Chapter 5

The Derivation of Meaning

Meaning, belief, recognition · Expectation · What-ness and Where-ness · Information filtering – what do I want to see? ... sensory fish · Learning to see · Information · Mirror Neurons and the analogical mind · Learning by osmosis · Mirror neurons – a few more technicalities · Hofstader & McGilchrist · L-R brain · Higher versions of meaning

The essential thing to realize about ethics is that it is the very manifestation of our will-to-live. All our thoughts are given in that will-to-live, and we but give them expression and form in words. To analyze Reason fully would be to analyze the will-to-live. The philosophy that abandons the old Rationalism must begin by meditating on itself.
Thus, if we ask,
"What is the immediate fact of my consciousness?
What do I self-consciously know of myself, making abstractions
of all else, from childhood to old age?
To what do I always return?"
we find the simple fact of consciousness is this, I will to live. Through every stage of life, this is the one thing I know about myself.
I do not say, *"I am life"*; for life continues to be a mystery too great to understand. I only know that I cling to it.
I fear its cessation – death.
I dread its diminution – pain.
I seek its enlargement – joy.

From The Ethics of Reverence for Life
Albert Schweitzer

Meaning, belief, recognition

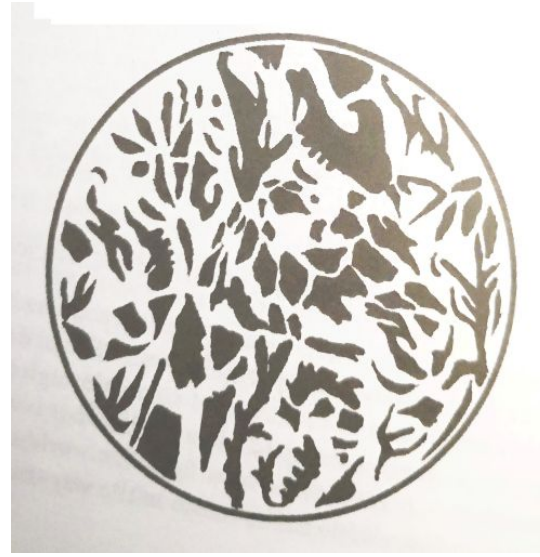
> I have been and still am a seeker, but I have ceased to question stars and books; I have begun to listen to the teaching my blood whispers to me.
>
> – Hermann Hesse

So far we have looked at our biological heritage, and the sensory system, and seen that every organism works with a completely integrated feedback between action / movement and what is being sensed. But there is a vital ingredient missing in the middle of these two … for sensing information is very different from the derivation of ***meaning***.

Meaning is very much in the eye of the beholder. If I say "this is a book", I am supplying you with information. But information is very different from *meaning*. It is the response that is evoked by that sentence that *both* gives it a meaning *and* is based on the meaning that is inferred. If you had never seen a book, its meaning would be very different to that of someone who loved reading, and would also be very different to that of someone who had difficult memories of school. Meaning is therefore at least partly related to historical experience and association. Given that one specific meaning has been programmed into the nervous system, it can be difficult to recognise the possibility of alternate meanings – particularly when the experience left a strong emotional imprint.

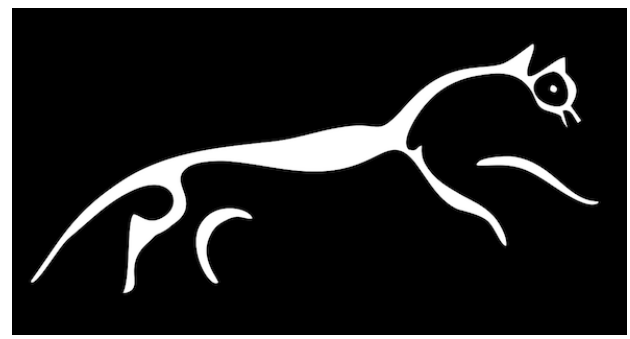
There is a somewhat paradoxical situation in that to see things we have to have already given them meaning (i.e. **recognised** them), but in order to have recognised something we have to already have seen it. Thus recognition of something new is not usually immediate, but rather a process that unfolds over time. Galileo's discovery of the moons of Jupiter is often presented as an immediate observation, but in fact he spent several weeks observing and making notes and drawings before he realised that he was seeing moons analogous to the moon that orbits the earth. Initially he thought that he was seeing stars that happened to be aligned with Jupiter's equator. Then he went through a process of confusion as his recognition of stars was challenged again and again. Everything is easier in hindsight. It is only in retrospect – already possessing knowledge that planets other than the Earth have moons, and that indeed, the "*wanderering stars*" are planets somewhat like earth (which Galileo did not) – that we can assume that he immediately perceived this arrangement. The usual model of scientific advance by discovery is therefore incorrect – in that new "discoveries" are rarely recognised by most people (or even by their "discoverers") for many years, unless there is a clear precedent or analogy, or circumstances contrive to make the idea both visible and acceptable, and it is "*an idea whose time has come*". The advancement of science is one of cultural shifts - to the extent that it is culture that allows science to advance as much as science having an effect on culture. Something new can only be perceived to the extent that anyone is open to perceiving it. Thus, Crick and Watson's (and Rosalind Franklin's) DNA[1] double helix particularly gripped

the public imagination in a very specific way because it was analogous to the "code" used to program computers – the newly rising star of technology. This requirement for recognition doesn't only go for science – it also goes for everyday potential experiences. It is only by being able to see because there is already an analogy for that object – that we can see it at all



The necessity of foreknowledge for recognition is very nicely demonstrated by Henri Bortoft[2] with his image of a giraffe in a forest. In order to see the giraffe, one must already be familiar with giraffe-ness. Given that pre-existing familiarity, there is a recognition as potentially random shadows and patches of light are found to contain the likeness of a giraffe. What you see in this image is typical of what is seen by *any* creature with an ability to capture visual data, be that a human being or a dragonfly or fluit fly, or frog, or giant squid. There is a complex mess of light, shade, perhaps colour, perhaps even movement – and for that visual information to be of any use at all, somehow there must be **recognition**, linked to an **interpretation of meaning**.

Some readers may already have spotted the giraffe's head before it was mentioned. But as soon as the possibility of a giraffe is known, most people would immediately be able to shift their perception and see the giraffe amongst the blobs – but only because they already have an inbuilt model of giraffe-ness. The blobs do not intrinsically contain a giraffe unless we structure our perception of them around the idea of giraffe-ness. The observation follows on from the conceptual idea, and not the other way round.



Another beautiful example of the idea being necessary before something may be seen is to be found in Celtic art. The horse only exists in our perception because there is already the idea of a horse in our mind. Indeed, any abstractions only have meaning if the pre-processors in the brain that determine meaning can identify a sufficiently (already) familiar pattern. Without a major shift in consciousness - the brain will only present to the conscious mind the interpretation that has already been made based on past experience. My partner derives some pleasure in seeing faces or animals in rocks and trees as we go walking – some of which look remarkably lifelike, but often refuse to be photographed! The question here is – does the giraffe exist in the outside world or in the pre-interpretative pre-conscious mind, or both?

Most importantly, it is usually the context that allows us to arrive at a meaning that allows a useful response. In an African forest, the idea of giraffe-ness would be in context. If a random arrangement of leaves and sunlight happened to suggest giraff-ness, then for a short while we might see a giraffe rather than leaves and sunlight. The perceptual shift from giraffe to leaves/light would be small, but would still create a small "bump" in the continuity of sensory experience. Context was a fascination for Impressionist artists such as Salvador Dali and Henri Matisse, who delighted in playing with it and subjecting their audience to perceptual discontinuities and bumps. Outer space is the most fruitful of sources for scales that stretch our sense of reality to breaking point. The Kardashev scale[3] was devised to give some sense of context as to what "contact" with extraterrestrials might involve from a human perspective.

> *"Let's say we have an anthill in the middle of the forest. And right next to the anthill, they're building a ten-lane super-highway. And the question is "Would the ants be able to understand what a ten-lane super-highway is? Would the ants be able to understand the technology and the intentions of the beings building the highway next to them?"*
>
> *– (Michio Kaku, Theoretical Physicist)*

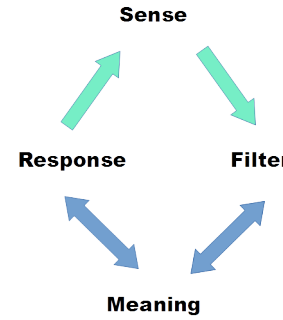
Ignoring the possibility that I might have unwittingly witnessed a type III civilisation galactic superhighway under construction … the most startling experience I have had of the importance of scale-context in real life was during a camel journey through the southern part of the Wahiba desert in Oman with four other people (including a Bedu guide). Sand dunes are fractal (self-similar on multiple scales), and so give no reference point for determining distance or size… If there are only sand dunes with no other features, there is no real clue as to what is being observed other than having direct personal familiarity with the particular object. Literally in the middle of nowhere, we saw in the distance the almost unbelievable sight of an abandoned medium-sized marquee/tent - that looked like it might have once been army surplus, and was large enough to stand up inside. We all stared for some minutes to reorient to this unexpected presence (and come to some consensus as to what we were looking at), and then headed towards it. Arriving in an unexpectedly short space of time, we discovered a small stick over which a dirty rag no bigger than a tablecloth was flapping in the wind. The resulting sense of unreality and unease that arose from this very minor incident (and major perceptual discontinuity) took several hours to shake off. Some weeks later we also attempted to visit the same area of dunes using 4x4 vehicles, and lost any sense of direction almost immediately, finding our way back out more by grace than good judgement. Loss of context-orientation may also arise as a result of neurological disorders – as described by the brilliant Oliver Sacks in *The man who mistook his wife for a hat*[4]. It is perhaps easy to assume that I am talking exclusively about human behaviour here – but it would appear that other animals also have a sense of normality, with dogs[5] and chimpanzees becoming disturbed when presented with visual events that defy the normal laws of physics.

Recognition in a strongly linear environment (such as one found in a modern building

or town) is a very different process from recognition in a complex natural environment in which leaves, shadows, movement, sunlight all interlace and interweave. Looking at the giraffe image above and considering the kind of recognition that requires, and comparing it to looking at a doorway or a wall (or even a picture of a giraffe within a clearly bounded frame) strongly suggests that learning to see and recognise and discriminate in a human-made environment creates a very different kind of brain to the one that has been presented with an unbounded giraffe right form the start. Maybe this is one problems that we face – the linearity of the human-built world we are born into makes it harder to distinguish what is important in Nature. It prepares the brain to look for sharp boundaries and contrasts... So perhaps it is not surprising that of all the many and varied logical systems available we have chosen the very black-and-white, True/False logic of Aristotle on which to base our science, mathematics and culture. Despite the clear importance of context in daily perception, purely objective observation is (in an ideal world) supposed to strip away all extraneous information so that only the object of interest remains. The decision as to what is extraneous and what is useful context is itself only objective if we already know what we are looking at – something that Goethe called "*getting to the milk by way of the cheese*".

