‘Empathy and Consciousness’ in *Journal of Consciousness Studies,* Vol. 8, Nos 5-7 (2001), p. 20.

[103] Ibid.

[104] George Lakoff and Mark Johnson, *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought* (New York: Basic Books, 1999), p. 565.

[105] Ibid., p. 566

[106] Jonathan Hale, ‘Cognitive Mapping: Rule or Model?’, in *Culture, Theory and Critique,* Vol. 40, No.1 (1997), p.83.

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[107] Fredric Jameson, 'Cognitive Mapping', in Cary Nelson and Lawrence Grossberg (eds), *Marxism and*
the Interpretation of Culture (Chicago: University of Illinois Press, 1990), p.353.

[108] McLuhan, *Understanding Media*, p.5.

[109] In some ways, the term "second nature" is highly problematic, in that can seem to reinforce a nature/culture dualism.

[110] Lakoff and Johnson also discuss empathic projection with animals, in particular in relation to shamanic practices.

[111] Gregory Bateson, 'Pathologies of Epistemology', in *Steps to an Ecology of Mind* , p.492.

[112] Indeed, as McLuhan again observed, "new media are not bridges between man and nature: they are nature." (Marshall McLuhan, *Counterblast* (London: Rapp and Whiting, 1969), p.14). Whilst he continues to warn that "literate man, once having accepted an analytic technology of fragmentation, is not nearly so accessible to cosmic patterns as tribal man," (McLuhan, *Understanding Media*, p.134) it does seem to be the case that "today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned." (McLuhan, *Understanding Media*, p.3).

[113] Manuel Castells, "Space of Flows, Space of Places", in William B. Braham and Jonathan Hale, with Johan Stanislav Sadar (eds), *Rethinking Technology* (London and New York: Routledge, 2007), p.444.

[114] Manuel Castells, *The Rise of the Network Society, Vol 1: The Information Age* (Oxford: Blackwell, 1996), p.458.

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8 Conclusion: Towards a Critical Urban Ecology

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