

Zen and the Art of Spatio-temporal Analogy:

A Surfer's Vision of Semiosis

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1 March 2009

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Epigraph

"Questions relating to subject and object, to their distinction and their union, must be put in terms of time rather than of space."

~ Henri Bergson (1859-1941)

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Preface

My mother sat me at a table, placed a pen in my hand and a piece of paper in front of me. I think I'd seen a pen in action already. However, I'm not sure if I had understood its purpose, or perhaps even that it had a purpose. I remember holding the pen vertically upon the page and watching closely as it rolled on its ball point, leaving a blue line where it had been. I remember the state of absorption. But, I also remember how suddenly it stopped, which is, I suppose, why I have come to remember the event. It stopped because I suddenly became aware of my mother watching what I was doing, for in that instant my involvement shifted from being one of absorption to being a performance. As if to indicate that I had command over its function, I immediately increased the speed of the pen. I wanted to give the impression that it was not a new thing to me. Then my mother suggested I draw something. Since I had already drawn a line, I figured that more was required for a drawing to be a 'something'. So, just below the line, I confidently scribbled around and around; that is, until my mother asked: What is it? This stopped me in my tracks. I didn't know what I had drawn. I thought I was drawing something, but didn't know that that something had to refer to something other than itself! Oh, how I remember being caught off guard. Eventually, with my mother's vocabulary, I decided that the line was a hill and the scribble was a cave.

Introduction

Language structure is easier to visualise when syntax and semantics are separated, just as everyday circumstances are easier to visualise when time and space are separated. This similarity may point to a common structure governing how things and relations form wholes, in which case, the traditional notion of language as a stream of coded information could be attributed to the ontological perspective that renders temporality as the passage of time.

We invoke the notion of an ontological perspective when we describe an analysis as either top-down or bottom-up, prescriptive or descriptive, etic or emic, etc. But the notion of opposition is itself an assumption that needs to be justified. For example, Saussure distinguishes *langue* and *parole*, corresponding to how we think we should speak, versus how we actually speak. However, *langue* and *parole* are interrelated insofar as *langue* provides the structure for *parole*, which continually restructures *langue*.

In terms of oscillatory dynamics, this interrelationship reflects waveform activity, which is perceived as significance. Oscillations are ubiquitous in nature, where organic patterns and processes appear to be derived from

non-organic patterns and processes. Our perception of mental and physical objects is similarly related, in the sense that our perception of physical objects underpins the concepts that form language, which in turn gives concepts a presence that rivals the physical presence of objects.

In contradistinction to *parole*, the defining feature of *langue* is the separation of grammar and lexicon. However, the schools that analyse *parole* appear to be compromised by a reliance on the *units and rules* approach traditionally applied to *langue* (Taylor & Cameron, 1987, p.159). Since *units* are spatial in character, I think that a natural predisposition to spatial relations could be responsible for distorting the analyst's perspective.

Drawing on a range of interrelated phenomena, I present an ontological perspective on language that transcends the limitations inherent in spatial relations. The rational framework for this approach is based on the notion of *embodied cognition* (EC), which characterises the mind as physically grounded in its situated presence. My contribution to EC concerns the nature of situated presence, which I describe as oscillatory. If oscillations thereby ground intentionality, they might help to explain the patterns and processes evident in language.

The EC paradigm encourages a flexible attitude to the study of consciousness, drawing on fields of research as diverse as phenomenology, neuro-physiology, evolutionary biology, anthropology, developmental and cognitive psychology, computer science, linguistics, literature, meditation, art and sport. Admittedly, interdisciplinary research is a risky enterprise, given that researchers attempt to base arguments on concepts they may not fully understand. The risk is often ignored by New Age philosophies, which draw analogies with scientific concepts to give their ideas credibility. The 2004 film *What the Bleep Do We Know!?* is riddled with counter-factual arguments that are viewed by academia as pseudoscience. According to a letter published in *Physics Today*:

"the movie illustrates the uncertainty principle with a bouncing basketball being in several places at once. There's nothing wrong with that. It's recognized as pedagogical exaggeration. But the movie gradually moves to quantum 'insights' that lead a woman to toss away her antidepressant medication, to the quantum channeling of Ramtha, the 35,000-year-old Atlantis god, and on to even greater nonsense." (Kuttner & Rosenblum, 2006, p.15).

The film presents a message that is potentially misleading, because laypeople would not know where the science ends and the speculation begins. However, the problem is not limited to pop culture. Sometimes, academics use terminology that carries inferences from everyday concepts, like for example "altruism" in biology. This no doubt appeals to a broader audience of readers. But, some question this application of the

term, suggesting that it is not consistent with the core meaning of altruism.

"Ordinarily we think of altruistic actions as disinterested, done with the interests of the recipient, rather than our own interests, in mind. But kin selection theory explains altruistic behaviour as a clever strategy devised by selfish genes as a way of increasing their representation in the gene-pool, at the expense of other genes. Surely this means that the behaviours in question are only 'apparently' altruistic, for they are ultimately the result of genic self-interest?" (Okasha, 2008. [WEB]).

Acting in the group's best interests in order to benefit in the future is delayed self-interest, the antithesis of genuine altruism. Not only does this undermine the original meaning of the concept, it infers that there is an evolutionary link between the two phenomena.

Clearly, metaphors serve a useful pedagogical function, but they are also fundamental to intellectual enquiry. The Nineteenth Century German Chemist, August Kekulé, who contributed some major discoveries to the field of organic chemistry, gives a tantalising account of the thought processes that led to him discovering the chain structure of many organic molecules and the ring-structure of the benzene molecule. The story is often discussed in the context of consciousness studies, because it highlights the mysterious ability of the mind to make sense. Here is the story in his own words:

"During my stay in London I resided in Clapham Road....I frequently, however, spent my evenings with my friend Hugo Mueller....We talked of many things but most often of our beloved chemistry. One fine summer evening I was returning by the last bus, riding outside as usual, through the deserted streets of the city....I fell into a reverie, and lo, the atoms were gamboling before my eyes. Whenever, hitherto, these diminutive beings had appeared to me, they had always been in motion. Now, however, I saw how, frequently, two smaller atoms united to form a pair: how a larger one embraced the two smaller ones; how still larger ones kept hold of three or even four of the smaller: whilst the whole kept whirling in a giddy dance. I saw how the larger ones formed a chain, dragging the smaller ones after them but only at the ends of the chains....The cry of the conductor: "Clapham Road," awakened me from my dreaming; but I spent a part of the night in putting on paper at least sketches of these dream forms. This was the origin of the "Structural Theory".

"Something similar happened with the benzene theory.... I was sitting writing at my textbook but the work did not progress; my thoughts were elsewhere. I turned my chair to the fire and dozed.

Again, the atoms were gamboling before my eyes. This time, the smaller groups kept modestly in the background. My mental eye...could now distinguish larger structures of manifold conformation: long lows, sometimes more closely fitted together all twining and twisting in snake-like motion. But look! One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke; and this time, I spent the rest of the night in working out the consequences of the hypothesis.

"Let us learn to dream, gentlemen, then perhaps we shall find the truth." (Martin, 1997, p.165)

This story is relevant for a couple of reasons. Firstly, it encourages us to be open to new ideas, even if they seem only loosely related to the research. My suggestion that surfing is analogous to language would fall into that category. Secondly, Kekulé recalls that a "snake-like motion" was instrumental in the processing of the mental images. This corroborates my assertion that a rhythmic motion like surfing is somehow implicated in thought processes. Thirdly, the idea that dreaming could actually lead to great discoveries validates introspection in research. My views on temporality are drawn from introspection. So, I take comfort in the thought that this might be viewed as acceptable, at least in principle.

My thoughts on time were presented in an essay, which was marked by the eminent logician Peter Ørstrøm. He assured me that the argument was logically sound; though he hastened to add that he did not agree with it. He reconciled the incompatibility of his ideas and mine, suggesting that my interpretation of time belongs to the B-series, while his belongs to the A-series; these being the two modes of time reference described by John McTaggart (1908). The difference between the A-series and the B-series hinges on the orientation of the subject relative to the object. It is our detached perspective that portrays time as a continual stream of events, labeled the A-series. Events are objectified, in the sense that they stand in relation to time, as if the event is in the foreground and time is in the background. In the B-series, events are subjectified, in the sense that they stand in relation to each other, with temporality viewed only in terms of events that are before and after each other.

It serves my purposes to adopt the B-series, because the subjectification of temporality suspends the separation of subject and object responsible for viewing the world in terms of *conceptual artifacts*. This term refers to ideas, as opposed to the phenomena referred to by ideas. *Conceptual artifacts* are, first and foremost, hypotheses that enable people to collaborate in problem solving activities (Breunig, 2009, p.5). Since the natural world has no concept of itself, it is not likely to reveal itself through conceptual means. On the contrary, it is concealed by them, as

Heidegger (1925) explains:

"When tradition thus becomes master, it does so in such a way that what it 'transmits' is made so inaccessible, proximally and for the most part, that it rather becomes concealed. Tradition takes what has come down to us and delivers it over to self-evidence; it blocks our access to those primordial 'sources' from which the categories and concepts handed down to us have been in part quite genuinely drawn. Indeed it makes us forget that they have had such an origin, and makes us suppose that the necessity of going back to these sources is something which we need not even understand."

(Heidegger, 1962, p.43)

Heidegger views philosophy as a means of destroying ordinary everyday meanings of words like time, history, being, theory, death, mind, body, matter, logic etc. By orienting ourselves to an objective reality, the truth is presented as a neutral fact belonging to what Heidegger calls the *they-self*. It suits our everyday circumstances to subscribe to the *they-self*, but it is an *inauthentic* existence, plagued by angst. Unlike fear, angst is not oriented to an object, but rather to an uncanny sense of one's own detached perspective. The German for uncanny is *unheimlich*, which translates literally as *not home*.

Heidegger defines this problem in terms of our attitude to death. In ordinary everyday discussions, the *they-self* views death as a mundane fact, which inadvertently hides its actual relevance to one's own presence. Angst challenges us to recognise life's finitude; a call of conscience from the self wanting to be itself. In a moment of vision, the self is revealed from a new perspective, which simultaneously exposes the *they-self* as responsible for concealing the self from the self.