The fact that one can identify certain neural circuits as being active during this process (or the ability to write image recognition software for a computer) in no way explains the mechanism by which pattern is recognised and then meaning is derived. In particular, when a newly formed or newly hatched creature enters the world, how do they learn pattern form, association and meaning? The usual sleight of hand is to say that it is "instinctual" (or the modern equivalent "it's coded in their DNA"), but that is no real explanation. It is merely a black box model in which something enters at one end and exits the other. We incorrectly assume that because the black box has been given a label ("instinct"), this automatically means we understand its contents. Modern technology surrounds us with "black boxes" (many of them are indeed, literally housed in black boxes!) A button is pressed, something happens, and there is no need to know the details of what joins the button with the resultant action. So I can use a TV remote control, and have absolutely no need to know that the button releases a coded infra-red pulse, or how that pulse is generated, or how the coded cycle of flashes is organsied – and I certainly don't need to know any technical details about now the TV set works or any of the technology involved in image and sound capture, storage, transmission – the skills of lighting and sound experts, producers, actors. I just press a button. By definition, it's Magic - and in reality is no different from Harry Potter knowing that the spell "*Engorgio*" makes something grow bigger. The modern technological world requires us to think in magical terms, and – being surrounded by magic, it is no surprise that Hogwarts magic has become a part of popular culture. One of the few groups of people who understand every part of the technology they use are astronauts. And this is necessary (and takes years of training), because their lives depend on it. For most people all that is necessary is the ability to know which button to press; and the button is then ripe with meaning.

Meaning is also intimately tied into what we call ***belief***, to the extent that it is almost impossible to change meaning if there is a strong belief in that meaning. Belief and expectation are extremely similar, and affect all parts of the sense-meaning-response cycle. I think everyone can appreciate that the belief that the sun will rise again tomorrow creates a very gentle response to the onset of night. If we were not so sure that the sun would rise again in a few hours time, the meaning of sunset - and our response to it – would be very different. In some parts of the ancient (and not so ancient) world, solar eclipses were viewed with fear and dread, because they fly in the face of an expectation that day and night have their proper place in a repeated and predictable cycle. Once we start to investigate the territory of belief (and hence philosophy and world-views), things get very complicated very quickly. The complexities of recognition and belief are given further attention in Chapter 6. For now, it is useful to recognise the tension between a sense of exploration and play (which requires an openness to new experiences and new meanings) – compared to survival, which requires that we have clear and well defined meanings assigned to survival-critical objects and situations.



> To the fearful eye, all is threatening. When you look towards the world in a fearful way, all you see and concentrate on are things that can damage and threaten you. The fearful eye is always besieged by threat.
>
> – John O'Donohue (1997) Anam Cara[6]

The fact that response and meaning are so intimately related is usually ignored when talking about the senses. It is also usually assumed that meaning is automatically conveyed by what is perceived, and is fixed; or that the sensory organs magically add a layer of meaning to raw data as part of their function. In many situations the derivation of meaning is nothing to do with the object of perception – and neither is it anything to do with any hard wired capacity in the sensory nerves. This raises very interesting questions… because <u>all</u> living organisms derive meaning from their environment.

With that biological inheritance, the human experience of meaning probably includes primitive and very non-cognitive components that have absolutely nothing to do with the cortex (or maybe even a central nervous system)! A newly hatched dragonfly has no doubt whatsoever about the meaning of its perch, or of its wings, or of the prey that it pursues. A tree root tip growing outwards perfectly understands the meaning of up and down, dry and moist, dark and light, healthy or toxic soil. But the usual understanding of "meaning" is very much human, and is tied into cognitive and supposedly cortical functions – language, explanation, reasoning. Meaning is, after all, experiential, and the only way I can definitively experience the world is as a human being. I have come to the conclusion that having a human mind capable of rationalisation is a very two-edged sword. One can easily rationalise oneself into believing something that is in reality not true, or that something real is illusory. Animals, insects, plants and microbes tend not to suffer so much from that particular

problem… It is therefore useful to consider how they might deal with issues of ***recognition*** and ***meaning*** – because we too experience a layer of meaning-interpretation that lies below the level of conscious cognitive (and cortical) processing[7].

Whilst – for a living organism - response *also* equates to meaning, this is not a totally closed loop. It starts somewhere, and in health it always ends somewhere as new meanings are perceived and responded-to. This is also worth considering – that when meaning is fixed, our response is also fixed, and then there is no room for something new, as was shown by Pavlov's experiments on dogs. It is important to consider the way in which living organisms process this loop. A computer program, or a robot, or a typical management structure will carry out each of these tasks sequentially. On the other hand, a living organism has evolved from the very start to carry out all three simultaneously.

One way that we sense the external world is by **moving through it** – exploring minutiae with hands, fingertips, or exploring landscapes by travelling through and experiencing them. One level of meaning – a pre-determined one - is built into the sensing, because **expectation of meaning** determines how we sense, how we interpret the information, and what we preferentially orient our senses towards. Sensation is always part of movement, if only because it is proprioceptive feedback that allows complex (non-oscillatory) movement in the first place, and anyone who has experienced their fingers coming across anything unexpectedly (e.g.) sharp or slimy can attest to the way that the somatic senses are constantly checking to make sure that movement is safe. The reflex response to unexpected sensations is non-conscious - and one has to be extremely well in control of the body (and very present in the moment) to have any chance of interrupting this kind of reflex. In fact, if one reflects on the use of senses and meaning, it becomes apparent that applying any sense is not so much directed at what is now, but is more an attempt to predict the future, because the "calculation" of meaning followed by the movement-response takes time. This is even more true for communication. Any animal, organism – or indeed, organelle - that communicates is essentially building a bridge that may alter events in the future. It is a human conceit that we think this capacity is impossible without a large brain and a frontal cortex. Flies, for one, have been found to anticipate possible futures[8].

Movement is a participation in both space and time. Movement is always relational – at its most basic to some abstracted set of coordinates - but in the nitty-girittiness of specific real experiences in life, movement is always relational; an expression of relationship with the physical environment and the other life forms that inhabit it. And whereas many concepts used to describe physical processes in physics and biology are static (objects, nouns – see later), the fundamental attribute of life that defines it above all others is movement. As the Zen koan above intimates, lack of movement is inherently pathological.

> Mokusen Hiki was living in a temple in the province of Tamba. One of his

adherents complained of the stinginess of his wife. Mokusen visited the adherent's wife and showed her his clenched fist before her face.

"What do you mean by that?" asked the surprised woman.

"Suppose my fist were always like that. What would you call it?" he asked. "Deformed," replied the woman. The he opened his hand flat in her face and asked: "Suppose it were always like that. What then?" "Another kind of deformity," said the wife. "If you understand that much," finished Mokusen, "you are a good wife." Then he left.

After his visit, this wife helped her husband to distribute as well as to save[9].

All of the internal communication systems of the body carry inherent meaning, because they are already in motion / convey some change of state. Whether that is via dedicated signalling chemicals such as hormones, or blood sugar or oxygen content, or a particular position or motion of the body (or whatever); the message already contains the potential response. From his perspective one can even consider the immune response to be an interface to the external, just like the skin. As living organisms that actively participate in and explore our environment (as does an amoeba in a pond), there is a constant stream of sensory information; to which meaning is attributed, and to which we then respond. The response always modifies movement in one way or another, and also modifies how we apply our sensory capacities in the next moment. It is only when we deliberately (consciously or unconsciously) turn away and distance ourselves from that constant stream of information / sensation – meaning / response / movement that it ceases to play out.

The dream of my life
Is to lie down by a slow river
And stare at the light in the trees -
To learn something by being nothing
A little while
but the rich
Lens of attention
– Mary Oliver (Entering the Kingdom)

For this reason – the need for a capacity to tune into or ignore sensory information – the ability to direct **attention** to (or remove it from) something is an integral part of the sense-meaning-response cycle. So for instance, there are many different sounds in a woodland, but some flowers have learned to identify the specific wingbeat frequency of buzzing insects[10] and to temporarily increase the sugar content of their nectar in response. When there is no capacity to discern or switch attention, this kind of response becomes "instinctive" - i.e. almost robotic and programmed – even though it still requires a causal chain of meaning (along with the capacity to detect vibration at those frequencies) to set it up in the first place. In general, plants seem to be universally responsive to certain frequency bands. It is fairly standard practice in Biodynamic greenhouses to either encourage song birds to live inside, or to play birdsong recordings at dusk and dawn. Birdsong with frequencies between 3000 and 7000 Hz opens the plant stomata so that the plants can absorb dew directly from the leaf surfaces – a particularly useful effect in arid climates. It appears that this enhances plant growth if the songs are played according to normal peak birdsong times, but plant growth is badly affected if the birdsong is played all day. Yet another interesting and unexpected thread in the web of life.

> …The individual is a totality and cannot be segregated into intellect, motor and social factors. The correlation of visceral, psychic and peripheral stimuli, underlying muscular response, involves the whole of man. It is the very perception of viscera, nerves and organic life. The whole body, enlivened as it is by muscular memory, becomes a sensitive instrument responding with a wisdom far outrunning that of man's reasoning or conscious control.
>
> from Mabel E Todd (1937) The Thinking Body p. 3

Since we cannot through normal outer conversations and by use of the outer eye ask the plants, insects and birds to tell their experience[11], it is hard to know to what extent this responsiveness is because the sounds have meaning (and so the plants pay attention), and to what extent this is a more mechanical linkage between external vibration and internal physiology. This is a good example of biological intelligence. In our human-constructed world we are used to a unidirectional flow of meaning from passive man-made objects to us. The flow back to those objects is extremely limited,

maybe with an option of half a dozen possible buttons. Computer programs are more complex, with a word processor having maybe a few hundred different kinds of meaning that can be fed back into it. But even this is very simple, brick-like and essentially passive in the way that the software and its user interact – when compared to the interactions between living organisms and their environment. Everything that is alive and/or in Nature has multiple potential layers of meaning, depending on how we relate to it. However, this level of normal ambiguity and potential and *mutual* interaction is masked by the utility of human constructions. The utility of a chair or a pair of trousers does not invoke multiple possibilities in an adult (though an un-adulterated child might feel differently). The relationship there is with man-made objects is one of serfdom. They have a function which is determined by their usefulness; and when placed in that box of severely limited potential we can choose to recognise and give them attention or ignore them according to habit, because they are also predictable. Poetry and art are two of the few things we make that have a potential ambivalence - and way of invoking multiple simultaneous responses – that even comes close to echoing interrelationships in the natural world that we truly belong to. This habitual impoverished and dulled relationship with human artefacts becomes a habitual relationship with the "natural" world, and can even become the basis for our relationship with ourselves and with other human beings.

