

# Exploration of Space, Technology, and Spatiality: Interdisciplinary Perspectives

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# Chapter I

## Paths and Patches: Patterns of Geognosy and Gnosis

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### **ABSTRACT**

*Map, mazes, myths, magic, and mathematics, computation, cognition, community, and the constructed environment, all reveal something of our internal models of space. Whilst the spaces we inhabit have many objective properties, we only perceive and process certain of these, and add many social and subjective qualities of our own. In fairy tales and science fiction, some of the “real” properties are let slip, yet the worlds remain comprehensible. Studying the essential and nonessential qualities of space can guide the construction and navigation of information spaces. However, the very idea of information spaces, and indeed cyberspace, presupposes that spatial metaphors can make sense of information. This chapter explores the relationships between our understandings of physical space and conceptual spaces; from childhood memories, to transarticulation, the way words shape our conceptual and physical landscape, we will see that our understandings of space and of knowledge itself are similarly shaped.*

### **INTRODUCTION**

In previous talks and papers, I have explored the way we as humans understand the physical world (Dix, 2000; Dix 2001; Dix, Friday, Koleva, Rodden, Muller, Randell, & Steed, 2005). Artefacts, words, and abstractions, such as maps, mazes, myths, magic, and mathematics, computation, cognition, community identity, and the constructed environment, all reveal something of

our internal models of space. Whilst the space in which we live has many objective properties, we only perceive and process certain of these, and add many social and subjective qualities of our own. In fairy tales and science fiction, some of the “real” properties are let slip, yet the worlds remain comprehensible. By observing which properties can be lost, we understand more clearly what is essential.

My own reason for studying the essential and nonessential qualities of space has been to understand the construction and navigation of information spaces. Others have had similar motivation; for example, the Tower project used theories of space syntax to lay out information objects in virtual spaces (Prinz, Pankoke-Babatz, Graethe, Gross, Kolvenbach, & Schäfer, 2004). However, the very idea of information spaces, and indeed cyberspace, presupposes that spatial metaphors can make sense of information. In this chapter, we will explore the relationships between our understandings of physical space and conceptual spaces. From childhood memories of the back lanes on the way to school, to transarticulation, the way words shape our conceptual and physical landscape, we will see that our understandings of space and of knowledge itself are similarly shaped.

## **OF MAPS AND MAPMAKERS**

### **Cartographic Journey**

Whilst I have always loved maps, I recall first being prompted to look at the history of maps by someone who was describing the way maps had “developed” towards the “true” maps we have today. The idea that the Cartesian bird’s-eye view is categorically “true” piqued me somewhat and, as we shall see, it is not even modern.

In fact, mapmaking is an ancient art. A clay tablet, discovered in 1930 at Ga-Sur at Nuzi (in modern Iraq), is often described as “the earliest known map.” It is dated at about 2,200 BC, and depicts a river running between two hill ranges and dividing into several channels with named places. Given it is incised into clay, the lines and location lack precision, but ignoring this, it takes a surprisingly “modern” bird’s-eye perspective. Whilst this is perhaps the oldest known map of a region, mapping goes further back still. In 1963, excavations at the ancient town of Catal Hyuk (now in modern Turkey) found a wall painting

depicting what is believed to be the township itself, dated at 6,200 BC. The painting is also surprisingly “modern,” a bird’s-eye view of the streets and houses.

Nearly a thousand years later than the Ga-Sur map, the Egyptian mayor of Thebes, Sennefur, made himself a tomb that Victorian Egyptologists called the “Tomb of the Vineyards” because of the garden painting on its ceiling. Yet again this garden plan is amazingly “modern,” very similar to the slightly too tidy plan views of 18<sup>th</sup> century grand gardens. The garden extends from a riverside with several walled enclosures and different areas, all viewed clearly from above. Except the trees. In the garden, trees are depicted in orchard areas and alongside the river and paths; clearly not one-to-one with real trees, there are too few, more to give an impression. However, the trees are not shown from above, but side-on iconic images, just like in a children’s cartoon story. Strangely though, look at a forested area on a modern UK Ordnance Survey map. To distinguish coniferous and deciduous woodland we find small iconic trees, just like those in Sennefur’s garden plan more than 3,000 years before.

Jumping forward another few thousand years to the early 17<sup>th</sup> century, John Speed produced some of the most accurate and popular maps of his day. The coastlines of these probably differ little from those drawn today, and on many of his maps, there are town plans for major centres, again very similar to those you might find in a current road atlas. However, his 1610 map of Wales is particularly interesting. Its coastline is cartographically highly precise; but, look inland and things are far more vague. Mountains are drawn as small conic side views, symbolic of mountainous country, but clearly bearing no relation to the actual panorama or plan. Rivers also are drawn, yet do not appear to have any of the precision of the coastline.