It is in the nature of *conceptual encoding* that one's perspective becomes detached. We are aware of ourselves being aware of an object (Brentano, [1874] 1973, p.91). However, this self awareness does not apprehend itself as an object. Jean-Paul Sartre alluded to this discrepancy, claiming that:

"Insofar as my reflecting consciousness is consciousness of itself, it is *non-positional* consciousness. It becomes positional only by directing itself upon the reflected consciousness which was not itself a positional consciousness of itself before being reflected." (Sartre, [1960] 2000, p.45).

Sartre's description of *non-positional* consciousness is strikingly similar to the role played by *optic flow*, which is to generate the point-of-view, from which to perceive space.

Since human infants are capable of perceiving three-dimensional space, Chomsky (1980) proposes a linguistic system that is analogous to the visual system. He sees strong parallels between vision and rationalism, which he uses to support one of the core tenets of generative linguistics, namely that language is an innate faculty of the mind. However, Chomsky does not interconnect vision and language. He sees cognitive systems as separate, in a sense that is analogous to biological systems, like the circulatory system, the digestive system, the immune system and so on and so forth. By contrast, Lakoff embraces modern biological models that are characterised more by the interconnections between systems. Chomsky challenges this stance, claiming that:

"there seems little reason to suppose that the principles of grammar or universal grammar have any close analogue in other cognitive systems...just as we do not expect the fundamental properties of the visual system to be reflected in language. Confident assertions to the contrary, which are prevalent in recent literature, seem to me rather dogmatic as well as without empirical support or plausible argument." (Chomsky, 1980, pp.245-6)

In tandem with spatial perception, mathematical knowledge is also posited as a supporting argument for innateness. These things, he says, "just seem to be inherent to human beings." (Chomsky, 1980, p.23). His internalist approach to language and mind is inspired by Descartes' theory of vision, which draws a clear distinction between inner and outer realities. Descartes views the body as a machine that is ideally controlled by the mind, though the body can influence the mind, as when passion influences behaviour. Insofar as Descartes acknowledges that the mind can be influenced by the body, his interpretation of the duality is a departure from previous accounts, which viewed it as uni-directional; i.e. the mind controls the body. The issue is bound up in prejudices concerning morality, which Hume takes to task.

Hume's most quoted assertion is that; "Reason is, and ought only to be, the slave of the passions, and can never pretend to any other office than to serve and obey them." (Hume, 1790, p.193). By this, he is not advocating irrational sentiments, beliefs or emotions. He follows the claim immediately, with a (less quoted) qualification: "As this opinion may appear somewhat extraordinary, it may not be improper to confirm it by some other considerations." The point is that arguments alone do not move people; passion is needed to drive us toward actualising the results of our reasoning. Descartes' dualism seems more like a characterisation of the human condition, viewed in the context of social values. Hume rebukes this stance, insisting that:

"Nothing is more vigilant and inventive than our passions; and nothing is more obvious, than the convention for the observance of [society's] rules. Nature has, therefore, trusted this affair entirely to

the conduct of men, and has not plac'd in the mind any peculiar original principles, to determine us to a set of actions,..." (Hume, 1790, p.289).

This shift from *Rationalism* to *Empiricism* inspired Emmanuel Kant to synthesise the two traditions. He asserts that: "Concepts without intuitions are empty, intuitions without concepts are blind" (Cited in Brook, 2009. [WEB]). Concepts have to be joined together in such a way that their synthesis gives meaning. According to Kant, information is organised by three types of synthesis: the apprehension of raw perceptual input, the recognition of concepts and the reproduction of each in imagination. These reflect three fundamental faculties of the mind; Sensibility, Understanding and Imagination. Imagination is the least stable of the three, as it allows the mind to alternate between understanding and sensibility. (Brook, 2009). This pattern reappears in Freud's model of the psyche, comprising three functionally interrelated parts, one of which negotiates between the other two. According to Freud:

"The ego is that part of the id which has been modified by the direct influence of the external world ... Moreover, the ego seeks to bring the influence of the external world to bear upon the id and its tendencies, and endeavours to substitute the reality principle for the pleasure principle, which reigns unrestrictedly in the id.... The ego represents what may be called reason and common sense, in contrast to the id, which contains the passions ... in its relation to the id it is like a man on horseback, who has to hold in check the superior strength of the horse; with this difference, that the rider tries to do so with his own strength, while the ego uses borrowed forces." (Freud, 1962, pp.363-4)

I similarly conceive of the imagination riding the mind, though I see it in terms of a surfboard riding a wave. There's something about surfing that touches the very essence of what it is to be alive. It's hard to explain to non-surfers how it feels to carve across a wave, to push the limits of your surfing ability and to surf even better than you thought you could. There's a thrill in surfing that only the experience itself can communicate to you. One surfs *with* the wave, drawing on experience to manoeuvre the surfboard in synchrony with the wave, all the while anticipating how it will change shape (Flynn, 1987, p.400). The next section describes in detail how the surfboard "uses borrowed forces" within the wave.

These forces are hidden from awareness, because their operation is akin to using a tool, where the tool becomes an extension of the self and is absorbed into the task being performed. Since the purpose of the self is an open question, interpersonal relationships are often confounded by the *transference* of one person's traits (negative or positive) onto another person. Clearly, this would seem absurd to the individual, if he or she

were aware of the process. But, Jung suggests that projection of the anima/animus is part and parcel of falling in love:

"If the positive aspect of the anima is projected onto a woman, she then becomes highly desirable to him. She fascinates him, draws him to her, and seems to him to be the source of happiness and bliss. A woman who carries this projection for a man readily becomes the object of his erotic fantasies and sexual longings, and it seems to the man that if he could only be with her and make love to her he would be fulfilled. Such a state we call falling or being in love." (Sanford, p.14).

The phenomenon of projection is exposed more concretely in the *Perky Experiment*, where subjects fail to distinguish between real and imagined percepts. In this experiment, subjects are asked to stare at a seemingly blank screen while visualising a particular object, e.g. a tomato, a book, a leaf, a banana, an orange or a lemon. A faint image of the object is then back-projected onto the screen in soft focus. While onlookers can see the faint image on the screen, the subjects think it is in their imagination. In the original experiments (Perky, 1910), one of the subjects was surprised that the banana she 'visualised' was vertical instead of horizontal, while another was surprised to have 'visualised' an elm leaf after trying to visualise a maple (p.432).

Surfboard design

The proposed model of spatio-temporal projection includes a surfboard without reference to a rider, because the presence of a surfer within the model would amount to placing a mind within a mind, which is not only distracting, but leads to an *infinite regress* of minds within minds. But, the spirit of the surfer is reflected in the surfboard, insofar as its design comes from the mind of the surfer who shaped it. There is an adage in surfing that goes "Only a surfer knows the feeling". But, surfboard shapers argue that only they truly "know" the feeling, since they project it into the design of the surfboard (Webber, G.M. 2007).

If you think of the surfboard as the medium for surfing expression, then surfboard design is its grammar. It is the structure through which surfing expression can flow. The aim of surfboard design is to refine this structure so surfing expression can become more fluent. The surfboard design process can be described as building a bridge between shape and context, based on function. According to this approach, the designer is concerned with two sides of a relationship (Alexander, 1964, p.16). On one side, there is the shape of the surfboard itself. On the other side is the surfboard's context, which is every external condition that influences its function.

The most obvious factors that play a role in a surfboard's context are physical in nature; from the surfer's weight to the size and shape of the wave. These are taken into consideration when deciding on a surfboard's length, width and thickness/volume. However, the ultimate aim of surfboard design is to relate shape to purpose, since the ideal is a surfboard that becomes absorbed into the surfer's intentions. So, the surfer's intentions are also part of the surfboard's context, making it part of the design process, too.

In considering the surfer's intentions, the designer analyses how the surfer's movements affect the response of the surfboard. Basically, the surfer turns the surfboard by leaning his body and extending his legs and feet to varying degrees. However, it is not the mechanics of the human body that concerns the designer, but the net affect. So, the designer reduces the surfer's influence to a set of rotational axes. At this level of abstraction, the surfer's intentions can be represented diagrammatically, enabling the designer to more easily visualise the different phases of a manoeuvre, as well as the transitions between them.

Whatever the axis of rotation, manoeuvres can be divided into two phases, a penetration phase and a release phase. The penetration phase is characterized by the inward rotation of the surfboard, while the release phase involves its outward rotation. By visualising each phase in terms of its rotational axis, or sequence of axes, the designer can identify which portions of the surfboard come into play for a given manoeuvre.

Having established a link between the surfer's actions and the under surface of the surfboard, the designer is ready to include the notion of resistance. The focus here is on the degree of drop-off allowing the water to escape. Imagine a straight line drawn across the bottom surface, depicting the flow of water. Now, picture this line as a cross-section of the bottom contours, as if drawn on a piece of graph paper. The curve of this cross-section determines the force generated during the penetration phase of the manoeuvre. For example, a concave curve is more responsive than one which is convex.

For the sake of simplicity, the greatest amount of resistance is achieved by rotating the surfboard sideways, since the bottom curve aligned with this plane of rotation provides the least drop-off. Subsequently, the penetration phase of a manoeuvre tends to be characterised by rotation of the board in or near to this plane. By contrast, the release phase is characterised by a transition from this rotational plane toward either the centre plane, by directing the water out through the tail, or into the horizontal plane, by sliding the tail out. The horizontal plane obviously provides the least resistance, since it is limited to the surface area of the fins. However, the loss of resistance felt in the central plane results from

the surfboard's rocker, since the greatest amount of surface drop-off is directed through the tail.

The blending of these curves, which fan out from the centre of the board, influences the transition from rail-penetration to release through the tail. Although curvature from nose to tail and from side to side, by themselves, determine the extent to which penetration and release contribute to a surfboard's performance, it is the blending of curves between these two extremes that ensures that the board enters and exits turns smoothly and with minimal loss of speed.

Although surfboards can be represented in 3D, with movements reduced to rotational axes, surfing manoeuvres are as much the transition between rotational axes as the axes themselves. So, it is exceptionally difficult to visualise at this level of abstraction, without drawing on actual surfing experience. To perceive how shape affects performance, the surfer-shaper has to visualise shape in the context of motion. This is radically different to everyday spatial perception and highlights the importance of an ontological perspective.

The next section clarifies this point with a thought experiment, showing how reality can be divided in conceptually different ways. This leads into a series of interrelated sections that describe dynamical structures that are biological, perceptual, phenomenological, psychological and finally symbolic, with the proposed model of spatio-temporal projection applied to language.