So to take the bee and the flower – they do not abide by the same rules. The bee pays attention to the flower- just as the flower pays attention to the bee, producing more nectar when it detects the bee's buzz[12, 13]. This is biological intelligence at work. Sometime over the course of a couple of hundred million years of evolution, they have learned to recognise each other and interact in a way that carries meaning more powerfully for the other. It is really impossible to tell how much the bee has adapted its wingbeat frequency to suit the responsiveness of the flower, and how much the flower has adapted is capacity to sense and recognise the bee in order to attract it more strongly to assist its need to reproduce. There is no specific beginning or end, no distinct causal chain, no single direction of flow of information. But the interaction requires that the bee has meaning to the flower (and so attracts its plant-like attention, whatever that might be) - just as the plant has meaning for the bee, and attracts its bee-attention. Am I being fanciful when I attribute the capacity for perception of Meaning to an insect? It is far too easy to dismiss insect behaviour as "instinctive" or "programmed" or "automatic", when just a little thought would cause some hesitation in dishing out those labels so quickly. How does an individual termite participate in the constant task of regulating the air circulation and humidity of a nest that might have to reach some 70 metres or more down to the water table in an African savannah? Or how do the many species butterflies who fly up Mount Mabu[14] recognise that they are following a riverbed, and that following this valley will lead them out of the rainforest into open sunlight? The behaviour of even a primitive a-cellular organism such as a slime mould[15] suggests that decision-making (necessarily based on an interpretation of the meaning of sensory information) indicates that a central nervous system is not a

universal pre-requisite for intelligent response. Which leads to the question for humans – how much of this information processing and derivation/recognition of meaning (leading to response) is carried out at a so-called primitive level outside of the central nervous system?

Attention is becoming a marketable commodity in the digital age, and social media. The way that attention is directed is one of the main factors that determines how time is spent, and so anything that repeatedly draws attention increases the proportion of life spent dealing with it. And in terms of advertising, the more attention that can be drawn, the more likely it is that something will be sold. Nature is not usually continuously random, and so we are not well equipped to deal with randomised information, and tend to confuse random (dopamine) reward as an indicator of importance. So, social media algorithms deliberately mix "big data" (i.e. an accumulated record of your viewing and purchase preferences) with a randomised feed that creates an addictive reward-compulsion cycle. It is telling that billionaires do not use social media at all - e.g. they pay other people to answer the phone for them. They have a sense of the value of their time, and recognise the way that social media deliberately disrupts their attention cycle.

> Teach the children. We don't matter so much, but the children do. Show them daisies and the pale hepatica. Teach them the taste of sassafras and wintergreen. The lives of the blue sailors, mallow, sunbursts, the moccasin flowers. And the frisky ones – inkberry, lambs-quarters, blueberries. And the aromatic ones – rosemary, oregano. Give them peppermint to put in their pockets as they go to school. Give them the fields and the woods and the possibility of the world salvaged from the lords of profit. Stand them in the stream, head them upstream, rejoice as they learn to love this green space they live in, its sticks and leaves and then the silent, beautiful blossoms.
>
> – Mary Oliver

Expectation

Meaning is also always contextual. A good example of that is the way that the expression on babies faces is interpreted differently by their mothers – according to the pre-existing mental state of the mother[16]. So mothers suffering from postnatal depression tend to interpret a higher level of distress than is interpreted by mothers who are not depressed. The fact that the parents state of mind is read very accurately by the baby then results in a feedback mechanism, so the baby may sometimes grow up with affect disorders and shows behavioural, psychological and relational difficulties quite early on[17] because the parents facial expressions do not convey care or safety.

I have a very direct and rather extreme experience of this perceptual shift in meaning brought about by expectation, having suffered from depression during my 20's through to my mid 40's. In about 1983, I visited the gothic cathedral of Clermont Ferrand. The Massif Centrale in France is characterised by a string of extinct volcanic craters – so whilst many European cathedrals are built from white or creamy limestone, this particular one was constructed from the best local materials – which happened to be a dark volcanic andesite. I have a strong memory of entering the cathedral, and seeing black pillars separating blood-red stained glass windows; and then walking up a spiral staircase to the roof, where I was surrounded by gargoyles. I truly had the sense that this was a portrayal of hell. It *was* hell. About 10 years later, I revisited the city. There were less gargoyles; and they were inanimate, curious and less menacing. The stone was no longer matt black - it was even a pleasant mid grey, sparkling with crystals. And the windows were not so uniformly, deeply blood red – in fact, most of them were not so red at all. The overall impression was one of a normal and spacious cathedral, rather than a heavy brooding darkness. I'm pretty certain that nobody had carried out a makeover … So that first experience of the cathedral of Clermont Ferrand – was a product of my own state of mind. A similar distortion is commonly found amongst sufferers of anorexia. They may have a body more akin to a skeleton, but they are unable to perceive that – what they literally see in the mirror is obesity and fat. It would be easy to dismiss this kind of anecdote as being purely related to mental disorders – but in fact they are simply more intense versions of *confirmation bias* – which is almost universal. What we see in the world often reflects who we are far more than it reflects the world itself.

It is therefore true that *expectation* is an important part of the process of deriving meaning; just as expectation alters what may or may not be perceived (i.e. which senses are available). This kind of expectation is not necessarily conscious – it is a kind of inner programming that expects a certain kind of world, and cannot see any other. A frightened hedgehog will curl up in a ball, and once in that state, any sounds or movements or contact from the outside will automatically be perceived as a threat. So a major contextual factor in the perception of meaning is the current inner relationship with the world, which at its bottom line largely revolves around the question – "*do I*

feel safe or not?" If there is any feeling of not-safe, then the attribution of meaning is always skewed towards possible catastrophe and danger. As humans we like to think that we can rationalise and take on an objective point of view - but the capacity to do that also suffers when there is a perceived threat to survival. Sugar cane farmers in rural India experience a continual cycle of boom and bust, being rich immediately after the harvest, and then desperately poor immediately before the next harvest. A study in 2013 showed that the extreme poverty preceding a harvest temporarily reduced their IQ by an average of 10 points[18]. So stress (poverty is a survival issue[19]) decreases the capacity to think clearly. In the case of the sugar farmers, this then creates further poverty, because planning is a crucial part of farming (and of money management), and the stress of poverty substantially decreases their capacity to plan intelligently. It has also been shown that poverty (i.e. desperate poverty leading to malnutrition, and/or poverty as perceived by the parents) has a substantial effect on children, which may have greater long term effects on either male or female children, depending on the implications of poverty in whichever specific culture you might come from)[20]. In Western countries, male children tend to be more strongly affected by parental poverty while they are infants.

Language also plays a large part in this pre-conditioning. One example (described in Chapter 3) is the way that geographic languages precondition their natives to be receptive to their magnetic senses. On the other hand, a lack of geographic linguistic structure – such as in English - makes the magnetic sense far less easy to access. There is also interesting historical material on the perception of colour. An analysis of Greek literature (the Odyssey) by Gladstone, the 19th century British Prime Minister, showed that there was no word for blue in Greek culture until about 2500 BC; and previous to this, the colour blue was *cognitively* indistinguishable from black and grey or green. His research has since been expanded, and has been found to apply equally to all cultures throughout the ancient world – Middle Eastern, Indus Valley, Chinese, etc; with historical shifts in colour perception occurring almost simultaneously worldwide. Studies on the Himba[21] (a native tribe in Northern Namibia, who do not have a word for blue in their language) suggests that their blue-blindness is actually a culturally induced colour blindness… The linguistic absence of the colour blue in their world-reality creates the possibility for a far richer and more subtle perception of different shades of green. Their eyes receive the same wavelengths, and they possess the same wavelength receptors as you or I.

The picture emerging from the various examples above - is that the particular frame of mind and societal perceptual bias and the availability of definitive words in the spoken language that determines what is perceived in conscious awareness; and that allows you to perceive blue, and the Himba to distinguish more easily between more subtle shades of green[22]. Similary, the presence of two specific names for blue - dark blue ("*siniy*") and dark blue ("*goluboy*") - in common-usage Russian allow native speakers to identify different shades of blue far more quickly and easily than speakers of other languages.

Consider that if language, culture, belief and expectation can have such an effect on colour – something we consider to be an absolute - how might it affect all other areas of our perception? There may be many different ways to experience and sense the world that we *could potentially* access - but cannot, simply because the specific language and dialect we speak does not have a commonly used word to describe or clarify that experience. When exploring unfamiliar sensory zones, several steps are required to unlock these senses and make them available in everyday situations… There must be a curiosity and willingness to explore and find something completely new, or to have far more clarity and subtle variation than we previously expected. We don't know what that "new" might be, or how we might discover it or perceive it... So in order to have any chance of perceiving it at all, there must be a suspension of disbelief. And experiences must be trusted – this new experience or means of sensing will initially arise in a familiar sensory channel, and there will be very subtle variations that we have up to now skated over or considered irrelevant or meaning-less. Once there is conscious perception, then the meaning often becomes apparent; because we will tend to be most aware of this new kind of information when it is particularly rich in meaning.

The way that meaning transforms experience is no better illustrated than by Meir Schneider. In his inspirational autobiography[23] he describes how he transformed his sight from being blind through to having 20:20 vision through eye exercises, yoga and physical therapy. But the clue to how this really was achieved is presented near the start of the book :

> *"In Poland [at age 4] I had my first eye operation for removal of eye cataracts. It was excrusiating, and I couldn't understand what was happening. Each night Savta lay beside me, massaging my neck and face. I remember waking up for a moment during the operation and seeing a doctors face – his surgical mask and eyes"*

Having read so far, a small voice inside my head was screaming "Trauma!!!!" But then in the next sentence Meir went on to write about his experience at four years old:

> *"I don't know whether I was dreaming it, or if I really did see him, but whatever happened, it was the first intimation that I might actually see, and that image and the hope it instilled never left me"*

What-ness and Where-ness

When most people think of the senses, the first kinds of sensory information that comes to mind are qualities of "what-ness" - colour, sound, texture, solidity… From a very practical perspective, "what?" is usually useless unless that information is also balanced by a "where?" There is no use knowing that a papaya is hanging from a tree, just perfectly ripe and waiting to be eaten – unless it is possible to also relate to its position sufficiently well as to be able to grasp it. If one reflects on sensory experience, there is

always a "where?" embedded in our experience of "what?" Where-ness is fundamental in determining meaning, partly because responsive motion is so wholly dependent on the where-ness, not only in determining where the thing is that I am going to react to, but also where are the arms legs and other body parts that are going to do the reacting.

The first question for where-ness is whether this is about the inside or the outside (i.e. self-other). Almost every single cell is provided with a means to detect direction, in the centrosome. The two louvred barrels of the centrosome are arranged at right angles to each other, and (as described by Guenter Albrechnt-Buehler) can therefore detect activity and motion in three dimensions – provided that it is signalled by near infrared light[24] in the range of 750-1500nm. The fact that even single cells can detect "where?" suggests that they also have some way of discriminating inside and outside, and so have some rudimentary sense of self-other, and also have some capacity to detect a "what?" This "what?-ness" and "where?-ness" is so fundamental to life that it can be seen operating in many single-celled and simple multicellular organisms that do not have a central nervous system – such as plants[25] and slime molds[26].

The function of where-ness is so important, and its resolution so very different from the determination of what-ness, that the human brain employs completely different pathways for these two aspects of sensing and the derivation of meaning[27]. A ventral stream of visual signals from the eyes (running along the bottom and sides of the brain, from the visual cortex up the bottom sides of the temporal lobes) processes qualitative information such as facial recognition; and a dorsal stream processes spatial information in the parietal cortex. Even spatial information derived from hearing (including echolocation) is processed by this dorsal stream and the visual centre of the brain. Any complete use of the brain must include not only left brain / right brain kinds of behaviour, but also attention to *both* where? and what?