On reflection, the reason for this difference is obvious. The precise Cartesian location of the coastline was of the utmost importance for

## Paths and Patches

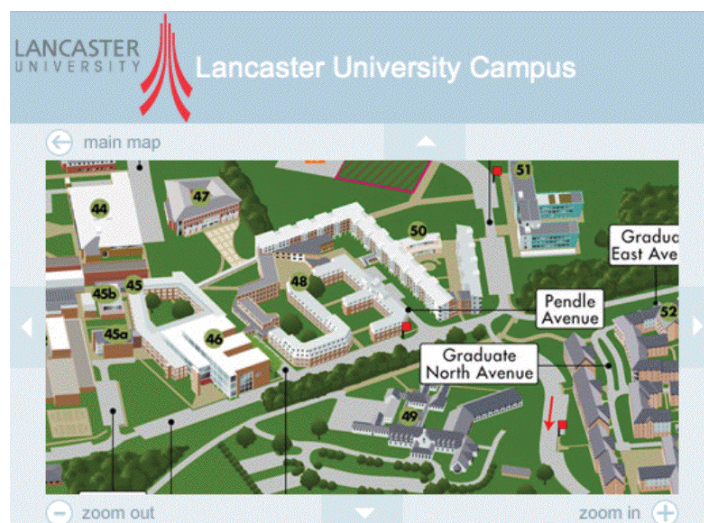
mariners, who use compass bearings (imaginary straight lines) to coastal landmarks to locate themselves<sup>1</sup>. Furthermore, the same imaginary straight lines and compass bearings make it (relatively) easy to map the coastlines; the sea gives you distance and long sight. In contrast, travelling inland, especially in the wild mountains of Wales, was a process of following rivers and valleys. What is important is not the precise location of these rivers, or even their lengths; travel time is only loosely correlated with metric distance. Instead, it is the topological connectivity of river valley and town that is critical. Furthermore, hillsides were more wooded than now, and mountaineering as a sport and leisure pastime still several hundred years to come, hence there is no viewpoint to see these valleys and rivers at distance; instead they created their own views following along themselves, in mathematical terms, an *intrinsic* coordinate system. Indeed, it was not until the early years of the 20<sup>th</sup> century that these hills were mapped with the same accuracy as the coastline (and recently this became the backbone of the plot for “*The Englishman Who Went Up a Hill But Came Down a Mountain*”<sup>2</sup>).

Looking again at John Speed’s Wales map, the inset town plans are perhaps more interesting still. Instead of plan views, they are sort of half plan, half side view. The buildings are drawn in side elevation and the pattern of streets is as if from the air, but looking obliquely at the town, perhaps at an angle of 30 degrees to the horizontal. This at first looks primitive compared to the more “modern” town plans in the English counties of his 1612 *Theatre of the Empire of Great Britaine*. Yet these side-view plans are more human in their perspective, looking almost as the towns would do as you approached them from a close hillside. Indeed, this is exactly the perspective chosen for many modern tourist town plans, and my own University has just such an alternative view for its campus map.

## Words of Worlds

There is an evening hymn “*The day thou gavest, Lord, is ended*” that is often used at funerals. The funeral association is because the words talk about the falling of darkness and the ensuing rest as all part of God’s plan; as fitting for the laying down of life as the laying down to sleep. Moreover, the

Figure 1. Lancaster interactive campus map – note semi-side view <http://www.lancs.ac.uk/travel/maps.htm>



words go on to describe the way in which prayer and praise never stop: with nightfall here, somewhere else a new day begins: “*While earth rolls onwards into light.*” John Ellerton is writing this in the midst of the 19<sup>th</sup> century, and maybe he was influenced by American millennial movements of the time that saw the colonization of the West as completing an earthly circle of prayer that would herald a heavenly second coming. However, whatever the details of the theology, there is no denying the passion of the words:

*As o'er each continent and island  
The dawn leads on another day,  
The voice of prayer is never silent,  
Nor dies the strain of praise away.*<sup>3</sup>

Whilst the fact that the world is spherical was known by the Greeks and the rotation of the earth accepted many centuries before Ellerton wrote, still there is a difference between head knowledge and heart knowledge, and clearly at some point Ellerton was caught by the wonder of the ever-flowing dawn. For those brought up in the 20<sup>th</sup> and 21<sup>st</sup> centuries, the different times of daytime and night are constantly reinforced by live television and long-distance phone calls in a way that Ellerton could never know (although the first transatlantic telegraph was laid in 1858, 10 years before the hymn was written in 1870). However, even in our generation, for many, this was perhaps head knowledge, known but not understood until the rolling 24-hour televised dawn of the 3<sup>rd</sup> millennium. For the children of the late 20<sup>th</sup> century, this was as defining as those 1960s images of earthrise on the moon were for their parents. Both, like the mariner’s view of the 16<sup>th</sup> century Welsh coastline, gave a perspective and distance and a different view of space and time.