Dimensionality

Spatial perception sets motion in the context of space. Space provides a sense of motionlessness - a sort of reference to show how motion differs to it. For example, we typically regard motion as a change of position, a reference to something fixed. But as a consequence, motion is seen as a movement *in* space when it is actually a movement *of* space - a space in motion.

The spatially derived model of reality is based on how the dimensions differ to each other. Space is characterized by the difference between a plane and space. The planes set the context for the idea of space. The edges of a plane provide a context by showing the line where the plane ceases to be a plane. The difference between a line and a plane is what the concept of a plane is based on. To visualise a line, we give it ends. Each end of the line is a point and together they serve as the context for the line. They show the difference between a line and a point, and in this way they define the point at which a line ceases to be a line.

Successive dimensions build on lesser dimensions; for example, a line as

a series of points. So, each dimension can be 'placed' within dimensions higher than itself, but not lower than itself. However, while this is clear for each of the dimensions leading up to the three dimensions of space, it is not so clear how time 'contains' its lesser dimensions. The problem is the spatially derived model of reality. We understand the passing of time to be in relation to the present moment, as if the 'now' has no duration. We supposedly experience a string of nows. However, it is only for sake of the concept that the passage of time differs to the present. The contrast does not reflect reality, but the setting of a context.

What the concept of time fails to take into account is that successive dimensions merge. They are not discrete. Each dimension carries within it the dimensions lesser than it. So, instead of focusing on how the dimensions differ to each other, we will consider how they differ in themselves. This reveals that the essence of a point is its location, the essence of a line is its alignment, the essence of a plane is its form, and the essence of a space is its density.

In considering how a motion differs in itself, one is tempted to describe it in linear terms: i.e. the path it follows. But this is not its essential quality, since a line has just one dimension, not four. Neither can we narrow it down to its location, form or density, though that which moves certainly has these characteristics too. But all these things being equal (imagine two identical movements side by side) there remains one characteristic which belongs solely to motion: its speed. This is how motion differs in itself - making speed the essence of motion.

The variable of speed is beyond the ordinary conception of motion, so we tend to regard it as inconsequential. But motion in the sense of speed is precisely how it ties in to reality. This can be observed in the shape of a wave. It is not simply that the form would not exist without motion, but that the variable of speed determines the variety of curves in a wave. A standing wave behind a rock in a stream is a good example of this principle: the water flows through the wave while the form expresses the various speeds at which the water is moving.

The whirlpool is a particularly good example because the dimensions are seen to be variables linked in a unified system. There is the alignment of its axis, the form of its surface, the matter it draws inward and, since a vortex rotates progressively faster toward its centre, the variable of speed. Placing a tiny pointer in a whirlpool can show the part played by motion. The pointer remains parallel to its original alignment, despite being carried around and around. This indicates that motion, rather than content, determines the form (Schwenk, 1996, p.45).

The concept of time fails to account for the diversity of change, since the division of time and space implies that change is restricted to the 4th dimension. However, assuming that change is the very essence of reality,

rather than a mere aspect of it, it follows that the essence of each dimension is how that dimension changes. By setting each dimension in the context of change, the concept of time subsequently loses its significance as one of the dimensions, as such, separated from space. To subordinate the dimensions to the concept of time ignores the crucial point that each dimension finds its expression in change and that change is, moreover, what holds them together.

Having reinstated motion as the fourth dimension, it becomes apparent that time is also a *generalisation* of change. Just as we tend to regard motion in terms of its lesser characteristics, so too do we have an inferior perception of that other form of change called growth. Since growth depends on but is more than motion, it might be a higher dimension, with evolution as its essence. To address this proposition, the focus has to shift from the ontological to the ontogenetic, i.e. from what things are, to how they come to be.

Biological structures

The development of spatial structure in the embryo has been found to involve a chemical reaction which is analogous to standing waves (Lehar, 2003, p.2). Using a staining technique, morphogenesis can be seen in the early embryo, in the form of a periodic banded pattern. This pattern indicates alternating concentrations of morphogens, which chemically mark the tissue, identifying which cells belong together. The mechanism, known as *reaction diffusion*, involves a continuous process whereby morphogen P catalyses the production of more morphogen P, plus morphogen S, which inhibits morphogen P. The physiological development of the organism is thus marked out, distinguishing bones, muscles, internal organs, etc. Camouflage patterns have also been attributed to *reaction diffusion* (Murray, 1981, p.473). The stripes of the zebra and the spots of the leopard show how morphogenesis exploits periodicity for evolutionary advantage. The extent to which this process is analogous to standing waves is easily appreciated when comparing patterns of animal skin colouration and sand vibrating on a steel plate. The sand accumulates at the nodes of vibration, to reveal the geometric character of the harmonic resonance. Many patterns found in living organisms can be replicated in this way.

The underlying argument is that the evolution of biological form is founded on generic physical forces, which presumably served as morphological templates within which genetic selection could operate. While the similarity between so many physical and organic forms suggests such a connection, the case is rather more compelling if one considers that many organisms have morphological features that are similar to physical forms despite being genetically unrelated. For example, a 3D logarithmic spiral found in seashells is also evident in tidal-washed kelp

fronds and in the shape of our own skin pores (Pronk, 2008, p.4). Natural patterns and processes are often applied to the development of new technology. This approach to design, called *Biomimicry*, enables designers to take advantage of the millions of years of incremental variations that have been made through biological evolution, to gain insight into the underlying principles determining naturally evolved shapes. For example, a highly efficient fan blade has been designed using the 3D logarithmic spiral, which appears throughout the natural world, because this shape optimises the flow of water or gas across its surfaces (p.4).

Since language has itself evolved through incremental variations that benefit the organism (or else decay through lack of use), the morphology of language might also be founded on generic physical forces. Superficially, each sense provides a range of metaphors to characterise psychological states, e.g. olfactory terms like bitter, sweet and stinks; tactile terms like hard, smooth and rough, auditory terms like noise, resonate and loud; visual terms like bright, dark and colourful. Although drawn from physical sources, these metaphors are figurative rather than structural. The next section looks at how concepts become configured in the first place. It initially presents an occularcentric perspective in the form of image schemata. But, this approach is seen to be inadequate. So, a more fundamental mechanism is sought by assessing the temporal character of visible persistence, which indicates that perception is tuned to periodicity and is hence not fundamentally occularcentric.

Perceptual structures

Image schemata are preconceptual structures derived from our apprehension of immediate situations. It seems reasonable to think that image schemata underpin conceptualisation, by basing logical connections and inferences on our perception of such physical orientations as *containment*, *path*, *centre-periphery* and *inside-outside*. For example, moving along a *path* is metaphorically extended to the abstract notion of *a line of reasoning*, with identifiable locations along the path providing the metaphorical basis for a connected sequence of abstract propositions. These can in turn be negated on the metaphorical basis of *containment*, since the principle of containment supports the dichotomy of *inside* versus *outside* (of a container). However, this hypothesis is challenged on developmental grounds. For example, pre-verbal infants initially classify objects according to their application, instead of visual features. This suggests that abstract categories, such as what things do, are not derived from image schemata, i.e. what things look like (Mandler & McDonough, 1998, p.1281). Similarly, the fact that humans used fire long before language, suggests that abstraction stems from controlling fear, rather than perceiving space (Breunig, 2009, p.259). Although image schemata may factor in conceptualisation, there would appear to be a more fundamental mechanism driving the process.

A mechanism similar to *reaction diffusion* has been written in computer code to reproduce perceptual structures. The programme, called Copycat, is driven by codelets, of which there are two types: scout codelets and effector codelets, corresponding to the P and S morphogens in *reaction diffusion*. Scout codelets assess potential actions and produce more codelets - scouts and effectors - based on their findings. Only effector codelets actually build or remove structures. The difference between their functions reflects the fact that one's experience of the psyche is unitary, despite being the result of many parallel unconscious processes (Hofstadter, 1995, p.226). Variations of an actual viewpoint are constantly being probed and assessed for their potential as a new viewpoint.

Neurologically, this process might be structured by bursts of interspike frequencies, which enable pre-synaptic cells to select post-synaptic targets:

"Such selective communication can be achieved on the time scale of tens of milliseconds without involving long-term synaptic modifications. Although bursts are usually stereotypical trains of action potentials, the exact interspike frequency can vary."
(Izhikevich, *et al.* 2003, p.162)

The ability to change frequency allows the brain to explore synaptic routes without actually modifying them. Without this freedom to communicate between brain cells, it is hard to imagine how anything novel could emerge from the mind. With so many unconscious processes continually assembling so many different levels of signification selected from so vast a store of memories, one is inclined to think that periodicity is fundamental to meaning construction, if simply as a unifying mechanism.

Our ability to build numerous levels of signification might be derived from an innate tuning of visual perception to periodicity: visual attention depends on recurrent interaction between early and later visual areas; and motion awareness depends on feedback from the motion selective area to early visual areas (Lamme, 2002, pp.14-16). We can peer into this mechanism, by analysing the temporal integrity of visual stimulation. The following experiment (Dixon & De Lollo, 1994, p.38) demonstrates the mind's orientation to the periodicity of stimuli.

The experiment presents a picture comprised of large dots aligned in five columns and five rows, with one dot missing. The picture is flashed to the respondent, who reports the location of the missing dot. The ability to detect the location of the missing dot is then challenged by distorting the picture in various temporal ways. This is done by flashing two sets of 12 dots independently and staggering the onset and duration of their

appearance. According to the results, the missing dot can still be detected, when the two sets of 12 dots are flashed in close succession, i.e. not at the same time, but only if the two halves of the picture appear for the same duration. We are tempted to explain this by reference to *visible persistence*, in the sense that the first image persists in memory, such that the memory of the first set of dots overlaps with the onset of the second set of dots. But, this explanation does not hold up, when you consider that varying the duration of either set of dots makes it harder to detect the location of the missing dot, even when the two sets of dots coincide. So long as their durations correspond, the missing dot can be detected.

If signification is founded on the temporal integrity of perception, each half of the picture could represent a symbol, such that the 'appearance' of the missing dot would be likened to the emergence of meaning derived from the combination of symbols, i.e. their syntagmatic relations. The missing dot would then be analogous to the foreground of a concept, with the two sets of dots serving as the background.

Only actively moving creatures evolved a nervous system. So, the evolution of mindness could be the result of the brain internalising movement (Llinas, 2001, p.17). The process of internalisation can be seen in shark embryos, which undulate rhythmically inside the egg to ensure the even distribution of oxygen necessary for tissue development. At this stage of development, the movement is generated solely by the muscle cells, which have not yet been innervated by motoneurons. When the motoneurons migrate from the spinal cord to the muscles, the electrotonic coupling of muscle cells ceases, allowing the brain to take control of motricity.