Information filtering - what do I want to see?

Prior to any discussion on PolyVagal theory, lets take a look at how the sensory system is organised. My approach is very much based on daily experience of the senses as evidence of their internal workings, and I would like to start with a simple statement...

> ***"It is necessary that the nervous system – and in particular its ability to home in on certain sensory information – is programmable in terms of what is important (for survival) and what is not important."***

How does everyday experience match that proposition? On reflection, most people will realise that the above statement is very familiar. Though maybe you have never thought of it on that way. As usual, there are several strands to this which have to be carefully unpicked so that they can be fully understood. This programming is necessary because the world is very rich in information, and our sensory capacity is also very rich and multilayered. So – which particular pieces of information (or even which particular sense) should we pay attention to? Or which particular movement? If you are walking in a wood, and the leaves are all moving in a strong wind, then the eyes very quickly stop paying attention to the fluttering of leaves – this is filtered out – and but will still be aware of other kinds of movement. Bringing attention back to the trembling motion of leaves in the breeze – requires an act of will. It is a useful experience of how we can wilfully manipulate of perceptual filters.

Just like recognition, the prioritisation and filtering that prevents sensory confusion or overload is of vital importance to all creatures, and is not a trivial issue. At any one moment we might occupy our attention with thoughts or emotions, or with any of the senses, or with performing a particular action. There is a limit to how many of these can be retained in conscious attention at any one time, as described in Chapter 3 ("sensory fish"). The filtering that results in a particular focus of attention is complex. Habit is one factor – and most people have specific senses that they pay more attention to than others. 21st century western culture is very visual, and many people live in a largely visual world, paying relatively little attention to other senses unless there is a specific need. Habit may be reinforced by expectation. And for a variety of possible reasons, what is of importance will be better engaged with through a specific sense. And habit may also be reinforced by an internal dissociation from or aversion to other senses. Generally speaking our culture tells us to pay attention to the loudest sensory "noise", and when discussing sensory channels (or fish) I always include thoughts end emotions – maybe a better description is a "channel of information".

> Meaninglessness inhibits fullness of life and is therefore equivalent to illness.
> Meaning makes a great many things endurable - perhaps everything.
> From Jung's Memories, Dreams and Reflections: p. 373

It is a very simple exercise to do. When you become engrossed in thoughts about anything (e..g reading this book), notice how other information channels – a visual

awareness of the surrounding room, noises, smells – may be present to some degree, but they are faded, distant, shuffled to the background. Re-focus on any one of those – maybe the noise of conversations, or traffic – and again notice how everything else may still be present, but it is no longer in the forefront of our perception. As a child I used to read up to five books a week, and was totally oblivious to any sounds or movements around me once I became fully absorbed in the book. The words and images were playing through the auditory and visual information channels in my head (inner-speech, and inner-vision) to the extent that there was no room for conscious connection to external sensory channels. Many people have the same experience when engaging something with their "full attention" - a film, or a conversation, or the touch of skin... And some information channels may be intrusive if they cannot be easily switched off. These are typically states of hyperarousal; thoughts or emotions that continuously intrude; a sense of hearing that is too acute to small noises or a peripheral vision that flags up every small peripheral movement.

So the reasons for filtering out or magnification of certain information channels fall into a small number of distinct categories :

- Conscious choice of focus
- Unconscious choice of focus (including habit and hyperarousal)
- Conscious choice to ignore/switch off/numb out certain channels
- Unconscious choice to switch off/numb/dissociate

These information filters are influenced by and influence expectation, and are one powerful influence on the perception and interpretation of meaning.

One major aspect of the a living everyday use of the senses is Recognition. This is largely the task of the left brain, and so in modern western adults there is L-R brain asymmetry, described in glorious depth by Ian McGilchrist[28]. If you consider a recording device – a film camera or microphone – a vast amount of information may come into it, and be accurately registered. But it has no meaning to the camera or recorder, partly because the machine has no capacity to discriminate or interpret[29]. The sounds of a waterfall cannot be distinguished by a voice recorder from those of traffic or voices or birdsong, because there is no means to identify (recognise) their individual sources. And even if there is artificial intelligence in the recording device that can discriminate and label – the label carries no meaning to the recording device other than a small difference in the binary sequence with which it stores its analysis. So there is a blur of essentially meaningless information. This is what the senses would be like if there were no post-hoc filtering and processing that :

- allows discrimination (filters out unimportant information),
- identifies important elements (recognition – which in animals using a spoken language usually translates into naming/nouns).

- ascribes a meaning. In linguistic terms this may require qualitative aspects such as colour (adjectives). And it would also usually include relationships /context (e.g. my family or close/far away) and processes such as movement towards or away from the observer (verbs).

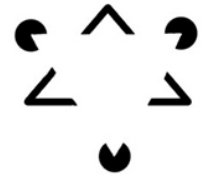
Gestalt in vision

In the early 20th Century it was recognised that vision passes through many interpretative and pattern-selective filters before we actually see what we are seeing. Gestalt Psychology[30,31] is now used in many fields of graphical presentation, from education to advertising, and has identified many of the basic rules by which visual information is organised into meaningful information. These internal "rules" help us to make order out of potential (or apparent or even actual) chaos, to find meaningful patterns, and to automatically default to seeing the whole – rather than having to wade through vast swathes of detail and then mentally construct a whole from that complex mess. It is only by these innate pre-conscious rules that it is possible to distinguish a face from its background landscape, or to know the difference between a piece of (significant) handwriting and meaningless scrawl, or to combine the detail of light, doors, wheels, and a certain kind of shape to identify a car. For in finding the whole from the detail, and in separating the subject from its background, "the whole is greater than the sum of its parts" takes on a very real meaning.

> *Gestalt is also known as the "Law of Simplicity" or the "Law of Pragnanz" (the entire figure or configuration), which states that every stimulus is perceived in its most simple form.*

One thing that is quite peculiar in visual perception is the ability to recognise the totality of what we see. Although this is a common human experience, behaviourally it is very difficult to argue that other forms of life have very different experiences. So although there is a degree of isomorphism – a tally between human brain activity and what is in the visual field – it would be hubristic to believe that *only* the human brain is capable of preforming Gestalt tasks. A few of the Gestalt tasks automatically performed by the intermediate interpretative layer of vision – so automatically that it can be quite difficult to override them - include :

- Law of closure : we fill in the gaps and prefer to see whole shapes rather than parts (hence the Giraffe!)



- Common fate : things moving at the same speed and/or direction are grouped together (e.g. a flock of geese)
- Common region : we group objects together that are in the same identifiable bounded region (boats on the water, faces looking out of a window)
- Continuation : lines connect objects, and our vision tends to automatically follow lines to find other objects
- Figure/Ground (Multi-stability): we look for the most stable of either figure or (back-)ground, and identify that first – unless the image is truly ambiguous (see image to the right).

- Common form : we group elements together that are similar in shape, form, colour, pattern etc (e.g. a herd of zebras)

- Meaningfulness (Familiarity) : items that have a common meaning or past association are grouped together.
- Prαgnanz (pragmatism) : complex or ambiguous images are simplified. This is one reason that Picasso paintings can be so disturbing – in that they are both simple and ambiguous, and so interrupt the Prαgnanz filter.

- Proximity (Emergence) : figures closer together are grouped together.
- Regularity : collecting items into a group if they form a pattern (again, see Bortoft's Giraffe)

- Similarity (Invariance) : identifying similarities and differences.
- Symmetry and regularity : symmetry is an important template for recognition. Almost all animals and insects exhibit symmetry, especially when seen face-on, and so symmetry is vital for recognition of species and identity. Regularity / pattern convey meaning. Camouflage is designed to interrupt automatic visual recognition, and cognitive pattern recognition is much, much slower.

- Synchrony : objects that appear at the same time are considered to be related to each other.
- Convexity : objects tend to be convex rather than concave. So (i) there is more interest in convex forms, and (ii) when an ambiguous form is seen, the tendency is to assume that it is convex. This is informed by :
- Lighting direction. Darker areas are assumed to be shadows and lighter areas

assumed to be sunlit; and the sun always shines from above (top) and shadows are always found below a convex projection and in the upper part of a concave hollow)

- Most frequently accessed – the things we look at/for most are given highest priority when interpreting visual information. Since we are social animals and that social activity is based round the face, the brain is always looking for faces – hence *face pareidolia*, the susceptibility to see faces in everyday objects such as trees and clouds and door handles. Of course, that's not to say that there aren't faces in these … (!)

Without the capacity to progress through some kind of interpretative chain of filtering, all of the senses would be almost useless, because useful information would not be easily extracted from the overwhelmingly vast stream of sensory experience. We are so familiar with this process and experience it to be so intimately connected to the capacity to sense, to filter, to prioritise, that it is usually unconscious. Not only is pre-filtering unconscious – but much of it is usually *inherently* unconscious – i.e. is carried out automatically by a part of the brain that is not cognitive. You are able to walk down a busy street and identify and focus on the specific movements that help you not to collide into anyone else, and on he specific information in shop windows that allows you to find what you are looking for. For this reason all living organisms are to some degree programmable. David Bohm[32] talked about *Thinking* vs *Thoughts* and *Feelings* vs *Felts* (which includes *Sensing* vs *Sensed* and *Moving* vs *Moved*). To which I would add *Meaning vs Meants.* With the former (thinking, feeling, sensing, moving, meaning) there is an immediate conscious engagement with the world that is fresh and open to new possibilities. However, this conscious level is relatively slow to respond and inefficient. So it is necessary that we learn (programme) certain patterns of *Thoughts, Felts, Sensed, Moved, Meants* based on the common experiences of everyday normality in order to be able to focus on what is most important. There is a delicate balance between retaining the capacity to come afresh to experience vs being able to react according to past experience. We can only ride a bicycle because there are a set of *Thoughts*, *Felts, Sensed* and *Moved*'s – a program run by the muscles, balance organs, cerebellum and other functions and part of the body-mind. But if this capacity to be programmed is allowed to take over too much, it leads (amongst other things) to a comfortable numbness to the outer world. Or even to racism and other forms of bigotry – as the programmed reaction to unfamiliar faces is most easily (when survival circuits are running behaviour) distrust and hatred.

Gestalts are a particularly useful programming that (perhaps) one would not normally wish to override or make particularly conscious. It makes sense in a world that is lit from above by the sun and moon to expect light surfaces to face upwards and dark shadows to be below. It makes sense to be more interested in convexities (substantial objects) rather than concavities (the gaps between them). It makes sense to assume that objects moving together might also share some commonality – such as a line of ants or

a flock of migrating birds. And so on. All the above gestalts reflect the way things usually occur in the normal "natural" world. This kind of programming causes optical illusions to be possible – but only because the optical illusion deliberately presents something that is not usually found in the natural world. Of course, Gestalts can always be manipulated – because they are automatic and lack discrimination. Therefore the stripes on zebras present an impossible illusion to flies, who see a solid animal from a distance, but see solid lines with gaps (like grass or a tree) when they get too close.