Going back to the 15<sup>th</sup> century, we can catch another glimpse of this intimate intertwining of perception and conception of space in the journals of a Venetian monk, Fra Mauro (Cowan, 1998). Mauro lived all his life in an island monastery in

the Venetian lagoon. Whilst Mauro never ventured from his own island, he was a mapmaker, and created one of the most detailed mappamundi of his generation. He created his map not from personal observations, but from the reports of explorers, traders, and others who came through Venice and from whom he obtained not just details of cities, rivers, and mountains, but also stories of people and culture. For him the map was not just lines drawn on the page, but also ideas and imagination. His map is as densely annotated with words as it is with topographic features; lived essence rather than cartographic distance.

## OF MEMORIES AND MINDS

### Childhood Associations

When I was a tiny child, we used to visit my half niece (who was my age) in the next street. I was not really aware it was the next street, I guess, because I was in the pushchair most of the time. I do remember the image of the house and its doorway as we approached, and going up the side stairs, as she lived in a first-floor flat. Later, when I went to nursery and then infant school, I recalled the route we took. Initially in a pushchair as we took my sister to nursery, then walking together with my mum, and later my sister and I on our own, down three lanes to the school. The lanes were places of backdoors and rubbish bins, safer than roads. Not for us the sense of dark alleys with used hypodermics, or lurking muggers. (Although clearly the world was not entirely “safe,” as the lamppost behind our own house, which shone on our garden and the lane behind, had been placed there after my own half sister had been attacked in the dark long before I was born.)

From the house I also learned early the way to the park at one end of the street and the church at the other, going “round the block” to the shops with the corner newsagent that sold sweets, the greengrocer with its fresh fish counter, and the



## Paths and Patches

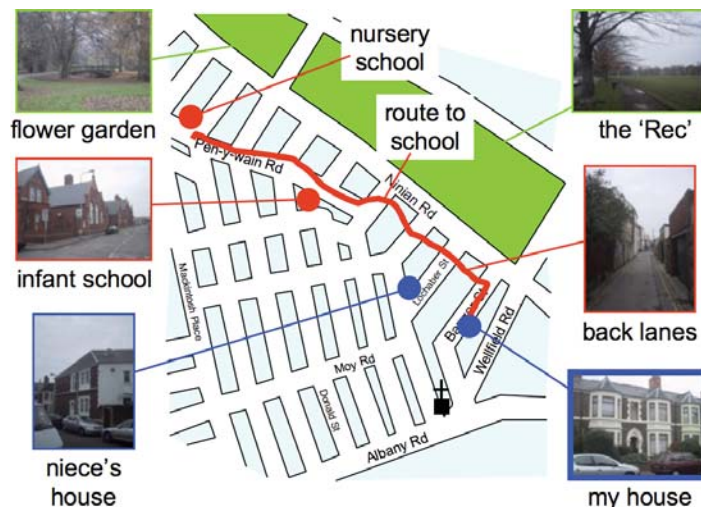
bigger newsagent with plastic soldiers; then further round past the church to the even bigger shopping street with Woolworths and Littlewoods. I knew early on about the link between the park at the end of the street and the parallel route along the lanes to the school and nursery. At nursery school, after orange squash and (an enforced but sleepless) “nap,” on sunny days we would walk snake fashion across the road to the flower park. Even at that age I knew how the vast green expanse of the “Rec,” the park closest to our house, led in a series of linked spaces to the flower garden and then further to the magical lake park beyond with its playground and lighthouse.

But it was only years later I realised that the roads that led off the big shopping street came to the back of the school, and that the alleys and back roads all linked together, and later still that I realised that the street we crossed when going from lane to lane on the route to school was the same street where we had visited my half niece when I was a toddler. Different understandings of my space: round the block, two ways to the flower garden, the open pathless grass of the “Rec,” and disconnected patches and paths branching star-like from my home.

My knowledge of town was even more patchy. We drove and there were a number of car parks. Each car park had an hour’s free parking before paying and so, on occasional Saturdays we would visit town starting at one car park, visit the shops nearby, bring back bags of things, then move to the next car park. Cardiff town centre was for me a series of isolated patches: big Littlewoods, WH Smith, and Marks and Spencer in one area; move to another car park for Howells (the posh shop) and David Morgan’s with its toy department and different ground floor departments dissected by dark arcades, yet mysteriously linking above ground; then further on another patch with more shop-filled arcades and the café, opposite the castle, where we sometimes had a cup of tea.

It was after even more years, I think possibly not until after my dad died and we had to walk the streets, that I began to link the various parts. In fact, it was not only proximity of car parks that marked these patches, but there are natural breaks: a big churchyard and public library between the Howells/Morgan’s block and M&S/Littlewoods, for example. Gradually I learnt ways between these: the large roads crossing near the castle, the Victorian glass-covered arcades, and the

Figure 2. My childhood neighbourhood



department stores with multiple entrance ways. However, it was years more still before I knew about other back ways beyond the web of main shopping streets and even on my most recent visit, I was surprised to find new interconnections.