The motility properties of the muscles are embedded into the neuronal circuits of the spinal cord, where they become integrated into the vestibular system, which monitors the effects of inertia acting on the organism through gravity and momentum. By altering interneuronal pathways, *central pattern generators* co-ordinate rhythmic movement of a range of motor outputs (Zehr, 2005, p.56). Simply visualising a motor skill can modify the neural substrates for its physical performance (Pascual-Leone, *et al.* 1995, p.1038). Mental practice is encoded into the neural networks, strengthening the same activation patterns triggered by the physical training. Visualisation is frequently used by performers to hone their skills. Even muscle strength increases, i.e. without the physical activity you would think was necessary for muscle growth (Ranganathan, *et al.* 2004, p.945).

Bridging the gap between minds, the internalisation of movement is supported by mirror-neurons, so-named because they fire in response to movements that share a common trajectory, whether performed by you or someone else. Mirror neurons facilitate the transfer of skills, e.g. from

parent to child, by coding movements in terms of their purpose (Gallese & Metzinger, 2003, p.369). The mind learns how to deal with objects through their use, which is fundamentally different to their spatial presence, since the use of an object extends the self beyond its physical limits. This is not to say that there exists a metaphysical plane of consciousness. On the contrary, an extension of the self depends on the structural coherence of consciousness and physiology. Of course, the duality of mind and body is a deep rooted assumption. However, it can be resolved by adopting an objective phenomenology, whereby the structural features of subjective experience are presented in objective terms (Nagel, 1974, p.442). This is the focus of the next section.

Phenomenological structures

The most basic assumption we have about objective reality is our own spatially derived presence, whereby our surroundings provide the context for our own presence. Neurologists point to the posterior superior parietal lobe-the portion of the brain Newberg and D'Aquili (2001) have dubbed the orientation association area, or OAA:

"The primary job of the OAA is to orient the individual in physical space-it keeps track of which end is up, helps us judge angles and distances, and allows us to negotiate safely the dangerous physical landscape around us. To perform this crucial function, it must first generate a clear, consistent cognition of the physical limits of the self. In simpler terms, it must draw a sharp distinction between the individual and everything else, to sort out the you from the infinite not-you that makes up the rest of the universe." (p.4)

They suggest that reduced neural activity in the OAA during transcendence indicates a deficit condition resulting from a lack of information processing:

"Would the orientation area interpret its failure to find the borderline between the self and the outside world to mean that such a distinction doesn't exist? In that case, the brain would have no choice but to perceive that the self is endless and intimately interwoven with everyone and everything the mind senses. And this perception would feel utterly and unquestionably real." (p.4)

However, by assuming that the spatial limits of the self are the *absolute* limits of the self, they overlook the key attribute of transcendence, which is the heightened sense of immediacy. They fail to acknowledge that the brain has to first generate a perspective from which to interpret the spatial boundary of the self.

One's perspective emerges from *optic flow*; those movements in the scenery that are attributed to one's own movement. In essence, the mind uses these movements for the sake of determining one's moving perspective. Since the correlation between these movements and one's own motion is immediate, the relationship between them contributes to one's sense of immediacy. However, while our perspective resides in the present moment, the interpretation of space suppresses our experience of the present moment by harnessing our perspective to navigate space. The mechanism that renders the world as spatial does so at the expense of our own immediacy.

We use a variety of cues to perceive depth; motion is only one of many. One of the most powerful cues to depth, especially at short distances, is binocular disparity, the difference in the images received by each eye. Additionally, we make use of accommodation, the thickening and thinning of the lens of the eye to better focus on near and far objects respectively. Additionally, we use a number of pictorial cues to depth, such as the fact that nearer objects occlude further objects (occlusion), nearer objects are larger than further objects (relative size) and are further from the horizon (relative position).

Although motion is not the only means by which depth is interpreted, it distinguishes itself from all other depth cues by virtue of its temporality. Depth variations revealed by motion are determined across time. The mind determines the shape of an object, or an empty space, based on how its appearance changes over time. These changes in appearance only make sense to the extent that they are relative to the observer's perspective. So, the process of determining depth through motion effectively harnesses the observer's perspective, with the result that our sense of immediacy is dulled.

Space seems like a solid foundation for presence, however, it is not as fundamental as it seems. As far as perception is concerned, it is a façade that masks the fluidity of one's perspective. Paradoxically, this fluidity is more resilient than space, because it is the foundation for spatial perception. Through meditation it is possible to retract one's awareness from the world, and in so doing dissolve the division between one's perspective and the object of one's attention, such that one's very perspective becomes the object. Then, one does not see the surroundings so much as the movements in the surroundings that indicate one's own motion. Subject and object merge and the here-and-now becomes palpable.

The "sharp distinction between the individual and everything else" only applies to our spatial presence. Our immediacy extends beyond this boundary. The so-called inner and outer worlds are intertwined within our consciousness. One's perspective emerges from the changing appearance of one's *surroundings* and the so-called "outer" reality only gains its

spatial character from the projection of one's *own presence*. What emerges from this discussion, however, is a distinction between spatial and temporal relations, where space is in fact 'imagined' and the nature of transcendence extends beyond our physical boundary.

While it is perfectly sensible to treat the world as objectively present, the spatial paradigm is by definition divisive. By contrast, the temporal paradigm is inclusive. However, the nature of this connection is not to be understood in spatial terms. It sounds absurd to say that: "the self is endless and intimately interwoven with everyone and everything the mind senses" without first dissolving the spatial paradigm. It infers that the mind is misinterpreting its relationship to the world. On the contrary, during transcendence, the mind perceives the foundation of its own presence. The extraordinary connection felt during meditation doesn't just feel real it is real. But it is a connection to the present moment, rather than the physical world as such.

Optic flow determines the point-of-view from which we perceive space. Or conversely, the perception of space depends on a point-of-view, which in turn depends on *optic flow*. Although a moving point-of-view can be described as a line, this is only how it looks within the spatial paradigm, which cannot depict movement other than in spatial terms. Besides, *optic flow* presents a veritable sea of moving points, which collectively determine the moving point-of-view. Not that they are seen as points or lines, however. Instead, the mind attends to the different rates at which the different parts of the scenery slide past each other.

Spatial perception *takes shape* within the fluid movement of one's own visual perspective. Just as a wave changes shape as it enters shallow water, vision converges with the visible to render spatial relations. The confluence of movements coalesce to give us the impression of form in our surroundings. Like a wave, spatial perception propagates through reciprocal causality. Motion determines the observer's perspective, which detects the spatial relations that situate the observer. There are thus two directions of causation: a feed-forward from motion to space and a feed-back from space to motion. The observer's perspective rides the interface between space and motion.

Psychological structures

While its basic function is to situate the agent in space, the observer's perspective vacillates between the spatial and temporal paradigms. Too much of the spatial paradigm causes the individual to see himself as an object. Too much of the temporal paradigm makes him oblivious to his circumstances. The individual needs to balance the two paradigms, to be able to act decisively in circumstances that continually change, because the ability to anticipate change underpins the ability to read a situation.

This mechanism evolved to anticipate change in the environment, because recognising danger was key to our survival (Montell, 2002, p.8). The ability to act decisively in a stressful situation set the stage for more advanced cognitive development. Ultimately, the ability to anticipate change underpins the ability to instigate change through language. Empowered by language, we deal with reality in objective terms. However, our experience of the world remains transient, because, in essence, we are transient, which is terrifying if thought of objectively. But, subjectively, experientially, this is the core of our being. As paradoxical as it seems, the fluid present is the only stable perspective.

We only fear transience when we look at it objectively. In essence, the problem is not the transience, but the perspective that renders it objectively. Although fear of transience seems to equate with fear of death, the threat is not gauged by the danger itself, but rather by our inability to determine the nature of the danger and how best to respond (Montell, 2002, p.12). Although the threat posed by our own transience is an illusion, the more we try to interpret it the more our inability to gauge the threat increases our fear of it. The fear is real. But, it is also pointless, because transience is not an object that can be interpreted separate from ourselves.

The interrelationship between spatial and temporal relations, which are so fundamental to our psychology, can be represented by modeling the psyche on fluid dynamics. Surfing provides an ideal analogy for the psyche, because a variety of interconnected elements can be represented, with scenarios representing their influences within the system. Each element is a variable that can be adjusted to change the whole system. Crucially, the mind is rendered as a nexus of past, present and future experience, corresponding to Heidegger's notion of *anticipatory resoluteness* (Flynn, 1987, p.402). According to the model, surfing prowess represents self-mastery, such that the challenges faced in surfing parallel the human condition.

Since wave shape is influenced by the depth and shape of the reef, these features represent either end of the spatio-temporal continuum; the reef inducing spatial relations and the wave temporal relations. Consequently, fluctuation in the tide represents the relative proportions of each, with low tide triggering more spatial than temporal relations and high tide triggering more temporal than spatial relations. At high tide, waves break less intensely, reflecting the reduced influence of the reef on wave shape. Somewhere between these two extremes, depending on the size of the swell, temporal and spatial relations blend in such a way as to produce an optimal shape for surfing expression.

Both the shape of the surfboard and the shape of the sea bed influence the degrees to which spatial and temporal relations interact. In each case,

the abruptness of the encounter is proportionate to the speed of the response. Applied to the surfing analogy, bathymetry corresponds to the *serotonergic system* and surfboard design corresponds to *latent inhibition*. Both neurological processes reveal that imagination resembles surfing in its response to various conditions.

The *serotonergic system* affects the mind in a similar way to how tidal variation affects the surf. At low tide, the wave encounters an abrupt incline in bathymetry, causing the crest of the wave to rise suddenly, just like low levels of serotonin result in hyper-sensitivity, causing sudden over-reactions. Waves carry energy like memories. Kinetic energy is stored in a chain of orbits, which taper into the depths. The orbiting particles are the wave's memory of the wind rippling the ocean surface. The more wind, the larger the wave, the deeper they reach. When the deepest orbits are compressed against the seabed, the whole chain is squeezed upward, causing each orbit to become elliptical. As wave height increases, the particles break free of their closed orbits and become displaced, either forward or backward of their previous position. The wave thus "breaks" inside, as well as on the surface. So, these breakages are like memories being released in response to a stimulus. As with high tide, serotonin ensures that memories reach the surface to help shape current experience.