Learning to see

A small amount of light striking the translucent tissues of the body does find its way into the womb, just as faint light enters the innermost recesses of brain and activates the pineal gland. So a newborn baby comes into the world without having used her eyes for anything more than seeing changes in light intensity. After a few minutes or hours or days, the baby begins to perceive something with its eyes. It has no sense of distance (other than maybe, or maybe not, close and far away), so it does not even understand how to focus. There is a blur of light, dark and maybe colour. It has no words or internal representation to allow it to label nose or mouth or cup – so there is very little capacity to respond meaningfully to visual information. Over the next few months, this changes – rapidly.

What the baby does know very well from the very start is its internal (somatic) sensory world... New babies regularly may be observed turning their attention inwards to check how well a bolus is progressing through their intestines. They also have an immediate sense of smell, and can hear their mothers voice. Just like a small joey (kangaroo), human babies instinctively know through touch and smell where the nipple is. And if left to their own devices, most babies are capable of moving themselves towards the breast and (after a short period of working out what the nipple is and exactly where it is relative to their mouth) they will begin to suckle unaided[33]. I could imagine a process of learning in which the eyes begin to register two round shapes as being sources of nourishment. And then the baby notices that there is another pair of round shapes that also provide nourishment – but not they are not quite the same kind of roundness, and the nourishment they provide is not so physical. So human eye contact might be learned. This would be a very nice model if it were not for the fact that other young mammals such as reindeer are born like a dragonfly - already capable of using all of their body with a small amount of practice, already aware of what limbs are for and with a desire to stand on them and walk and run; already aware of the difference between nipples and eyes, and ready to connect to both in the appropriate manner. And even already prepared for moving around on unfamiliar and uneven ground.

> Look at the sparrows: they do not know what they will do in the next moment. Let us literally live from moment to moment.

– Mahatma Gandhi

We regularly use the term "instinctive", and say that babies instinctively suckle, birds, sharks and butterflies instinctively migrate thousands of miles, dogs instinctively bark, and so on… But exactly what that word "instinctive" means is not so clear[34]. I don't think anyone has ever identified a gene that carries instinctive responses. And this may be because instinctive responses are complex chains of events that begin with sensory activity, which is then interpreted, and once there is a sense of meaning, then movement arises in response to that meaning. But meaning *to what*? What is it that perceives meaning? By definition, *meaning* means the "proper" (contextual) response to a specific stimulus. Internal information (via the somatic senses) usually requires an internal response – which is usually physiological in nature. But external information usually requires a response in the form of movement – towards things that will nourish us and keep us alive, and away from things that are dangerous. The best evidence to date[35] is that many/most cases of so-called instinctive behaviour are yet more examples of the way that Gestalts are programmed into a nervous system through normal interactions within a normalised background environment.

> *… research in this area teaches us that species-typical behaviors develop—and they do so in every individual under the guidance of species-typical experiences occurring within reliable ecological contexts. Blumberg (2017)*

It is therefore perhaps not so surprising that (in animals with brains that have a motor cortex) *mirror neurons interpret everything derived from the external senses symbolically as if we were physically moving*. Nevertheless, it must also be remembered that creatures that do not have brains also perceive meaning to some degree, program behavioural Gestalts, and have an internal representation of themselves, allowing coordinated directed purposeful movement. So all that can be said of the brain is that it is a more developed and specialised means of symbolic interpretation that grew out of a less specialised capacity. The self-organisation of cells in a growing embryo gives some insight into this pre-brain world[36].

Mirror neurons are a higher level form of interpretative mechanism – and by definition that specific interpretative pathway can only be accessed by any creature that possesses a motor cortex and a pre-motor cortex. However, even the most primitive single celled organism with no neurology or brain is in the same position and faces the same challenge of converting raw information into meaning… Its senses are useless unless information can be extracted in a winnowing/filtering/pre-conditioning stage; then interpreted; and meaning derived; so that the resultant response is appropriate to the situation. This loop between

sense – filter – interpretation – movement-response

is so interdependent – that all of the necessary parts of the organism that are involved in it must have evolved more or less in parallel – and must be functionally interconnected in all organisms, no matter how simple or complex that organism may

be.

This plays out in a manner so familiar as to be unremarkable in everyday life. Everyone who learns a trade is essentially trained to detect minutiae of detail in a way that other people cannot. A bricklayer can know the exact amount of mortar on his trowel so that one trowel-full of mortar exactly matches the requirement of one brick. If you have ever watched a skilled bricklayer in action, you will have perhaps seen the slow and deliberate rhythm of accuracy in which there is no waste, no excess cement dripping off the edge that can dirty the courses of brick below, no fiddling around with extra little dollops of cement to fill in gaps. Every movement is deliberate, full, efficient, rhythmic, and in its own way beautiful – because there is a complete integration between the different senses and movements. My experience of this in the real world, having copied my father and tried my hand at many different skills – is that each skill or task has a **rhythm** of its own which brings about an optimum of mastery, efficient timing, and integration of "hand and eye" (or sense and movement – because once mastered the hand and eye are linked through non-conscious pathways in what is commonly termed "*skill*"). Achieving this requires that the both sensory and motor systems are trained. The sensory-interpretative system must learn to recognise the minutiae of detail that allows fine control of motion, and the motor system (cerebellum) must learn patterns of motion that allow efficient use of sensory messages – not just messages of what or where, but messages that also indicate meaning.

It would seem that rhythm is somehow fundamental to the way we interact with our environment. Considering the fundamental principle of rhythm, it is a regognisable "signal" that repeats on a consistent manner through time. So it's not unreasonable to think that every form of communication and information might have an inherent rhythmicity that allows for it to be used to predict possible futures. Research into the adaptation of living systems[37] shows that pretty well every systemic interaction – be that "internal" physiological relationships or "external" ones with other organisms – are organised around a rhythm, and that rhythm might be one of the fundamental means by which living systems attune themselves across their internal and external ecosystems. Rhythm is essentially the means by which coherence is made possible.

Recognition

Most new mothers quickly learn to identify the cry of their child – and what it conveys… hunger, distress, a small temporary unsettlement that will quickly turn back to sleep… Some even learn how to identify the exact sound of the cry and can (like a penguin in Antarctica) recognise their child's voice amongst that of many other thousands of children (and vice versa). Anyone who forages for wild food will have experienced how – when they decide to hunt for mushrooms, they begin to be able to see them in the most hidden of places – under leaves, resting in dark and shady hollows. The amount of detail that is immediately recognised (so that we pay a lot more attention in that direction) – given the smallest number of clues – is quite extraordinary. Cognitively, the experience is that something switches on inside – our

mental-emotional qualitative state becomes more interested, curious, focussed, slightly more awake, alert, present… The *Orienting Reflex*¶ engages, and so the head/ears/eyes are positively pointed in that direction by non-voluntary nerve signals arising from autonomic motor efferent fibers. To put this in laymans terms – the head *turns itself*. It's not a conscious movement of orientation – it's an automatic one.

Some people have this hyper-awareness of their environment and can detect the smallest of changes. I had a really freaky experience of this when I was about 12 or 13 years old. I visited a friend and we played marbles in his lounge. During the game one marble flipped up, sailed through the air and hit the bottom corner of a glass door, leaving a diagonal crack in the corner of the glass – no more than about half an inch long. My friend became really frightened, saying how his father would see that, and (obviously living in a different family) I said "*nonsense – it's a tiny crack – nobody will see that*". About half an hour later his father came in from work, stood in the middle of the room, scanned the whole room once (taking just a couple of seconds to do so) and then pointed at the crack in the glass, saying "*How Did That Happen? Who Broke That Window?*"

Information is similarly filtered out (and ignored) in the opposite way – but for the same reasons. Deep in the brain are sensory filters whose task is to determine what is of importance vs what is not. The more we *feel* that we are under threat, the more "importance" actually means "life-or-death survival importance". The more we are in a playful and curious mood, the more easily we can shift perception and choose what is important.

A recent experience of both myself and my partner came about as we were trying to find a suitable design for a porch on our house. It's both odd and interesting how tiny variations in angle of roof pitch, tile type and beam thickness/spacing can have huge impacts on the aesthetics of a front door porch, and so we spent two hours driving round, looking front door porches as we drove round the countryside. What then happened surprised us both. We were having lots of fun, we were interested, we were curious. Then strange things started to happen. Both our heads would turn very rapidly and unconsciously … and behold! There was a porch! It took about 15 or 20 minutes to train our senses to find porches – but it took several months to train our eyes NOT to pick out porches in preference to other features of the roadside landscape. Our heads and eyes and necks were finding porches and turning to look at them all the time, even though consciously we no longer wanted to find them. So once something is given a high importance, the subconscious mind and body will seek it out. This is worth considering carefully. What happens if we pay attention to pain or tiredness or other signs of our own distress, or looking for signs of possible violence (because we think that we need to be aware of it so that we can deal with "problems")? Compare that to (say) deliberately cultivating a habit of noticing signs of health or strength or happiness or safety… This also reminds me of an interesting argument I had with a

¶ See section on the PolyVagal Theory

friend some 30 years ago. I claimed that there were a lot of cars on the road in which the male was the driver and the female was a rear-seat passenger (with the front seat unoccupied). I saw lots of instances every day! And it really annoyed me. My friend (who was a female journalist) saw none – and even when I told her of how many of these I saw, she still saw… none. We finally decided half jokingly that we lived in two universes. Those two different universes were internal worlds constructed out of belief and expectation, leading to different sensory-perceptual filters. The external world had (I assume, perhaps incorrectly) an underlying reality that was potentially common to both of us, if only we could both achieve pure objectivity.

If you consider a hunter-gatherer, there is a real need to be able to detect the smallest hint that food or danger is near. The sight of a deer's antler in some bushes and long grass. The atypical symmetry of a tigers face looking out of the undergrowth. The particularly dense shadow in a jungle that might indicate a wild (and dangerous) buffalo. The smallest hint of movement that tells of a snake that must be avoided or a tortoise that might be eaten. The slightly different hue of green and specific shape of leaf that leads directly to a plant particularly useful for food or medicine. Even most animals in most circumstances do not have this information programmed into their neurology from the moment of birth – but have to undergo a learning process in which their senses become attuned to specific types of shape or motion or colour or sound or smell that have important survival meaning.

Most people also have the experience that this kind of immediate non-conscious recognition/"knowing" can almost be the opposite. We try so hard to see a piece of paper we just scribbled on, or a pair of shoes – and even though the item is directly there in front of our eyes, it remains invisible. Personally I can recognise several ways that this may happen :

- The item is not the same shape/colour that I remember, and I am strongly filtering out everything that is NOT the same as the item in my memory.
- I am trying too hard to see it, and/or am in too much of a rush.

These are two nice examples of how the filtering and recognition system works. Expectation is a very powerful filter, and it can create a near-blindness to anything that is not expected. The more certain we are that we know what we are looking for, the harder it is to see anything other than what we already "know". The idea of distance-perspective is deeply embedded in western European culture, to the point that we expect perspective to exist in all situations. So optical illusions that distort perspective – such as the Ames Room fry our brains. Interestingly, it has been found that some people from (e.g.) Africa who live mainly outdoors – and are not surrounded by the square architecture and straight edges that underlie perspective – can look at an Ames Room and be completely and immediately aware that it is the room that is distorted and the people in it are the same size. So an expectation of a context of squareness and straightness against which things can be measured – is exactly that – and expectation. True, it is a useful one in many situations, but it becomes so habitual part

of normal perception that it cannot be discarded. There are many other expectations that apply pre-conditioned filters and interpretations to our senses – which can all enhance our life or distort it. Instinctive racism is a preconditioned perceptual filter. A desire for money is another one – because after all, money is a symbolic token, and not the real thing. It can only be exchanged for the real thing. Which brings us rapidly back to the topic of meaning, because meaning itself is largely symbolic.