## **Learning and Thinking**

These childhood memories and growing understanding of physical space mirror the growth and patternings of our internal conceptual space. In constructive learning theory, linking new knowledge to the student's existing understanding is critical. Just like my childhood knowledge of areas growing out from my home, our intellectual understanding grows from the familiar to the unknown. Educationalists talk about the "zone of proximal development" (note the word "zone"): those things at the edge of existing skills and understanding, which we can only accomplish with help, yet are ripe for learning because they are those things that can be interpreted by and connected into our existing mental schemata (Vygotsky, 1978). Where knowledge is patchy and disconnected, as often happens with "school learning," it may have its own internal coherence; yet there is always a thrill when we find two apparently disconnected ideas are, in fact, linked, or two things that are linked one way are also linked in others (like visiting the flower garden from nursery).

However, whilst the linked-ness of those childhood patches of space was important in my developing understanding of my neighbourhood and city, so also their definedness was critical. My house, my street, the shops around the block, the "Rec," the flower gardens, the area near the school, by being separate although linked, these gave my infant geography an intelligibility sometimes nameable, "Wellfield Road," sometimes not, like the parts of town around the car park known only by the shops they contain. As an adult I now know much of the web of interconnections and back routes between these childhood areas, yet still

my intellectual landscape of Cardiff city centre is shaped by these childhood patches.<sup>4</sup>

Just as routes and paths are important in our understanding of the physical world, so also are stories and sequential events critical to our thought processes and memories. In both working memory and long-term memory, we often encode information in sequences and find it hard to recall it out of sequence. Beginnings are easiest to remember, followed by endings, and middles hardest: try remembering the middle verse of a poem or song you know well without starting at the beginning.

The paths themselves are not uniform, but have landmarks to find the way, and perhaps more importantly, points of significance, so that the story or route becomes a sequence of episodes: down the road then turn into the lane, along the first lane then cross the street, into the next ... Just as the patches retain their intelligibility through a combination of distinctness and interconnectedness, so also our stories in the intellectual landscape have phases and key points: the princess is kidnapped by the dragon, the people fail to save her, she discovers the dragon is really a pussycat under the scales, befriends it, and returns home with a new pet.

And finally, notice how each area or landmark was invested with emotional responses: memories, feelings. The warmth of the house where I went to play with my niece, the memory of buying honeycomb bars at Marks and Spencer, or seeing the large stuffed monkey in David Morgan toy department and never guessing it would be there with my presents on Christmas Day.

Whilst we all know the way emotionally significant events burn themselves on our memory, and educationalists understand the importance of motivation in learning, it is relatively recently that the rich interconnections between emotion, memory, and thinking have begun to emerge.<sup>5</sup>



Figure 3. *The Christmas present monkey*



## The Mind of a Mathematician

Returning to that idea of a “zone”; it is interesting how the words we use about ideas and concepts are often spatial: “that’s *nearly* right” we say to a child, we may feel *close* to finding a solution to a problem or, if faced with an impasse, we may try another *way*. In the political sphere we may choose to *follow* our *leaders*, and Margaret Thatcher, in the 1980s, declared there would be no *U-turns* (although later was willing to accept sea change!).

Mathematical thinking is often spatial too in its use of metaphor. Whilst some mathematicians (especially logicians) clearly use more linguistic ways of reasoning, most use some form of internal visualisation, supported and communicated using diagrams and pictures. Recent brain-mapping technologies have corroborated these more anecdotal and subjective reports and shown that mathematical (as opposed to arithmetic) thinking is usually co-opting the parts of the brain related to spatial tasks (Dehaene, Spelke, Pinel, Stanescu, & Tsivkin, 1999). Even whilst writing this chapter I spent some time in a mindless task and during this time, the outline became clear; my wife remarked that I had needed *space* to think; we constantly paint our intellectual landscape with spatial words.

## OF LINES ON THE LANDSCAPE

### Journeys and Stories

Often when I give talks on space, I ask people to draw their journey to the meeting. I try to phrase this as ambiguously as possible to allow people to frame their own interpretation. The resulting drawings fall into a number of broad categories, or perhaps, to be more precise, embody elements of a number of categories.

- *Cartographic (isomorphic)* – Bird’s eye maps attempting an Ordnance Survey accuracy of location. These are often also oriented to the North, but not always.
- *Cartographic (homomorphic)* – Still bird’s-eye view, but not rigidly Cartesian, instead morphing space so that areas of interest, typically near the beginning and end of the journey, are shown expanded. There is some attempt to maintain the relative locations of places, roads, and so forth.
- *Schematic* – Bird’s eye but with little regard for the locations in space, and instead based on connectivity. Roads with many bends and curves may become straight lines. The London Underground map follows this principle.

- *Linear* – In all the previous, the land away from the route of the journey is shown with less detail or perhaps left blank. However, with linear drawings, the focus is entirely on the route. The turnings may be shown schematically, so the line on the paper may not be entirely straight, but the emphasis is on the line of the route. Again “real” maps often use this, for example, maps of motorways showing the road as a straight line with junctions along its length.
- *Episodic* – Again, in all the previous, one sees an episodic element: the greatest detail where there are significant landmarks, or where significant events occurred on the journey. In strongly episodic drawings, these dominate the image so that there is no attempt at an “objective” or external viewpoint. In one case I have seen an extreme version of this, a “time tunnel,” where the journey was drawn as if one could see from end to end with significant features, like stage scenery, either side.