Latent Inhibition is the neural mechanism that screens out information previously viewed as irrelevant. It underpins our ability to deal with packets of information without having to unpack the contents every time. People with low *Latent Inhibition* perceive more detail than is necessary. It can be overwhelming to have to deal with so much detail. However, it can also enhance creativity, because the surplus information becomes manageable when combined with high IQ (Carson, *et al.*, 2003, p.500). So, if we equate IQ with surfing prowess, then *Latent Inhibition* would equate with the shape of the surfboard, such that a highly responsive surfboard becomes analogous to low *Latent Inhibition*. It takes great skill to control a highly responsive surfboard, just as it takes high IQ to control low *Latent Inhibition*.

In the surfing analogy, the surf break represents the memory bank of experience needed to interact in society. This includes the cultural values within which the psyche develops. Since waves break without necessarily being surfed, this asymmetry in the model reflects the sense that language somehow exists independently of its use. Although language can be viewed objectively as *langue*, its use occurs in the present moment as *parole*, where our behaviour is reflexively related to the context within which it is embedded (Firth, 1995, p.273). Actions and context mutually elaborate one another in an endless loop, just as the response of the surfboard is derived simultaneously from the shape of the wave and the shape of the surfboard.

Often, the decision to abandon a surf break is motivated by the tide being too low, which equates with low levels of serotonin. In a social context, the resulting hypersensitivity might be experienced as self doubt. Faced by what seems to be overbearing relationships, one is tempted to reject the values that support such relationships. Unable to change the sea bed, one tries to find another surf break, in which case, paddling across the ominous depths would be equivalent to periods of detachment, when unfamiliar circumstances cause you to feel disoriented. However, this form of detachment is fundamentally different to meditation, because your awareness continues to be directed at the world, but without the familiar values that give it meaning. Since making sense necessarily involves values, this is as futile as trying to catch a swell in the open ocean. Meaning depends on culture just as a breaking wave depends on the sea bed.

Symbolic structures

Language involves the simultaneous interpretation of its so-called spatial and temporal axes: paradigmatic and syntagmatic relations. This corresponds to spatial perception insofar as spatial relations are perceived relative to the observer's perspective, which emerges simultaneously from the very same space that is being observed. In each case, there is a continuum between spatial and temporal relations; a spatio-temporal continuum. Toward either end of the continuum, utterances become increasingly nonsensical. Consider, for example:

(1) *Colourless green ideas sleep furiously.*

This sentence is as nonsensical as a visual scene of a distant object appearing to be supported by a near object, such as the tiny man standing on an outstretched hand in figure 1. Although the objects are suitably positioned to produce the illusion, we know that tiny men do not exist, just as "green ideas" do not exist. The large gap in space between these two objects corresponds to the large gap in meaning between these two words. Although they appear together, they do not belong together. The failure to make appropriate paradigmatic choices in language corresponds to the failure to perceive depth in space.

At the other end of the continuum, sentences are composed of words that are semantically connected, but poorly arranged. For example:

(2) *Dogs harmlessly young bark friendly.* (meaning: Friendly young dogs bark harmlessly).

This sentence could be likened to a portrait that repositions facial features in bizarre, yet still face-like assemblages, such as Picasso's cubist

paintings of women (fig.2). The elements seem to belong together, to the extent that they are semantically related. But, the syntagmatic relations between the various elements are distorted. The fact that it still resembles a face can be equated with the horizontal alignment of the words, which start with a capital letter and end with a full stop, indicating that this group of words is a sentence.



Figure 1.
A distant object appearing to be connected to a near object.



Figure 2.
Bust of a woman seated in a chair.
Picasso, 1939.

Since (1) lacks spatial integrity and (2) lacks temporal integrity, they each sit at opposite ends of the spatio-temporal continuum, with (1) at the temporal end and (2) at the spatial end. Of course, spatial and temporal relations are usually deployed to produce sensible utterances, by interacting to varying degrees, as per the notion of a continuum.

Chomsky (1957) suggests that the lack of meaning in a sentence like (1) proves that syntax is independent of meaning, because the syntactic patterns are coherent even when the meaning is not. But, the notion of a continuum challenges this postulate by representing grammar and lexicon as fundamentally interrelated. In fact, they are ontologically interrelated. Paradigmatic choices invoke a perspective, which is drawn in by the sense of movement invoked by syntagmatic connections. This can be discerned, phonologically, in passages that employ *Onomatopoeia*.

For example, the following passage uses the perceptual overlapping of sound and movement to characterise its denotation:

True ease in writing comes from art, not chance,
As those move easiest who have learned to dance

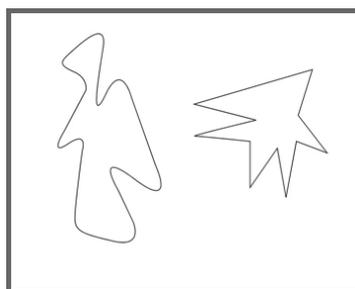
'Tis not enough no harshness gives offense,
The sound must seem an echo to the sense.
Soft is the strain when Zephyr gently blows,
And the smooth stream in smoother numbers flows,
But when loud surges lash the sounding shore,
The hoarse, rough verse should like the torrent roar,
When Ajax strives some rock's vast weight to throw,
The line too labors, and the words move slow;
Not so, when swift Camilla scours the plain,
Flies o'er the unbending corn, and skims along the main.

Alexander Pope ([1711] 2004)

The sense of movement induced by the speech sounds is seen to be analogous to the physical movements described. In effect, the rhythm of movements in the vocal tract mimic the interplay between spatial and temporal relations active on the semantic plane. As Pope suggests: "The sound must seem an echo to the sense".

The stimulation in one modality that triggers sensations in another is called *synaesthesia*. For example, a synaesthete may consistently experience a specific colour when hearing a particular tone or looking at a certain numeral. Mild forms of *synaesthesia* permeate consciousness. This is classically demonstrated by the *Kiki and Bouba* experiment, where a range of speech sounds differ in ways that remind us of shapes (Ramachandran & Hubbard, 2001, p.19). In this experiment, a drawing of two aliens is presented, as in figure 3. The subject is asked to identify which alien is *Kiki* and which is *Bouba*. The vast majority of respondents identify *Kiki* as the spiky alien and *Bouba* as the rounded one, indicating that our perception of sound and shape overlaps.

Figure 3.
Kiki & Bouba.



The sounds that combine sequentially to form speech are taken from a set of sounds that can be articulated within the vocal tract. These basic components of speech sounds are divided into two groups, called *obstruents* and *sonorants*. *Obstruents* are produced by obstructing the air flow against a range of articulation points within the vocal tract. By contrast, *sonorants* are produced without obstructing airflow through the vocal tract. By equating *obstruents* with space and *sonorants* with motion, the combination of speech sounds invokes the image schemata

corresponding to the physical motion denoted by the words or, in the case of *Kiki & Bouba*, the physical motion of the mind's eye as it interprets the shape.

When we apprehend speech sounds, the interplay between spatial and temporal relations can be used on the semantic plane, where words function as "anchor points around which complex neural dynamics can then swirl and coalesce" (Clark, 2005, p.18). One becomes situated in language, just as one becomes situated in space. This notion of language as "a form of environmental structuring" (p.3) can be augmented further, by equating spatial perception with *latent inhibition*, since both phenomena suppress the salience of background information. In the case of spatial perception, this refers to the sense of immediacy resulting from *optic flow*. In the case of *latent inhibition*, it refers to details shrouded by *conceptual encoding*.

By screening out information previously viewed as irrelevant, *Latent inhibition* allows numerous categories of signification to be expressed at the same time. The symbols that combine sequentially to make morphemes are each taken from the set of alternatives (an alphabet). Morphemes are selected from the set of grammatical components that combine sequentially to form phrases, which combine to form sentences and so on and so forth, with the emergence of ever larger categories that overshadow their constituent parts, to create larger units. *Latent inhibition* can be compared to *optic flow* in the sense that the precise makeup of one's surroundings is suppressed so that attention can be directed to *where one is going* semantically.

Embodied cognition

The ability to shift one's perspective toward the spatial end of the scale might have evolved for self defense. A clear sense of your own physical presence is vital when faced by danger (Montell, 2002, p.8). The ability to assess danger is supported by the *Serotonergic System*, which works like a buffer, giving the brain time to interpret the threat posed by a given danger. Low levels of serotonin result in hyper-sensitivity, causing over-reactions to potential threats. When there is insufficient buffer, past experiences fail to inform present experiences, resulting in an over-emphasis on spatial relations, at the expense of temporal relations. Since *conceptual encoding* enables us to use packets of information without having to unpack their contents every time, reasoning skills depend on our ability to engage temporal relations, so spatial relations can emerge spontaneously at numerous levels of categorisation.

Categorisation is fundamental to neurological processes, efficiently transferring information at every level of mental activity, from the electro-chemical impulses travelling throughout the brain to the formation

of mundane concepts (Lakoff & Johnson, 1999, p.18). A key attribute of signification is the ability to extract meaning by drawing on numerous levels of categorisation. This feature of language is exposed when the meaning of a simple concept is compromised by an unrelated context, as in the following example from personal experience. Ordinarily, the words *cricket* and *bats* placed together in that order triggers the concept of the appropriate bat used in the game of cricket. This interpretation of the phrase would undoubtedly be the default interpretation in cultures familiar with the game, despite the ambiguity in each of the words. But, this seemingly simple concept did not register in my mind, when it appeared on TV as the title of a news story about cricket bats. The two concepts failed to merge because this particular program concerned agricultural issues, which were usually unrelated to sport of any kind. Although cricket bats are made of willow grown on plantations, the threat to agricultural production caused by locust plagues and fruit bat colonies apparently made these concepts more salient than cricket bats. This anecdote highlights the diversionary affect of contextual information competing for attention.

Metaphorically, language rides the mind like a surfboard riding a wave. Symbolic structure is supported by two poles; a phonological pole, represented by the act of surfing, and a semantic pole, represented by the breaking wave. Characterising the phonological pole, the penetration and release phases in surfing are analogous to *obstruents* and *sonorants*. Sequences of rotational axes direct flow across the wetted surface of the surfboard, such that each angle of flow corresponds to a *phoneme*. Characterising the semantic pole, the curvature in the surface of the wave is analogous to the access afforded by language to the contents of the mind. The hollower the wave, the deeper the access, the more layers of signification attainable. Between the contents of the mind and the phonemes we use to explore it, there is a yin-yang sort of struggle influencing what we 'make' of reality (both in terms of speech perception and speech production).