The idea of "Meaning" in the context of survival is usually taken to indicate danger, but in fact there are two types of information-meaning that have survival value. One is Danger : this may injure or kill me… And the other is a positive survival value – this will enhance my survival… a mate, or food, or shelter, or an immature (human) animal needing protection. The principle of Meaning is massively extended and nuanced in tool-making animals. The use of tools requires an analogical way of processing, in which the tool is perceived as an extension of the body, and is found in many parts of the animal kingdom. A crow will look for and identify a stick that is the correct length and width to be used to poke in that hole to get that juicy grub. In fact, any kind of nest-making (including nests made by insects) are also forms of tool-usage, and social animals are generally more able to learn from each other and pass on skills … So it should come as no surprise that bumblebees have been found to be able to use tools (e.g. a string to access food), and to pass that skill on to their fellow bees and to their descendants.

> If men bore black feathers, few would be clever enough to be crows
>
> – Henry Ward Beecher

Human tool-usage is universal, and so familiar that we hardly pay it any attention. An experienced mechanic will look for a socket that fits that particular size of nut and (without initially reading the socket number) be able to pick up the correct one from a pile of maybe 20 or 30. An accountant will look at a page and her eye is immediately drawn to important details – both things that should be there and things that are missing. An experienced copywriter will notice a missing full-stop without even thinking about it. Putting on clothes, using a mobile phone or computer, eating with a knife and fork or chopsticks, sleeping in a bed, travelling in a car, wearing spectacles or sunglasses - and employing someone(!) – are all everyday examples of tool-usage.

There are several pattern-recognition parts of the nervous system that engage in this kind of activity. But one of the most important ones is the Amygdala – a pair of small oval structures lying on the outside of the midbrain (which in turn is the main seat of memory in the brain). So this pattern recognition system is not strictly conscious – it lies at a level below that of purely conscious processing, and is shared at least with all other animals who possess a midbrain … i.e. all other mammals.

It would appear that there are at least four layers of recognition of meaning.

a) There is a hardwired layer – which seems to be innate – i.e. it is present more or less from the moment of birth.

b) This innate recognition system then allows us to identify further key survival features, which then can be deeply and irrevocably programmed in the early stages of life.

c) There are types of sensory information – features of the external environment – whose meaning and importance may be programmed and de-programmed to varying degrees. A few examples have been mentioned above in regard to manual skills that we may acquire.

d) There is at least one layer of meaning that we derive by telling ourselves stories. Dr Alan Watkins[38] distinguishes between emotions (which are a non-conscious biological level of response, and feelings – which are far more complex and interpretative and conditional.

It should be recognised that perception of meaning requires that we first have a means to identify something to attribute meaning to. So a knife is not a knife unless we are able to see something and know that it has the qualities that would allow us to apply the label of "knife". There is a recognition of something that has a sharpness of blade and/or point, a hardness, and maybe a handle that allows it to be grasped. Knives come in many shapes and sizes, but are all identifiable through their generalised shape and function. Their **meaning** is strongly modified by contextual information – the particular kind of blade, what our relationship is to it (and what its relationship is to us). Is this an almost unrecognisably rusty Viking sword I just found in shallow water in a Norwegian wetland? Or is it in someone's hand and pointing towards me? Or is it lying next to a loaf of bread?

Western philosophy has led us to a way of thinking in which an object – a train, or an orange – can be thought of floating in a blank and effectively infinite space, completely stripped of context. This is a cultural illusion, since there is nothing that can be stripped of its context and still retain significance and meaning. And it is only significance and meaning that give purpose and use to any object, or allow us to respond to it in a "meaningful" way. The context of the identified object usually determines its meaning – because meaning is very often different from the linguistic label (noun) that we apply to it. The knife, according to its context, may be a useful life-enhancing tool or a mortal threat, or maybe even an uninteresting and almost meaningless part of display behind a glass case in a museum. If I see a stuffed tiger in my living room, I might be frightened only for as long as I do not realise it is stuffed. The meaning of being close to a stuffed tiger is clearly very different from the meaning of being close to a living unstuffed one. The meaning of a knife lying in a cutlery drawer is very different from the meaning of one being wielded by a wild-eyed person who is staring directly at you. From these examples it is hopefully clearer that the meaning is the kind of response that is invoked (or required) as we meet and recognise and engage with that particular object or person or situation.

It seems that all mammals and birds have a basic hardwired ability to recognise a pair of eyes, and this is initially used to identify parents. Two closely spaced black dots

have a high significance and meaning in a way that seems to be written into the deepest be-ing of mammals, and maybe other creatures. The interaction with these two black dots then leads to bonding, and some kind of fundamental self-identification based on the particular shape behind the first pair of eyes that give extended contact to a baby. I once had an extended conversation with a half-grown chicken that had been hatched and reared by humans, and who obviously thought herself to be a human, because the first face it saw when it hatched - was human. I was sitting on a rocking chair, reading the Sunday paper in the kitchen of a friend's farm. This small bird jumped up onto my foot, ran up my leg, and proceeded to chirp and chuck at me for several minutes, possibly welcoming me as a new member of the extended family. On the other hand it may have been telling me off in no uncertain terms for sitting on its personal chair and invading its territory. Birds have an intelligence and courage that can exceed all expectations. A few years ago I attempted to close a hole in my roof that obviously contained an active nest. Within less than a minute, an enraged sparrow was sitting on the scaffold right in front of me, and its anger at my stupidity was very very obvious. I sheepishly took the brick out again. The bird clearly had me at a disadvantage. It then stopped venting its anger at me, and went in to feed its young ... with a certain body language that conveyed contempt at my lack of attunement to the laws of nature.

There are other hardwired visual cues more obvious in animals than humans. A new hatchling will cower in the nest if it detects the silhouette of a bird of prey in the sky. Birds also will peck at anything that is small, grain-sized and that is lighter than the background floor material. All of our senses (as are those of all animals) are hardwired to notice difference – in pattern or in lightness/darkness or (to whatever extent they can distinguish colour) of tint and tone. If something is different then it is of potential significance. That very simple distinguishing of difference quickly extends to recognition of complex patterns of shape and shade and position relative to the rest of the world. We don't look for lost keys on the ceiling or floating in the air because we know that they do not levitate – they always lie on a surface or are tucked away in a pocket or are in their place in the keyhole of the car dashboard. So context is also relevant to recognition. On the one hand, this is a simple process of discrimination – of identifying what is of interest within a background of what is not of interest.

PolyVagal Theory is one description of how recognition of context is hardwired into the nervous system and used to modify behaviour. Dorsal Vagal (reptilian) recognition of eye contact has very little modulation based on context. The context for a lizard might be defined more or less in terms of how (relatively) big the pair of eyes are (can I eat them or should I run?) But since there are some clear cases of reptiles becoming loving and responsive pets, maybe that presumption (expectation) has to be treated with due caution. Mammals have a modified neurology… and so in some contexts the Ventral Vagal system overrides the classic reptilian response and allows socialisation behaviour. Indeed, as mammals we positively enjoy and are nourished by the right kind of eye contact in the right context.

> Richard Lee calculated that a Bushman child will be carried a distance of 4,900 miles before he begins to walk on his own. Since, during this rhythmic phase, he will be forever naming the contents of his territory, it is impossible he will not become a poet.
>
> — Bruce Chatwin, The Songlines

If the context does feel not sufficiently safe (i.e. its details do not fit the pattern that conveys the meaning of safety), then our nervous system defaults back down the evolutionary chain to a Dorsal Vagal (reptilian) system response. And with sufficient now-consciousness and a little time to adapt, this reptilian response may be re-modified if appropriate. So we may recognise that although this situation falls outside the normally identifiable range of safety, actually it is safe. It's a dark street – the heavily built man looks up, then walks towards me … he begins to speak … "Hi I'm lost – can you tell me where the taxi rank is?" That recognition of safety allows us to up-grade the response back to a mammalian socialisation level. Negotiation, meeting new people, travelling to new places and cultures – are examples of situations which demand a higher-than-usual level of conscious adaptation. Without this heightened awareness and conscious willingness to adapt, the reptilian responses are unrestrained and will automatically escalate to fight-flight (alienation and conflict). This is the first of a series of example situations I wish to cover showing how the sensory filtering and derivation of meaning can – in the right conditions – be modulated and regulated by higher-level cognitive (conscious) processes. The point is that – if the conditions are not ideal, this conscious/cognitive override is not possible, or at least becomes more difficult.

In fact, there are sometimes good reasons why it should not be overridden. Its function is to keep us safe – to keep us alive. All of this is quite difficult to describe as a general system, because it is so context-driven, and each circumstance may have slightly different nuances that result in very different responses. At this most fundamental level, it is very clear that appropriate response requires some definition of the Meaning of difference. A chicken does not distinguish that much. Anything that is lighter than its background and about the right size and shape such that it might be a seed or grain – is pecked at. The Meaning of this simple discriminatory template is "Food". On the other hand, once context and detail are included, the recognition of pattern becomes more and more sophisticated and detailed. A professional printer can look at a page of text, and accurately identify not just the font size, but also the font being used (from a possible selection of several hundred different fonts with often very subtle variations). Someone not trained or unfamiliar with those subtle variations can still derive meaning from the printed words (provided they are in a familiar character set and language). In fact, the printer is far less interested in the words (which have almost no meaning to his professional eye), and far more interested in the spaces, colours, font, alignment, qualitative suggestions and image resolution. Which is another useful example of perceptual filtering in action.

Information

Just as simple shapes and tone contrasts seem to have a hardwired meaning, the detection of change (or movement, which is change through time) is given particularly high priority in the visual senses. Really, all this is about information theory. I can present a series of symbols …

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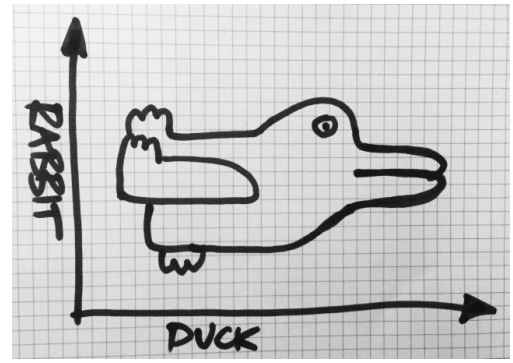
1111111111111111111111111111111111111111111111111111111111111111
1111111111 … (etc)

In the context of the background page and its text, they do have a qualitative monolithic presence. But if I focus in on the middle of the row of 1's, there is nothing to distinguish one from another. There is no flash in the dark or a shadow in an otherwise light surface that might say there is something different. Inside that forest of identical artificial stumps there is no relieving feature that might allow me to navigate home or find anything that might be of importance. Let's relieve the monotony a little …



1111111111111101111111111011111111111111111111111111111111111111
1111111111111111111111111111111111111111111111111001111111111
1111111111111111111111111111111111111111111111101111111111111111
1111111111111111111111111111111111111101111111111111111111111101
1111111111 … (etc)

This is also a very nice demonstration that context is inherent in meaning… The number 1 is usually "something", as opposed to the number 0 which is "nothing", but here we have 0's being significant because they are identifiable differences in an otherwise featureless sea of 1's. So if there is uniform darkness, light has great meaning. Whereas in a field of uniformly bright light, shadow and darkness are identifiable and have meaning (and perpetual, ubiquitous unchanging featureless light is essentially meaning-less). Language operates in a similar manner. I can say "This is an Orange", and implicit in that sentence is the usually unstated fact that everything that is not an orange is also (automatically) labelled as "not-an-Orange". So nouns are not very different at all from that sea of 1's and 0's. What is 1 is NOT-0. What is 0 is NOT-1.