This sequence of drawing kinds is deliberately chosen to emphasise the move from more

Cartesian, external views of the world to more personal views, and also the corresponding move from more 2-D representations of space to more 1-D linear ones of journeys. Indeed, as Tim Ingold (Ingold, 2008) has argued very cogently, our own experience is always linear, driven by time not space.<sup>6</sup>

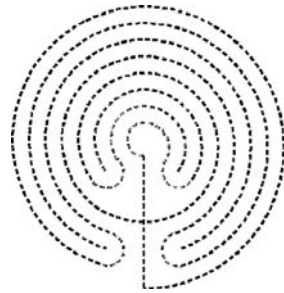
The linear and episodic representations are reminiscent of the rivers and even town plans on John Swift’s Wales map, linear paths and human perspectives, whereas the cartographic drawings reflect the mariner’s long sight over trackless waters and almost God-like view of the land. However, even on sea voyages, when the distances extend beyond the horizon, the linear nature of lives and stories resurfaces. The Argosy, Odyssey, and Viking sagas are not map-drawn oceanographic surveys, but instead relate the events of successive landfalls, or even creatures emerging from the deep.

On the sea, lines of movement may curve with the tide, but sight lines extend to the horizon. In constructed landscapes, often themselves built where the land has least intrinsic structure, long vistas are the exception and hold special significance: the Champs Elysées or the view from

*Figure 4. From Pincio to San Pietro*



Figure 5. A simple maze



Pincio to San Pietro. The importance of these lines of sight is central to space syntax, where the intelligibility and human movement patterns in constructed environments and urban spaces are analysed in terms of turnings and sight lines (Hillier, 1996). This intelligibility is critically challenged in mazes, which take a linear temporal path and convolute it over space. The earliest mazes are, literally, single lines wrapped and curled around themselves (Fisher, 1990), and it seems likely that the Minotaur's labyrinth was a simple spiral: in a related story, Daedalus threads a snail shell by tying a thread to an ant's leg, just as Theseus uses Ariadne's thread to find his way out of the labyrinth.

### **Boundaries and Thresholds**

Whilst the wild interior of Swift's Wales map is drawn rough, the English counties are more precisely circumscribed in Swift's 1612 *Theatre*. In comparison to the wild Welsh mountains, the southern counties are tamed and claimed. Precise boundaries mark the end of one man's land and the beginning of another's. For tribes who counted wealth in horses and gold, precise boundaries were not so important, but when wealth comes from taxes, it is of the utmost importance to know who lies in or out of your domain.

Older boundaries normally follow the features of the land: rivers or ridges, drawn by the land itself. The Northern extent of the stable Roman

occupation of Britain was marked by Hadrian's Wall, running from the Solway Firth in the west and extending to the Tyne in the east, following a rugged natural escarpment between. But where the land is more open, or where boundaries are defined from a distance, we see straight lines drawn across the map. Compare the state outlines of the eastern United States with those of Colorado or Wyoming.

Of course, it is the 2-D spatial extent of the land that gives crops, grazing, and wealth, but it is the line of the boundary that defines it! Perhaps this is most clearly seen at Rogationtide in an English church parish, when the parishioners "beat the bounds" of the parish, walking round its borders, reminding themselves of the boundary stones and markers that say where the extent of their land ends and that of their neighbours begins. This dual nature of boundaries, as things drawn from the land or drawn on the land, accounts for some of the fluidity of boundaries over time. Near my current home, the border between Scotland and England has moved back and forth over the years, and within my own lifetime the Welsh maps of Wales had a different border to the English ones (until local government reorganization in the 1970s, when the Welsh border won!).

The borderlands are always places of outlawry, trade, and adventure; dangerous yet exciting, and often creative. The one-street town in the Wild West, sea ports, and the interstitial community on the Golden Gate Bridge in Gibson's *All Tomorrow's Parties* (Gibson, 1999). Lines themselves are ambiguous, joining from end to end and separating from side to side, and where the joining line of a path intersects the separating line of a boundary, there is the threshold.

Thresholds are magical places in older cultures, where this world and the other meet, often the site for liminal experiences, themselves thresholds between life stages where the stability of role and place is breached. Even today, thresholds have a certain power over the imagination, whether it is Checkpoint Charlie or Ellis Island. During his

enthronement as the new Archbishop of York in 2005, as is customary, John Sentamu struck a staff against the doors of York Minster until he was let in<sup>7</sup>. Whilst in biology “interstice” is the name for the gap or boundary between tissues, in ecclesiastical terms it is the liminal moment when, like the Archbishop, a minister being ordained to new office is momentarily between orders and so in none<sup>8</sup>. And in Holman Hunt’s “Light of the World,” the doorway is an image for letting Christ enter your heart<sup>9</sup>.