When information is unpredictable, the mind is guided more by observation than expectation, because a minor loss of signal can compromise the whole message. By contrast, when information is predictable, the overall message can be inferred, despite major loss of signal. Most of everyday talk is predictable. So, everyday talk would be represented in the surfing analogy by riding the shoulder of the wave, where the interplay between surfboard and wave is least demanding in terms of speed and curvature. As a result, the surfer's expectations can over-ride any disruption of the signal. By contrast, the interplay between surfboard and wave is most demanding in the hollow portion of the wave, where surface changes are more pronounced, both spatially and temporally. Riding this portion of the wave would therefore represent language that is unpredictable.

Years ago, I spent some time surfing in Indonesia, where the combination of consistent swell, trade winds and coral reefs creates ideal surfing conditions. The quest for perfect waves became an obsession, leading me further and further afield to find waves seldom seen, let alone surfed. The atmosphere at such places is indescribable. On one occasion, I had a unique experience, which I think bears relevance to this thesis.

It was at the end of a great day of surf and I was alone, surfing a break regarded to be one the best waves in the world. Not surprisingly, I was reluctant to call it a day. The surf and the whole atmosphere were too perfect to leave. So, I paddled out once more to savour the moment and wait for another wave. While I was waiting, some dolphins passed by and then a turtle appeared momentarily. I became mesmerised, it was so tranquil. I watched a flocks of birds swirling about, gradually coming to land on the perfectly still ocean. The setting sun had sparked a deep orange glow, vividly highlighting the clouds on the horizon. It was picturesque. A big fish jump clear of the water about a hundred metres out. Then, it occurred to me that the light was quickly fading. So, I turned to go in, but discovered it was completely dark. I blinked and blinked, trying desperately to see the shore. But, there was no light whatsoever. I looked out to the tranquil scene on the horizon and back to this empty black space.

The darkness seemed all encompassing. I wasn't sure what to do, because if I paddled in, I risked getting caught by a wave breaking on shallow reef. So, I decided it was safer to wait for a wave and attempt to ride it in the dark. The surface of the sea reflected what little light remained on the horizon. Eventually, I noticed the vaguest silhouette of a swell approaching. Although it disappeared, I turned toward the land and paddled with determination, hoping to catch the wave, despite being in total darkness. I felt the board lift as the swell rose beneath me and as it peaked, I leaped to my feet. Dropping down and turning across the face of the wave, all I could go on was the feeling of the water passing beneath the board and the way the board responded to the changing curves in the wave. Apart from the sensation of movement, I was immediately struck by the sound of the wave sucking, like water draining from a sink. Ever so carefully, I turned the board toward the land and rode on my stomach into the nothingness.

The sensation of movement evoked an image in my mind's eye of how the wave might have appeared at that moment. On reflection, the image was probably more threatening than was actually the case. I was certainly mindful of the risk of being hit in the head by the lip of the wave. But, the success of the ride can only be attributed to proprioception, a form of perception that highlights the dynamical character of the spatio-temporal continuum. Aware of my own awareness, I felt prompted to control the situation by focusing on the information available through proprioception. The desire to influence my circumstances invoked the immediate

comparison of expectation with observation (Grush, 2004, p.381). Insofar as it enabled me to manipulate my environment, proprioception represents, in the surfing analogy, the conscious link between the phonological and semantic poles of language: the meaning invested in speech sounds.

The interaction between the surfboard and the wave points to a subtle aspect of the relationship between language and mind, concerning the difference between foreground and background. This is reflected in the surfing analogy by how actively, versus passively, the surfer engages the wave. This difference can be sensed in tube riding, where the surfer has to be especially sensitive to the transition between active and passive engagement, which is controlled by the surfer shifting his centre of gravity relative to the surfboard. By shifting weight inward, the surfer actively engages the wave, because this causes the surfboard to penetrate at a sharper angle, which increases the resistance and, therefore, also the speed. By leaning outward, the penetration angle is lessened and the surfboard becomes flat against the water, making it drift sideways, thus slowing it down. Actively engaging the wave can be likened to foregrounding an entity, because the surfboard - its shape and motion - is the primary factor influencing where it is going. Passively engaging the wave can be likened to invoking background information, because the surfboard follows a track determined more by the shape and motion of the wave than by the shape and motion of the surfboard.

Boundary versus quality

On this basis, a parallel can be drawn between the surfer's centre of gravity and the notion of construal in Cognitive Grammar. Active and passive engagement of the surfboard is analogous to the different processes determining count-nouns versus mass-nouns, i.e. how certain aspects of an entity can be highlighted or suppressed, to suit the communicative intent. For example, the count-noun *waves* highlights the individual entities that comprise a *surf* (i.e. the referent of the mass-noun), which conversely, suppresses the salience of individual *waves* to render the same entity as a homogeneous mass. This can be represented diagrammatically in terms of the boundary of one's attention relative to the boundary of the referent, such that one lies either inside or outside the other, as depicted in figure 4. For count-nouns, the referent lies within the boundary of attention. For mass-nouns, the focus of attention lies within the boundary of the referent.

When the focus of attention lies within the boundary of the referent, as in the case of mass-nouns, a sense of quality supplants the sense of quantity engendered by the reverse situation. Conversely, when the referent lies within the boundary of attention, quantity over-rides quality, to draw attention to the individual units. However, the symmetry of this

depiction is misleading, since mass-nouns subsume count-nouns, e.g. *surf* subsumes *waves*. The difference in their construal is not easily represented in 2D, because construal is not a spatial relationship. But, it does concern spatial perception; which differs to spatial relations insofar as perception is a process and hence temporal.

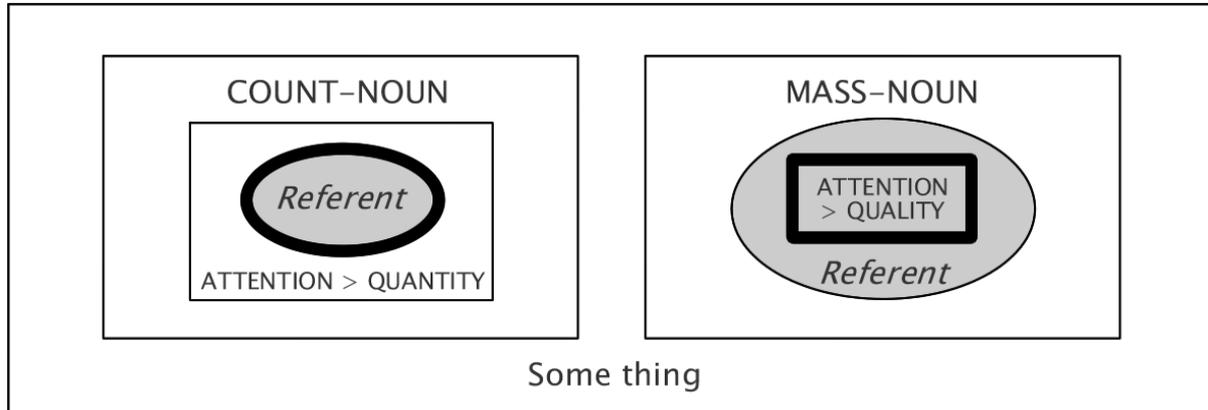


Figure 4. Construal serves to highlight quantity versus quality.
Diagram derived from Langacker (2008, p.133).

If we equate count-nouns with foregrounding, then in the context of spatial perception, their individuation simultaneously separates the perceiver from the entity perceived, setting the two in a spatial context. Conversely, the correlation between mass-nouns and background information suspends this separation of the perceiver from the entity perceived, with the result that its quality is revealed through the invocation of a temporal context, projecting the observer's own sense of presence into the entity in question. Both mechanisms stem from spatial perception, but emphasise opposite aspects of the process, i.e. spatial versus temporal presence.

This link between quality and temporal presence (versus quantity and spatial presence) is also evident in verbs, where perfective verbs profile an event and imperfective verbs profile a state. Events are inherently temporal, so perfective verbs carry a sense of transition from one state to another, e.g. fall, jump, kick, bite, throw and break. Since these verbs represent processes involving two states, they are perceived in a spatial context, which simultaneously separates the perceiver from the event perceived. By contrast, a single state is inherently atemporal, so imperfective verbs invoke the temporality of the perceiver's own presence, (which differs to the temporality of events, insofar as presence is an unchanging state). Examples of imperfective verbs are; know, believe, like, love, detest and appreciate.

Although nouns and verbs are traditionally characterised as polar opposites, they each divide into sub-categories on the basis of essentially

the same schema (Langacker, 2008, p.128). The prototypical nouns and verbs correspond to isolated objects and events, because the context of categorisation is inherently spatial. Although we tend to characterise nouns as objects and verbs as events, count-nouns and perfective verbs are no more valid than mass-nouns and imperfective verbs. But, their spatial character sets them apart more clearly than their alternatives would. Langacker (2006) agrees on this point, stating that:

"Viewed as nodes in a network, category members are discrete. ... The nodes of a network are invariably visualized spatially as fully disjoint, i.e. separate and non-overlapping. ... It would however be unrealistic to suppose that they are wholly distinct at the level of cognitive processing. ... Ultimately, linguistic units reside in recurrent patterns of neurological activity." (p.141).

However, Langacker suggests that the perceptual experience of distance is responsible for the distinction between count- and mass nouns. In agreement with Lakoff (1987, p.428), he explains:

"(W)hen viewing a collection from an increasingly greater distance, there comes a point when we can no longer distinguish individuals, and thus perceive them as a continuous mass." (Langacker, 2008, p.111).

Since distance is a spatial variable, I do not think it can be responsible for the sense of quality invoked by mass-nouns, nor the temporal presence invoked by imperfective verbs. Although proximity is implicated in our ability to distinguish individuals, which can then be metaphorically extended to characterise events, proximity by itself would not be responsible for their isolation. Langacker suggests, moreover, that:

"The registration of contrast makes possible the detection of a *boundary*...." (and that bounding is the) "crucial property differentiating count and mass nouns, as well as perfective and imperfective verbs." (p.113).

But, I would respectfully argue that the perceptual process responsible for isolating objects is not *spatial*, in the sense of combining contrast and proximity, but *spatial perception*. Besides, the distinction between discrete and continuous *signifieds* cannot be derived from a *posteriori* comparison, as Langacker suggests:

"Thus, the same abilities ["to *compare* two experiences and register any discrepancy between them"] are relevant at two levels: for characterizing linguistic structures; and for examining the metaphors employed in metalinguistic thought." (p.111).