The duck-rabbit is a useful way of demonstrating this is/is not quality in the perception of meaning. It is a nice illusion that we can set ourselves apart from the world as objective observers, but as soon as there is an identity "I", there is automatically a definition of "not-I". This is the same for every noun - "Duck" defines not only ducks,

but also automatically excludes everything that is not a duck[39]. The way that our sensory system identifies objects or sounds of specific meaning or significance is therefore simply an extension of a more fundamental identification of change/variation from (potentially) meaningless background blankness or noise. Identifying substance from random noise and from "other" - the discrimination of [X] and [NOT-X] is an interesting topic in its own right. There are several points of interest around these images, and Bortoft devotes a significant portion of his essays on the philosophy of science to these two images and their significance. Although I know that the duck-rabbit is both a rabbit and a duck, I can only see one of them at any one time. Another is that – once I know that the giraffe exists (or that both the duck and the rabbit exist, and not just one of them – it is far more difficult not to see them (and therefore more difficult to see something else, such as a random pattern of light and shade). One can see different parts – a Frankenstein duck-rabbit composed of bits of each, but not the whole of each/both simultaneously, and once there is a knowing that this is a duck or a rabbit (or a giraffe), it is exceedingly difficult to view the drawing as simply a set of meaning-less black marks on a white background.

> Allow yourself to see what you don't allow yourself to see.
>
> Milton H. Erickson

So far I have mainly concentrated on the visual sense. Partly because this is an externally directed sense (and the main interest from a survival point of view is the outside world). Partly because vision is culturally the dominant external sense. However, all of the above principles – recognition, filtering, meaning, etc – apply to all of the senses. The hearing sense is also important, in that any newborn that has spent any time in its mothers body as it grows will have been bathed in the vibrations of whatever noises she happens to make. Obviously, the frequency range and quality of sound changes. In the womb or in the egg, there is no perceivable echo, and sound is transmitted far more quickly than in air. But a human baby or a chick or a newborn otter will recognise its mothers voice, and other sounds that have also transmitted through the layers of tissue and fluid into the watery orb of the womb.

The detection of a pair of eyes is in many ways related to the chicken's detection of a possible grain or seed… And it is possible to see some kind of biological hierarchy of logic in this choice of focus. A newborn is incapable of defending itself. So it may as well bond with the first pair of eyes, because if this is a predator, it makes no difference – the bonding will still take place, and their first expression of relationship will be as food. Nothing is lost by this first default to Love rather than fear. Possibly as a result of this adaptation of the physical structure of the Vagal nervous system to allow socialisation, eye contact is one of the most hardwired of responses in mammals. Bonding is a complex process and is not solely via a single sense. Smell is particularly important – and a baby will immediately recognise its mothers smell, just as it will recognise the qualitative aspects of how she touches, holds, grooms etc... Vision usually only becomes an active sense some time after birth, and up to then there are

more somatic clues to safety and recognised dependence. Once their eyes do open and they become a little more mobile, young animals know that they will continue to be cared for by nearby adults because they receive high quality eye contact. The eye contact may also have a profound the relationship of adult humans/animals who meet it with their eyes. In a very general sense, adult mammals (including humans) recognise infant eye contact and respond by offering grooming/ care/ protection/ safety. The power of this eye contact can be seen in some films of predators who have adopted a young animal they would normally eat – or even when they have brought down adult prey that happens to have big eyes! There is a period in which the predator is semi-hypnotised, because the pair of big eyes staring at it create a deep biologically significant message that this is a young animal that needs care. So whilst that hypnotic spell endures the animal will not be eaten, and may even be protected from other members of (e.g.) the same pack of lions. And as soon as the spell is broken or eye contact is lost, the relationship changes to the more familiar one of predator and prey.

I was not aware of the moment when I first crossed the threshold of this life.

What was the power that made me open out into this vast mystery like a bud in the forest at midnight?

When in the morning I looked upon the light I felt in a moment that I was no stranger in this world, that the inscrutable without name and form had taken me in its arms in the form of my own mother.

Even so, in death the same unknown will appear as ever known to me. And because I love this life, I know I shall love death as well.

The child cries out when from the right breast the mother takes it away to find in the very next moment its consolation in the left one.

– Rabindranath Tagore

Mirror Neurons and the analogical mind

"You can observe a lot by watching."
Yogi Berra

In essence, with lots of not so superfluous detail temporarily skated over, mirror neurons

> play out the (external) actions that we observe other people making as if we were doing them ourselves.
>
> play out what we are imagining ourselves doing "as if" we are moving, without the need to actually carry out that movement.
>
> interpret sensory information, motor usage, and even ideas – into a motor-based symbolic "language" that is understood by non-verbal parts of our being/organism.

The original discovery of mirror neurons[40] came about at the University of Parma, Italy. As part of a study of the ventral premotor cortex of the macaque monkey, researchers accidentally found that the same neurons fired in the monkey when it was watching a researcher – as when it was performing the same task itself. The original submission of this remarkable finding to Nature was "rejected for its lack of general interest".

Many of the aspects of awareness and other mental processes are based on biological requirements for survival, adaptation and the necessary level of responsiveness to the external environment. As such they are mediated and controlled in quite primitive parts of the nervous system – parts that have been around since we were maybe earthworms or sea squirts or jellyfish. The primary survival interest of our body/being is in determining meaning – in quite a limited sense of the word. The most important aspect of meaning is the relationship between ourselves and the perceived environment. One way that a sense of meaning and relationship comes about is through the action of mirror neurons. Put in a simple way – these play out external scenes, noises, maybe even scents and tastes, as if they were happening internally. Mirror neurons take everything personally.

For instance – if somebody who I am looking at is smiling, my mirror neurons would be firing as if they were activating exactly the same facial muscles in my face – and so I would sense internally if the smile were genuine because my body would say something like "*when I move my face muscles like that, I feel happy/ gracious / loving / deceitful / embarrassed / uncertain / halfheartedly welcoming*" – or whatever. If the quality of information being passed to mirror neurons is high enough, we become capable of detecting fake smiles from real ones – by slight changes in the perceived muscle usage. If you reflect a little about how easily you do this in your everyday life, and how often this innate skill is used, you will realise that it is a major component in

most communication. Milton Ericksson stated that information passed through verbal communication is processed as roughly 7% words, 38% intonation (tone of voice) and 55% body language (including, but not necessarily restricted to facial expression).

In certain circumstances this internal mirroring can spill out into an external mirroring movement or posture – a direct copy of what is happening in front of us. A common event in congruent and genuine two-way conversation is that people adopt the same facial expressions and body language (movements and postures). This is called (from a biological and athropological point of view) – mimicking – and is a natural response with many uses. It occurs when the external mirror neuron states are allowed to pass (leak) from the premotor cortex into the motor areas of the brain.

For people who are capable of exercising a good control over the mind-body link, it is possible to more or less choose whether the premotor cortex leaks out into the motor cortex. However, very few people are capable of exercising so much control that they can completely censor this leakage. For some, the leakage is substantial and uncontrolled. These psychotic states were described by Pierre Janet[41]. Leakage can also be cultivated to occur "on demand" such that spontaneous movement occurs in a useful way.

Mirror neurons are particularly important in social communication – particularly those aspects of communication that require some level of empathy[42]. In fact, we know this already without even needing to know of the existence of mirror neurons. When we talk of empathy and sympathy, the experience being described includes some element of taking on the emotions felt by the other person, and mirroring/expressing them back to that person in an appropriate manner and context. This empathic communication occurs because we have learned that partial and controlled leakage of the premotor mirroring cortex is a useful trait in some social situations. Most of this decision making is on the borderline between conscious and unconscious, with (again) some people being far more adept at being aware of this grey area of consciousness and so more capable of exercising conscious control over the type of leakage that occurs. So high quality communication skills require a significant level of presence and mindfulness or "now"-awareness. And this system is so sensitive that if we are disingenuous in our mirroring, the other person will (if they are self-aware) detect this and feel unease. The more skilled the faked body language, the less easy the unease will be to identify or verbalise, but nevertheless, it will still be there.

Learning by osmosis

Mirror neurons are particularly important in the early stages of infant development. Babies in particular (and toddlers to a slightly lesser degree) learn how to use their body by tuning into the adults around them. They learn how to use and interpret emotions, how to move their body, how to learn, how to respond to so many things in life. It is a wonderful and terrible thing that a child will copy exactly how its parents respond to their life experiences, and learn from those responses. Thus, children become almost

exactly like their parents, responding in the same way, or having noticed that they are uncomfortable with the parents response, they find something that is different – unfortunately this is often usually opposite.

Many behaviours and traits that are thought to be genetic inheritance are in fact simply copied in an unconscious way. For instance (and, ignoring the specific details, this is a fairly common generic type of thing I find causes many cases of baby distress) – I recently treated a baby who wasn't digesting its food very well – in particular the large intestine wasn't clearing the food very efficiently. As I worked with the baby, its body relaxed, but its sacrum still felt disconnected. I checked the mother's sacrum, and found that a) it felt to be similarly disconnected, and b) she told me of an accident during primary school that had damaged her coccyx. When I started to remobilise the mothers coccyx, the baby's sacrum also started to mobilise. This is a really difficult issue, in that babies are sometimes not able to distinguish between good things to copy about their parents body usage, vs things that they really never should copy at all. And these continue to be unconscious responses throughout life unless they cause such difficulty that the person decides – at some stage in life – to do something to change that automatic response. The saving grace of this system is that children have an instinctive wisdom that often overrides or places question marks around the responses that their mirror neurons have detected. The tendency of babies and young children to pick up non-functional traits and patterns form their parents is not a universal thing – many children do not copy unhealthy patterns in any way. At the moment, with no clear evidence, I explain this to myself by thinking about internal and external validation. Children who require external validation would tend to pick up parents habits more indiscriminately, whereas children who are internally validated (i.e. refer to their own bodies to check how useful/appropriate something feels before copying it) would be less likely to copy non-functional patterns.