## OF LANDSCAPES OF THE MIND

*i dizionari vanno continuamente corretti, come le carte geografiche*

dictionaries need to be corrected continually, like maps

-Carlo Dossi

### Articulation and Transarticulation

It was on a journey, along roads through mountains, and a conversation about words got intertwined with the flow of landscape. It started with computation and a passage about ubiquitous computation that read “the world is suffused with computation.” Such a statement makes “sense” because computation is being used in this context to mean an “essence” of the act of computation rather than the act itself. This led to a discussion about “essence” words, ones that you could say, whether truly or not, that something was suffused with. Many of these essence words end “-tion,” but not all -tion words are essence words, for example, articulation.

Of course, ever up for a challenge, whereas articulation is normally act not essence, we began to wonder, what would articulation mean if it were an essence word? Articulation as an act is either movement or speaking. As we considered this, we realized we could see meanings for an essence

of both. Articulation (in the movement sense) is surely of the essence of a Victorian cotton mill, and as a tree moves (articulation), it also tells us (articulation) something about itself, its own properties, and of the wind and air. Scientists may talk of the way nature speaks to them, and certainly poets often feel the same. It may be a human projection, but it is not so strange after all to speak of a world suffused with articulation.

However, note that the word “articulation” does not have this essence meaning in a standard dictionary; it was a meaning we were creating based on our conversation. Nothing unusual here; neologism is common, especially in academic circles. However, normally a neologism is an articulation, a coining of a word to describe some concept or thing that was already “there” in our heads. Here instead we took a word and forged a meaning for it, the opposite of articulation ... *transarticulation* (Dix, 2003a).

When we articulate we give name to an idea that we already have, like a cartographer naming an island or mountain. When we transarticulate, the word, by its naming, creates and delineates the idea, like Dido stretching ox thong to mark out Carthage.<sup>10</sup> Articulation goes from meanings to words, whereas transarticulation makes meanings from words. Of course, transarticulation is a neologism in the standard sense: we had a concept “forging meanings from words” and gave it a name. That is, whilst our formation of an essence meaning for “articulation” was an act of transarticulation, our coining of “transarticulation” to express that act was just common or garden articulation!

Now, just as the Scottish–English border is not arbitrary, but is shaped by the underlying landscape, so also transarticulation is not an arbitrary affair. In establishing the essence meaning for articulation, we could not choose anything we wanted, but were constrained partly by the existing meaning of the word, and partly by the physical and mental nature of the phenomena we saw around us and our own modes of thought.

However, just as the Scottish–English border is not entirely governed by landscape, and indeed does not currently lie east–west along the line of Hadrian’s Wall, so also the process of transarticulation, and the natural evolution of words, is not fully constrained by the world.

### **Exploring the Borderlands**

As a mathematician, it is normal to see the world of abstractions and concepts flattened onto the canvas of the page. Indeed, the Venn diagram is iconic of the discipline. We can see articulation and transarticulation clearly in this model. Articulation sees a coloured region and names it; transarticulation takes a name and chooses a region. The mathematical space is more like the English counties of Swift’s *Theatre* and less like the wild Welsh hills. Our conceptual landscapes are more ambiguous, more like the territories of the pre-Roman Celts, who certainly cared about the land they controlled, but were more likely to mark their centres than their boundaries.

In words and concepts, centres are also perhaps most important. If I say “chair” it does not matter too much that there are some things that are only questionably chairs (stools, low tables),

you know what I mean. Certainly one of the ways in which it is assumed we codify concepts like “chair” is through prototypes, specific examples, centre stones not boundary stones. This can be verified by reaction-time tests, where the further an example is away from an archetype the longer it takes to say “yes”; it would take longer to say “yes it is a bird” when shown a penguin than it would if shown a robin (Rosch, 1978).

However, although the centres are important, it is often in the borderland where the excitement lies; the domain of the bureaucrat and the outlaw. In academia and especially science, it is often the bureaucrat that wins. You may recall school discussions of whether a platypus is a mammal or a bird: it has mammary glands and feeds its young, it has fur and four legs, just like a mammal, but it has a beak, webbed feet and lays eggs, just like a bird<sup>11</sup>. If you are a curator and want to know whether to put the platypus in the room with the mammals or the room with the birds, this is an important question, but the issue hits at philosophical as well as pragmatic considerations. Linnaeus’ Classes are a way to describe and group creatures; the problem of the platypus is not that it does not fit cleanly into a class, but that one feels

*Figure 6. Stone at Tara – marks the heart, not the boundary of the land*





it *should*. That is, there seems to be an urge to either define the concepts we use to classify the world so that they fit exactly, or alternatively, to force the world so that it fits our classes. The idea that a platypus could simply be neither or both seems deeply troubling to many; the boundaries need to be drawn precisely with no gaps.<sup>12</sup>

There are good reasons for this desire to define; the semiotics of the abstract is far more problematic than the semiotics of the concrete. If I say “that sheep,” you may be looking in a different direction and get the wrong sheep, that is, our interpretations of the terms may differ, but in the end, the concept of the sheep that I am referring to is one we could both share as there is a real sheep to see. However, if I say “all sheep,” then the concept is generic and it is far less clear, not just because our interpretation of the term may differ (I mean white woolly sheep, you mean Genus Ovis), but because the concept I have in my mind may have *no* precise equivalent in yours. There is no shared object for our words to denote.