The difference between discrete and continuous signifieds cannot be derived from a "discrepancy between [two experiences]", because the ability to "*compare* two experiences" is *a posteriori* and the "metaphors employed in metalinguistic thought" are *a priori*.

Basically, the spatial metaphor is inadequate, because it takes temporality for granted. Continuous signifieds emerge from temporality in the same way the observer's perspective emerges from *optic flow*: the quality invoked by mass-nouns and imperfective verbs is derived from the quality of the observer's own presence. The difference between continuous signifieds and their discrete counterparts; count-nouns and perfective verbs, is motivated by the difference between temporal presence and spatial presence. Although combined in spatial perception, temporal presence and spatial presence are *a priori* experiences.

Further evidence that continuous signifieds are derived from temporal presence is revealed by the process of *hypostatic abstraction*, which I suggest replicates spatial perception to objectify qualities. For example, *hypostasis* transforms "honey is sweet" into "honey possesses sweetness", by abstracting the substantive "sweetness" from the adjective "sweet". This process of abstraction derives an object from a quality in a manner that parallels the projection of space from motion; motion being the "quality" of one's perspective, experienced as presence.

Semiosis

Ultimately, the presence of meaning stems from the presence of perspective derived from *optic flow*. This perspective projects spatial relations, which produce the bounding from which *hypostatic abstraction* is derived. The product of *hypostatic abstraction* then feeds back, to support another concept, in the same way that spatial relations feed back to situate one's perspective in space. Since the resulting spatial configuration changes from moment to moment, the feed-forward feedback mechanism repeats itself constantly, though only insofar as it serves to confirm where one is going, whether that be spatially or, as Peirce (1906) describes, semantically:

"That wonderful operation of hypostatic abstraction by which we seem to create *entia rationis* that are, nevertheless, sometimes real, furnishes us the means of turning predicates from being signs that we think or think *through*, into being subjects thought of. We thus think of the thought-sign itself, making it the object of another thought-sign.

Thereupon, we can repeat the operation of hypostatic abstraction, and from these second intentions derive third intentions. Does this series proceed endlessly? I think not. What then are the characters of its different members? My thoughts on this subject are not yet harvested. I will only say that the subject concerns Logic, but that the divisions so obtained must not be confounded with the different Modes of Being: Actuality, Possibility, Destiny (or Freedom from Destiny). On the contrary, the succession of Predicates of Predicates is different in the different Modes of Being. Meantime, it will be proper that in our system of diagrammatization we should provide for the division, whenever needed, of each of our three Universes of modes of reality into Realms for the different Predicaments." (para.549).

Peirce regards *semiosis* as the product of a *triadic relation*, comprising a sign, an object and an interpretant, such that a sign stands *for* an object *to* an interpretant. Surfing can likewise be described in terms of a *triadic relation*, in this case, between the wave, the surfboard and surfing. Like a sign, the wave exists in relation to itself. The surfboard is like an object in the sense that both are defined on the basis of a relation beyond itself. Surfing can be likened to an interpretant, because both are defined on the basis of their relation to the other two components.

Numerous mental phenomena are modelled on *triadic relations*. Fundamentally, this structure reflects the spatio-temporal structure of experience, represented in table 1, in the form of nine isomorphic schemas, each comprised of three *a priori* components, corresponding to temporality, space and emergence. The character of *triadic relations* can be visualised in the geometry of surfing:

Focus attention on the surfboard and ignore the shape and motion of the wave, which is subsequently reduced to a flat plane. The fact that waves are fantastically varied in their shape and motion reflects the limitless possibilities of each of the qualities listed under "temporality" in table 1. The precise nature of these qualities is incidental to the task of visualising a geometric representation of *triadic relations*. In terms of Peirce's categories, this is the "ground" onto which we introduce a "correlate" in the form of a surfboard. Now, we try to visualise the rotational axes that describe the surfboard's interaction with the wave. To make this easier, we can think of the lines of latitude and longitude circling the globe.

1. The first rotational axis traces a circle on the horizontal plane, which can be thought of as the Equator. So long as the surfboard rotates on this plane, its interaction with the wave has no affect. So, this is a *monadic relation*, defined solely by the "ground" (i.e. wave) in its relation to itself.

2. The second rotational axis traces a circle on any vertical plane; which can be visualised as the lines of longitude circling the globe from north to south. Rotating on any of these axes causes the surfboard to penetrate the wave, which represents a *dyadic relation* between the surfboard and the wave.
3. The third rotational axis traces a circle on a vertical plane set at right angles to each of the other two. This second vertical plane of rotation simultaneously introduces the variable of direction, in the sense of the surfboard traversing the surface of the wave. When all three rotational axes combine, *monadic* and *dyadic relations* become absorbed into *triadic relations*.

Having established a picture of this geometry, the next step is to consider the nature of *monadic relations*, i.e. the "ground" in its relation to itself. This can be thought of as the relation between the vertical axis and the horizontal plane of its rotation. But, this is an abstraction that denies the multiple forms created by a wave. The complete picture needs to include the wave, which expresses the interwoven nature of meaning.

Philosophers	Modes	temporality	space	emergence
Freud	Emotion	id	super ego	ego
Peirce	Being	possibility	actuality	destiny
Kant	Intellect	sensibility	understanding	imagination
Peirce	Perception	feeling	reaction	representation
Peirce	Categories	ground	correlate	interpretant
Peirce	Semiosis	object	sign	interpretant
Saussure	Signification	signified	signifier	meaning
Halliday	Metafunctions	textual	interpersonal	experiential
Metaphor	Surfing	wave	surfboard	manoeuvres

Table 1. Isomorphic models depicting the organisational principles that make experiences coherent.

This aspect of language is addressed by *Functional Grammar*, which attributes multiple patterns of meaning to structural considerations within

the clause (Halliday, 1994, p.30). It recognises that words are multifunctional, in the sense that they contribute to three strands of meaning, referred to as *textual*, *interpersonal* and *experiential*, which correspond to *triadic relations*:

1. The *textual metafunction* concerns the clause as a message, according to which the *theme* refers to its point of departure. It is a *monadic relation* in the sense that it grounds what is being said.
2. The *interpersonal metafunction* concerns the clause as a process in ongoing human experience. It is a *dyadic relation* insofar as it relates to features that are independent of itself; an *actor* participating in a *process*, directed toward a *goal*.
3. The *experiential metafunction* concerns the clause as an exchange of information between speaker and listener. It is a *triadic relation* insofar as a *subject* is deemed responsible for the validity of the information presented by the *interpersonal metafunction*.

As in surfing, each thread contributes a "dimension of structure" (p.35) to the composition of the clause. In fact, as Halliday (1994) explains:

"the threefold pattern of meaning is not simply characteristic of the clause; these three kinds of meaning run throughout the whole of language, and in a fundamental respect they determine the way that language has evolved." (p.35).

So, within the *theme* one finds an *experiential* element, which may be preceded by *textual* and/or *interpersonal* elements (p.53). Multiple patterns of meaning span longer stretches of language (p.54), which even "folds back on the setting in which it happens" (Garfinkel, in Firth 1995, p.273). For example;

Late one night, I overheard a couple arguing in the street. Their speech was slurred and they seemed to be dragging their feet, so I think it is fair to assume they were on their way home from the local pub. Suddenly, the male of the species declared: "You're a fucking *slut!*" in response to which the female said: "I'm *your* fucking *slut!*" and together they continued stumbling along the street.

This lively exchange demonstrates how language is reflexively related to the context within which it is embedded. By saying "I'm *your* fucking *slut!*", the woman simultaneously observes, constructs and elaborates their relationship, through;

1. formulating the preceding comment as a threat to their status as a couple, thereby *grounding* it in the social context,

2. rejecting the allegation of infidelity, which thereby infers that their *relationship* is sound, and by
3. implicating her partner as *responsible* for their relationship being sound.

Corresponding to the *textual, interpersonal and experiential metafunctions* (indicated with italics), this analysis is adapted from Weider's (1974) observations of social cohesion in a halfway house for paroled drug addicts. Based on his research, Weider maintains that the order and intelligibility of any social context is reflexively related to behaviour that continually feeds back into the selfsame context (Firth, p.273). People are constantly doing contextual work in "seen but unnoticed" ways that parallel the organisational principles exhibited by other mental phenomena.

In terms of the surfing analogy, the simultaneous operation of metafunctions within metafunctions might be captured by the complex curvature in the surface of the wave. As already mentioned, the hollow surface of the wave is analogous to the access afforded by language to the contents of the mind. Since waves exhibit a range of curvatures, reflecting contact with the sea bed, this feature could represent the concurrent expression of metafunctions at various levels of the text.

This analogy is probably best expressed in the formation of a whirlpool, where it is easier to see that the water travels at different speeds, depending on the diameter of the orbit. In the time it takes for an upper level to complete one revolution, a lower level will have completed numerous. Considering the life-like changes that occur from moment to moment in a whirlpool - with its surface undulating and warping as it expands and contracts - the many diverse schools of thought and fields of research may ultimately come together in the surfing metaphor. After all, language is first and foremost a phenomenon that occurs in the present moment.

Conclusion

The structure of meaning depends on familiarity with the code. Chomsky labels this *competence*. However, by drawing a distinction between *competence* and *performance*, as Saussure does with *langue* and *parole*, he divorces both *competence* and *performance* from the present moment. The notion of *competence* becomes a background against which language *structure* is objectified and the notion of *performance* becomes a background against which language *use* is objectified. But, language is fundamentally no different to other forms of perception, because the brain's evolution and development is fundamentally a biological response to its environment (Rohrer, 2005, p.166). Just as industrial designers use

patterns and processes found in biological phenomena, which in turn resemble non-biological (natural) phenomena, there exist patterns and processes in language that are found in neuro-physiology, which in turn resemble surfing.

To properly situate the mind within language, we need to transcend the spatial frames of reference that objectify linguistic phenomena. Of course, the notion of temporality can be introduced in the form of a spatio-temporal continuum. But, we are inclined to visualise a continuum as symmetrical, thereby ignoring the ontological priority that temporality (at one end) has over space (at the other). Drawing on convergent evidence spanning phenomenology, neuro-physiology, evolutionary biology, psychology and artificial intelligence, I have developed the ontological groundwork for a functional model of the psyche, derived from spatial perception - with an emphasis on *perception* signalling the temporal component of situated presence. Since surfing exhibits a rich spatio-temporal structure, I suggest that it lends itself to metaphoric depiction of language structure.