The clarification of the meaning of a word, often through exploring and drawing the boundaries of the word’s scope, is not just about agreeing an interpretation, but also about creating the interpreted concept. This may allow us to agree and even to differ in our interpretation (just as the maps of Wales differed in my childhood school-room), but we know what we are disagreeing about (Monmouth!). But of course this is our intellectual

landscape that is being scoped and bounded, not the world; the Severn happily meanders across the Welsh borders without hesitation as it breaches Offa’s Dyke.

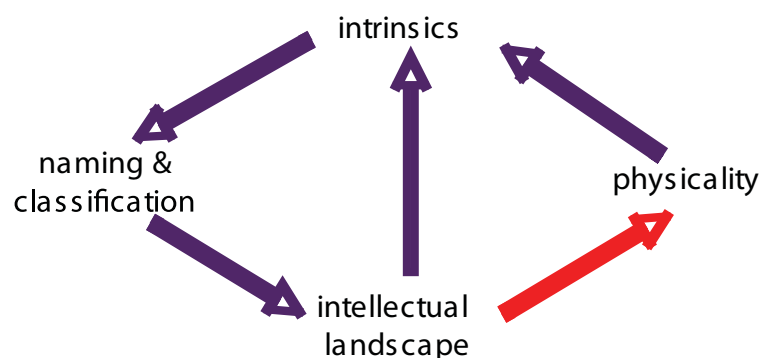
This defining of conceptual boundaries can be useful, but the full power of intellectual borderlands comes when you accept their nuanced nature and see boundary drawing as exploration, not definition. By attempting to establish boundaries, whilst knowing that these boundaries are artificial, it is often possible to understand better the nature of the centre.<sup>13</sup>

### The Physical Ecology of Semiotic Dynamics

As noted, our mental landscape itself shifts with the words we use. Occasionally new words create their meanings (transarticulation), and sometimes we create words to name things we already know (articulation). However, always there is an element of both at play, and our vocabularies constantly shift as words change their meaning. Our thoughts are partly channelled by our named categories, and partly when the tension between what we can say and what we want to say surfaces and we are forced to create or modify the words, and both happen soundlessly and effortlessly day to day.<sup>14</sup>

So, there is a constant cycle. There are the intrinsic things that we wish to deal with and talk about. Our words name these and group these and

Figure 7. Naming and physicality



in so doing, establish an intellectual landscape. However, this changes the way we see the world, and so the nature of the intrinsics themselves.

Of course, the objects of our thought and communication cannot be arbitrary, but are influenced by the physical world and the fact that we must interact with the world. There is much academic discussion about the socially constructed nature of science, but whilst many aspects of the way we choose what to do and how to represent it are about disciplinary culture, still, when we get into a plane we expect it to fly. The knowledge of aeronautic engineers must, in the end, respect the physicality of air and aircraft.

The tale does not quite stop there. The physical properties of the world are fixed, and indeed so are many other things, such as the passage of the sun across the sky. However, other aspects of the physical world, such as existence of aircraft, are constructed by us ... and what we construct depends on what we can think about. Because there are the words chair and table, it is hard to sell an item of furniture that does not neatly fall into one of the named furniture categories. If we have something that can be used as either, where do we put it in the catalogue? Although unnamed things do get constructed, there is a tendency to create things that fall into categories and hence, for those categories to harden and crystallise through positive feedback.<sup>15</sup> If it had been left up to people, the problematic platypus would probably never have been made!

Finally, returning to the parallels between the intellectual and spatial, we find they have come intimately together. Not only do we draw borders on maps, but we name countries, regions, and localities, and the naming changes the ways we conceive of ourselves. In 2004, Danielle Beccan was gunned down simply because she lived in the St Ann's area of Nottingham, whereas her killers came from the Meadows. Borders are often drawn where natural physical features lie, or where there are linguistic, ethnic, or cultural divides. However, once drawn on the map those human

distinctions tend to crystallise, and the landscape itself may reflect this in changes in architecture (crossing the Scottish border), in varying land usage (Israel and Jordan), or artificial barriers (Hadrian's Wall, Offa's Dyke, or the concrete barrier on the West Bank). The physical world reflects the intellectual.