Afterword

Many of you will appreciate the title as an appropriate tribute to Robert M. Pirsig's (1974) *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values*. Pirsig's *metaphysics of Quality* signposted my own "inquiry into values", which began with the troubling thought that I had inherited "a genetic defect within the nature of reason itself" (p.102). The influence is all the more obvious to me now that my thoughts are packaged for a larger audience than my mother and three ex-wives! But, as with this veiled confession, the prominence afforded Pirsig's book in the title, in contrast to its total absence in the body of the thesis, acknowledges, albeit obscurely, the compulsive determination behind my reasoning. I recognise in myself the following description of the character *Phaedrus*;

"But he's such an abominable scholar it must be through the kindness of his instructors that he passes at all. He prejudices every philosopher he studies. He always intrudes and imposes his own views upon the material he is studying. He is never fair. He's always partial. He wants each philosopher to go a certain way and becomes infuriated when he does not." (p.127)

Not everyone would detect such a subtle message. On the other hand, most people familiar with Pirsig's book would no doubt think that my choice of title is a populist stunt; there being so many titles beginning "Zen and the Art of...", whose authors have attempted to cash in on the phenomenon. But, however you interpret this connection, the fact that you recognise it reveals that *reflexivity* has grounded it within the horizon

of your world. As I see it, the connection is drawn out in a manner that is ontologically equivalent to the flow of water drawing off a reef as a wave breaks across it.

Bibliography

Arbib, M. A. (2005). From monkey-like action recognition to human language: An evolutionary framework for neurolinguistics. *Behavioral and Brain Sciences*, 28: 105–167.

Benyus, J.M. (1997). *Biomimicry: Innovation inspired by nature*. William Morrow and Co.

Borg, J., Andree, B., Soderstrom, H. & Farde, L. (2003). The Serotonin System and Spiritual Experiences. *AM J Psychiatry*, 160: 1965-1969.

Brentano, F. ([1874] 1973). *Psychology from an Empirical Standpoint*. Routledge and Kegan Paul.

Breunig, S. (2007). *Body, place and grammar: Exploring the concept of "image schema" in mind, language and aesthetic experience, through interpretive analyses of architectural space and the uses of the English preposition "on", "in" and "at"*. PhD.

Brook, A. (2008) Kant's View of the Mind and Consciousness of Self. *The Stanford Encyclopedia of Philosophy (Winter 2008 Edition)*, Edward N. Zalta (ed.). [[URL](#)]

Carson, S.H., Peterson, J.B. & Higgins, D.M. (2003). Decreased Latent Inhibition is associated with increased creative achievement in high-functioning individuals. *Journal of Personality and Social Psychology*, 85 (3): 499-506.

Chomsky, N. (1957). *Syntactic Structures*. The Hague: Mouton. Reprint. Berlin and New York (1985).

Chomsky, N. (1980). *Rules and representations*. Columbia University Press, New York.

Clark, A. (2005). Beyond The Flesh: Some Lessons from a Mole Cricket. *Artificial Life*, 11 (1-2): 233-244.

Dixon, P. & De Lollo, V. (1994). Beyond Visible Persistence: An alternative account of temporal integration and segregation in visual processing. *Cognitive Psychology*, 26: 33-63.

Firth, A. (1995). Ethnomethodology. *Handbook of Pragmatics Manual*, 269-278.

Flynn, P.J. (1987). Waves of Semiosis: Surfing's Iconic Progression. *The American Journal of Semiotics*, 5 (3): 398-418.

Freud, S. ([1923] 1962). *The Ego and the Id*. Hogarth Press, London.

Gallese, V. & Metzinger, T. (2003). Motor ontology: The representational reality of goals, actions and selves. *Philosophical Psychology*, 16 (3): 365-388.

Gruber, T. & Muller, M.M. (2005). Oscillatory brain activity dissociates between associative stimulus content in a repetition priming task in the human EEG. *Cerebral Cortex*, 15: 109-116.

Grush, R. (2004) The emulation theory of representation: Motor control, imagery and perception. *Behavioral and Brain Sciences*, 27: 377-442.

Halliday, M.A.K. (1994). *An introduction to Functional Grammar* (Second Edition). Arnold.

Heidegger, M. (1962). *Being and Time*, trans. John Macquarie and Edward Robinson. New York: Harper & Row.

Hofstadter, D. (1995). *Fluid Concepts and Creative Analogies: Computer models of the fundamental mechanisms of thought*. Basic Books.

Hume, D. ([1790] 2005). *The Philosophical Works*. Elibron Classics series.

Husserl, E. ([1928] 1966). *The Phenomenology of Internal Time Consciousness*. Trans. J. Churchill. Indiana University Press.

Izhikevich, E.M., Desai, N.S., Walcott, E.C. & Hoppensteadt, F.C. (2003). Bursts as a unit of neural information: selective communication via resonance. *TRENDS in Neurosciences*, 26 (3).

Kuttner, F. & Rosenblum, B. (2006). Teaching physics mysteries versus pseudoscience. *Physics Today*, 59 (11): 14.

Lakoff, G. & Johnson, M. (1999). *Philosophy in the Flesh: the embodied mind and its challenges to Western Thought*. Basic Books.

Lamme, V.A.F. (2002). Why visual attention and awareness are different. *TRENDS in Cognitive Sciences*, 7 (1).

Langacker, R. W. (2006). On the continuous debate about discreteness. *Cognitive Linguistics*, 17 (1): 107-151.

- Langacker, R. W. (2008). *Cognitive Grammar: A basic introduction*. Oxford University Press.
- Lehar, S. (2003). Harmonic Resonance Theory: An alternative to the "Neuron Doctrine" paradigm of neurocomputation to address gestalt properties of perception. *The Behavioral and Brain Sciences*, 26 (4).
- Lieberman, A.M. & Mattingly, I.G. (1985). The motor theory of speech perception revised, *Cognition*, 21: 1-36.
- Llinas, R.R. (2001). *I of the vortex: From neurons to self*. A Bradford Book, MIT Press.
- Mandler, J.M. & McDonough, L. (1998). On Developing a Knowledge Base in Infancy, *Developmental Psychology*, 34 (6): 1274-1288.
- Mandler, J.M. & McDonough, L. (2000). Advancing Downward to the Basic Level. *Journal of Cognition and Development*, 1(4), 379-403.
- Martin, R.M. (1997). *Scientific Thinking*, Broadview Press.
- McTaggart, J.E. (1908). The Unreality of Time. *Mind: A Quarterly Review of Psychology and Philosophy*, 17: 456-73.
- Montell, C. (2002) On Evolution of God-Seeking Mind: An Inquiry into Why Natural Selection Would Favor Imagination and Distortion of Sensory Experience. *Evolution and Cognition*, 8 (1).
- Murray, J.D. (1981). On pattern formation mechanisms for lepidopteran wing patterns and mammalian coat markings. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 295 (1078): 473-496.
- Nagel, T. (1974). What is it like to be a bat? *Philosophical Review* 83: 435-50.
- Newberg, A.B. & D'Aquili, E.G. (2001). *Why God Won't Go Away: Brain Science and the Biology of Belief*. New York: Ballantine Books.
- Okasha, S. (2008). Biological Altruism. *The Stanford Encyclopedia of Philosophy (Winter 2008 Edition)*, Edward N. Zalta (ed.), [[URL](#)]
- Pascual-Leone, A., Nguyet, D., Cohen, L.G., Brasil-Neto, J.P., Cammarota, A. & Hallett, M. (1995). Modulation of muscle responses evoked by transcranial magnetic stimulation during the acquisition of new fine motor skills. *Journal of Neurophysiology*, 74: 1037-1045.

Peirce, C.S. (1906). Prolegomena to an Apology for Pragmatism. *The Monist*, 16 (4): 492-546, reprinted in the Collected Papers vol 4, paragraphs 530-572. [[URL](#)].

Perky, C.W. (1910). An experimental study of imagination. *The American Journal of Psychology*, 21 (3): 422-452.

Pirsig, R.M. (1974). *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values*. Bantam Books.

Pope, A. ([1711] 2004). *An Essay on Criticism*. Whitefish, Montana: Kessinger Publishing.

Pronk, A.D.C., Blacha, M. & Bots, A. (2008) *Nature's Experiences for Building Technology*. www.arnopronk.com Acapulco.

Ramachandran, V.S., & Hubbard, E.M. (2001). Synaesthesia - A window into perception, thought and language. *Journal of Consciousness Studies*, 8 (12): 3-34.

Ranganathan, V.K., Siemionowa, V., Liu J.Z., Sahgal, V. & Yue, G.H. (2004). From mental power to muscle power—gaining strength by using the mind. *Neuropsychologia*, 42: 944-956.

Rohrer, T. (2005). Image Schemata in the Brain. In *From Perception to Meaning: Image Schemas in Cognitive Linguistics*, Beate Hampe and Joe Grady, eds., Berlin: Mouton de Gruyter, pp. 165-196.

Sanford, J.A. (1980). *The Invisible Partners: How the Male and Female in Each of Us Affects Our Relationships*. Paulist Press.

Sartre, J-P. ([1960] 2000). *Transcendence of the Ego: An Existentialist Theory of Consciousness*, Trans. F. Williams and R. Kirkpatrick. The Noonday Press.

Schwenk, T. (1996). *Sensitive Chaos: The creation of flowing forms in water and air (Second Edition)*. Rudolf Steiner Press.

Taylor, T.J., Cameron, D. (1987). *Analysing Conversation: Rules and Units in the Structure of Talk*. *Language & Communication Library*, Vol.9. Pergamon Press.

Ward, J., Thompson-Lake, D., Ely, R. & Kaminski, F. (2008). Synaesthesia, creativity and art: What is the link? *British Journal of Psychology*, 99 (1): 127-41.

Webber, D.J. (2009). Zen and the Art of Surfboard Design. *Indo-Pacific Journal of Phenomenology*, 8 (1).

Webber, G.M. (2007). Video of interview on www.webbersurfboards.com.

Wieder, D.L. (1974). Language and social reality. The case of telling the convict code. *Approaches to semiotics, paperback series*, 10.

Zehr, E.P. (2005). Neural control of rhythmic human movement: the Common Core Hypothesis. *Exercise and Sport Sciences Reviews*, 33 (1).