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## ENDNOTES

- <sup>1</sup> Detailed coastal charts, called portolano, date back to the 13<sup>th</sup> and 14<sup>th</sup> century, but in *Maps and Map-Makers* (1949), Tooley suggests that this form of cartography may date back as far as the 2<sup>nd</sup> century Marinus of Tyre.
- <sup>2</sup> Produced by Miramax Films, Parallax Pictures, 1995.
- <sup>3</sup> Words from *Hymns and Psalms*, Methodist Publishing House, London, 1983.
- <sup>4</sup> Some readers may notice similarities with Lynch's paths, districts, edges, landmarks, and nodes (Lynch, 1960). In his empirical research into the intelligibility of the city, these came out as key elements in people's mental maps. However, in his work, the paths, districts, and so forth, are features of the city that are likely to be shared by many people (e.g., Champs Elysées or Times Square). My childhood paths and patches are very personal (as will be yours). However, now as an adult ... not least because I know names of places and roads, my model is more normalised. This relation between

individual and shared conceptualisations is important, but not one I will pick up fully in this chapter.

<sup>5</sup> Notably in the works of Damasio (Damasio, 1994).

<sup>6</sup> While Ingold argues for the primacy of paths over places (or certainly Cartesian space), in this chapter I argue that both are critical. In fact, in these images that people draw, the episodic nature focuses on events; locations at particular times with meaning. The childhood patches are in fact more like his helicopter stops; as a child, the travelling between, in push chair or car, left the world disconnected, yet these childhood patches were places of meaning: not just a room in a house, but the place where I played. Ingold cites Massey (2005), who similarly argues for alternative conceptualisations of space in terms of trajectories, and for both the inhabited nature of places and spaces is central. Later in this chapter, when I look at physical and semiotic dynamics, we will come to a place that perhaps both would recognize even though our paths there have been different.

<sup>7</sup> See [http://news.bbc.co.uk/1/hi/england/north\\_yorkshire/4481796.stm](http://news.bbc.co.uk/1/hi/england/north_yorkshire/4481796.stm)

<sup>8</sup> Victor Turner (1982) coined the term *liminal* to cover various rituals of passage or other in-between times, when social norms are often ignored or even systematically violated. The word liminal comes from the Latin *limen* – a threshold. Often these rituals include a literal move across a threshold, or in and out of a sacred space. Not explicit in Turner’s writing is the way in which the liminal period, by being not a part-way point, but a totally other place, allows the distinctiveness of either side to be preserved, with no hint of ambiguity. This partly explains why, in an age where all distinctions are lost, we have only what Turner calls *liminoid* experiences; the elements of the ritual, but without the

threshold passing, for there are no boundaries.

<sup>9</sup> See <http://www.explore-stpauls.net/oct03/textMM/LightWorldN.htm>

<sup>10</sup> The story goes (in Virgil’s *Aeneid*) that Dido was allowed as much land as she could enclose with an ox hide. She cleverly cuts the hide into thin strips and uses these to surround a hill that then became the city of Carthage. Mathematicians regard this as the forerunner to the theorem that a circle is the shape that encloses the maximum area for a given perimeter, which itself is a classic problem in the Calculus of Variations. See <http://en.wikipedia.org/wiki/Dido> and <http://courses.washington.edu/hum523/dido/>

<sup>11</sup> Indeed in “*Left Hand of the Electron*,” Asimov (1972) suggests that the question should even be mammal or reptile, as the bones in the platypus’ jaw are characteristically reptilian.

<sup>12</sup> Casey (1997) notes that in the Mesopotamian cosmology, Anshar and Kishar are the gods of the horizons of sky and earth, that is, the horizon is not the boundary itself. This actually accords with a mathematical view of the horizon, which is a limit point from either side, but itself a singularity. It has definable things above and below, but it is not so clearly meaningful to ask what is actually *at* the horizon itself. There is no gap, but neither is there an actual point between; those who use liminal experiences to transition but not bridge discrete social structures would surely approve.

<sup>13</sup> We have used the exploration of boundaries extensively as a technique to explore difficult areas and, in fact, once you recognise this is what is being done, you start to see it elsewhere. One form of this is seeking critical points. You choose examples that are central to two categories, and then try to find intermediate examples and ask which

category they fall into. At some critical point a small change shifts the examples from one side to another, and you can then ask “what attribute(s) have changed,” and in so doing discover one attribute (usually of many) that is critical for the core concepts. (Sas & Dix, 2006)

<sup>14</sup> This account, to some extent, follows and yet also opposes the Sapir-Whorf Hypothesis that thought is conditioned by our native tongue (Crystal, 1997). While accepting the influence, and to some extent determining force of language on thought, I am presenting this as part of a more dialectic or dynamic canvas. Indeed, Whorf’s own (much

debated) example of 15 words for snow in Eskimo illustrates this; it is no accident that the language has words for snow; this must have come, albeit maybe over a long period, as the result of a cultural and linguistic dynamic, giving words to concepts necessitated by the constraints of the environment.

<sup>15</sup> Indeed the Soviet philosopher Ilyenkov regards nonmaterial “ideal” phenomena, such as goodness, as not merely being embodied in, but actually having their existence within constructed cultural practices and created artifacts (Turner, 2005).