The power of this unconscious copying is perhaps most overtly apparent when children are allowed to be around working adults – something that we have almost completely expunged from western society. I am lucky enough to have found some very good Yoga, Taiji and Qigong teachers over the years, and one aspect of Taiji training is that there is far more demonstrated than described. This is precisely because we best learn body movements through applying the mirror neurons. So one part of a long-term training in Taiji (or any other martial art, Yoga, Qigong or similar body-based tradition) is that we train our mirror neurons to be more consciously active, or maybe to be more easily consciously activated. Thus, teachers have themselves to exhibit substantial skill and congruence in what they are teaching, and the greater that congruence and internal skill, the greater the “transmission” of the skill through activation of mirror neurons to the students. As the mirror neuron circuit becomes more consciously dominant, the movements become more and more like those of the teacher. Provided that one drops into a body-felt-sensual style of learning (rather than remaining on an intellectual level of information gathering).

The ability to tune into the physical body-use of a skilled person is an extremely useful

skill in itself. Most tasks have an inherent rhythm and type of mental-physical connection that is quite distinctive, that opens the body/mind to be most able to perform a particular set of actions, and which is the mark of an expert. If you watch an expert in anything, what is very apparent is the effortless effort. Each type of expert has a different internal rhythm which carries that effortlessness, and a different quality and degree of counterbalance and input between mind and body, and this again rides on the same rhythm of movement and action. This quality is particularly open to being connected to by using mirror neurons.

Mastery is an embodied state first and a state of mind second; and the state of mind follows naturally on from the embodiment. Some years ago I was fortunate enough to be invited to a local Taiko drum making session, which was being supervised by a retired master cabinet maker. I sensed that the man had a lot to teach, and deliberately tuned into his rhythm of movement, just as I would have connected with a Taiji or Qigong teacher. Meanwhile, he gave me a few simple jobs to do with a saw, and worked steadily away in the background. He insisted on using hand tools rather than power tools. So, to take the top off an oak barrel and transform it into a drum rim, he used a hand auger to drill a series of holes large enough to take a saw. He then hand sawed in a perfectly smooth and perfectly evenly angled line round the barrel, while I did my sawing and chiselling. The whole experience was extremely soothing – his rhythm of work was slow and steady, but in a surprisingly short length of time the barrel looked like a drum, and then he started on the next one. I went home feeling pretty good, and it was only several months later that I realised the quality of my carpentry had gone up several notches – and the underlying experience of that improvement was that I could now find a similar rhythm to the one I had been in the presence of. A similar effect is often reported by people who have been in meditation workshops led by very experienced and skilled practitioners – just by sitting in the same room they are empowered to travel to places their normal everyday skills would not have been capable of. When they leave the workshop, the experience remains, providing them with a map of where they can go and something of how they got there. Rather like placing a book under your pillow and absorbing its essence without knowing the precise words.

What a child could do with this – from an emotional point of view, and from the point of view of learning life skills – is far greater. Children are naturally tuned into their mirror neurons far mare than most adults. This is why contact even for a few short minutes with someone who is highly congruent in anything can enrich a child's life for – well – for life. The important factor is not some qualification in teaching – because that focuses on conveying information through conscious means. Rather, it is about the passing on of internal skills, internal relationships – what I think of as rhythm, congruence and mind-body coherence.

Mirror neurons – a few more technicalities

The brain – or at least the motor area of the brain – cannot just seal itself of from the body to inhibit movements it is preparing and contextualising information in the PMC. So what really happens is that – when the premotor cortex fires up, the motor cortex reduces its background activity[43] to balance the premotor signal, with the total activity in that part of the brain (i.e. the motor cortex plus its associated premotor area) remaining the same[44]. The motor cortex produces a negative "image" of the activity in the premotor cortex – almost like a photograph that has been colour inverted. The brain is constantly flipping between action/movement and inhibition[45]. This may be viewed from two directions. In one sense, the muscles are constantly moving (essential tremor), so that constant froth of motor cortex activity is necessary just to maintain stillness. On the other hand, the motor cortex activity maintaining stillness is a "neutral", so it may also be a means to provide a synchronisation between inherent muscle frequency and the inhibition signals generated for movement by the motor cortex. Whichever way this works (less inhibition or less synchronisation of inhibition), areas of the body that are active within the premotor cortex end up with a reduced inhibition of essential tremor, causing them to vibrate very slightly. As the inhibition is further reduced by even more premotor activity, this may be seen as trembling – such as would be observed in a deer or rabbit ready to run, but not quite sure which direction to go in.

How long is this preparatory stillness? Essential tremor[46] takes place at about 10Hz (0.1 seconds), which is also approximately the frequency of alpha waves (and several other physiological processes in the body)[47]. The inhibitory action of the motor cortex has to be able to interrupt that tremor at and phase points, so that it can transform an oscillatory motion into a continuous smooth motion, Therefore this signal has to refresh at about (4 x 10 = 40) 40Hz which, interestingly, is the EEG frequency range[48] found in the midbrain, and is also the frequency at which microtubules naturally resonate.

When the motion is allowed to express, the MC stops inhibiting and takes up the signal being presented to it by the PMC – and the PMC then prepares for the next motion.

> *"In theory - there is no difference between theory and practice.*
> *… In practice, there is."*
>
> *- Yogi Berra*

Despite its complexity, the above description is in turn a simplification of rapidly changing MC/ PMC activity and is not so straightforward in practice. On a more primitive level, the muscle fibers and groups are engaged in a locally (spinal nerve) generated essential tremor in which (ideally) agonist and antogonist are engaged in a

controlled and almost imperceptible mutual vibration. If there is no immediately obvious ideal choice of response/reaction, then the duration of stillness/ inhibition/ pause lengthens. On a higher level, experience tells us that we can simultaneously

i. think of one action,

ii. perform another,

iii. listen to a conversation,

iv. speak or sing or think of words or recall a memory,

v. feel an emotion, and

vi. see/hear external colours, shapes and watch other people expressing different emotions and movements from the ones we are expressing/ experiencing.

All of these (i) through to (vi) are literally and/or symbolically processed by the PMC, and may involve many different body parts. In addition to this more or less conscious activity, the PMC also receives (or generates) a habitual response to all of the perceived internal and external environment. Although the activities (i) through (iv) may be theoretically capable of being totally decoupled, I have not yet met anyone who can totally decouple one of them from all the rest – in that there is always a shadow of the other activities that subtly (or not so subtly) changes the expression of each. Since each of these will have in one way or another to affect the activity of the PMC (and therefore of the MC), there are interesting subsidiary questions as to how much parallel processing is possible in segments of the cortex, and how that might be achieved. The two most obvious technological analogues are multiplex signalling (where different messages are transmitted at different frequencies) and distributed processing (where a multiple task is divided between different processors – in this case somehow the synaptic activity compartmentalises so that some neuron groups are dealing with one task and other physically proximal groups are dealing with another task). Based on a few conversations about learning capacity, I suspect that both of these occur.

All the conscious and non-conscious material passing through the PMC – either literally preparing for movement or engaged in (mirror neurone) symbolic representation of the external world – therefore inevitably creates a frisson of activity at a physical level. Whatever we think, feel, remember, see, hear or say each moment (to be precise, each 0.1 seconds) creates a series of micromovements throughout the body. In cases of chronically reduced inhibition (and one might well ask what kind of premotor activity might underly this) micromovements can become gross movements. The movement may be oscillatory (as in Parkinsons) or more gestural (such as the movements of the inmates in the Paris sanatorium observed by Pierre Janet). The type of inhibition that has been lost is different in these two cases.

Douglas Hofstader[49] takes this principle and dissects it further, arguing that all of human language, thought and perception is based on abstraction and analogy. With the further implication that even biological (i.e. non-conscious, non-cognitive)

interpretation of meaning by even simple single celled organisms is a process based on analogy. In fact, on analysis this is inevitable, because any representation that is not the entire original object must inevitably be a "token"… Just as a pound coin in the UK originated as a pound note, which itself was a token – a promissory note to by the Bank of England to exchange the piece of paper for a pounds weight of sterling silver, should the bearer ever wish to cash in his assets[50]. All representative data – whether digital or biological or in whatever form is based on tokens. Archetypes and symbols are particularly rich and universal forms of token, and so human culture, thought, literature, art, dreams, and pretty well every sphere of human experience you can think of – are saturated with archetypal and symbolic tokens.

The important distinction between archetypal/symbolic tokens and nouns as we usually apply them – is that archetypes always contain a degree fo ambiguity or ambivalence or offer a vast range of interconnected possibilities. The mistake that we make (with regard to the nervous system) in our culture – is that we attempt to pin down stories into facts – so processes and archetypes are increasingly restricted to the classification of nouns, and so become more and more fixed. The richness of a language is defined – not by its ability to classify using nouns (as in medicine and biology), but in its provision of a rich and fertile bed of verbs and verb-derivatives (adverbs, adjectives, and verb-derived nouns).

An example might be

verb : **create**

adjective : **creat-**ive → *adverb* : **creativ-**ely

noun : **creat-**ed

These linguistic structures are not fixed, but rather are processes that contain an internal movement leading from one state to another, which then leads to another – and so on. David Bohm[51] in his classic book "Wholeness and the Implicate Order" goes to some effort to derive a language based on verbs instead of nouns – which he called the "*Rheomode*". One aim is to provide a linguistic means of experiencing the world as a shifting and malleable, yet clearly defined process - instead of a set of immutable yet abstracted events and objects.

The ability to tell stories appears to be one of the few human traits that is shared with very few (?) other animals[52] – bees and cetaceans being two probable exceptions to that slightly dubious rule. As storytelling humans, there are two basic kinds if story that we are familiar with. One is a more mythological, symbolic story that was common in early human civilisation, and which is inherently rich in potential meaning. A more familiar kind of storytelling in the modern world is a declaration of facts – which pins everything down and attempts to define "truth". Applying this fact-noun based kind of storytelling to our internal processes also pins them down in a way that sits very uncomfortably with the structure of - at least part of - the nervous system. We tell stories because we desire meaning. But once meaning is fixed so rigidly (and is

dominated by nouns instead of the ambiguous and shape-shifting qualities found in symbology, archetypes and verbs), it can become difficult to extract ourselves from the prison of the story we have created. Thus, although the search for factual meaning gives something of a sense of safety and security because the world is "known"; it does not so easily allow the world to metamorphose, for one situation to transform into another, or for inner meaning to transcend an initial impression/interpretation. As we have seen above, mirror neurons are one (of possibly many) different feedback devices in the brain that link meaning with response-movement. It even appears that the cerebellum – a part of the brain intimately connected to movement – is also critical for memory[53]. From a biological point of view, meaning *should be* inherently connected to movement. And movement is a process that leads us from one set of circumstances into another. We feel e-motions, and are moved…

The importance of differentiation between general and archetypal processes vs specific nouns is captured very well by Terry Pratchett's

"All mushrooms are edible, but some are edible only once"

So one has to have generalised meanings (e.g. "food") that give generalised qualitative responses; and specific meanings that help to define the messy edges of the complete world of food vs not-food… And which create even more clarity wherever there is potential ambivalence – such as roots that contain such high levels of sharp oxalate crystals that they would be deadly if not properly prepared by cooking. Or (naturally) where many mushrooms are excellent food ... but some are not. Specifics are required to pin down the true scope of an archetype in the messy and apparently disorganised real world. Yet it is the loss of archetypal and symbolic thinking that leads to loss of connection with the Natural world. Goethe[54] pointed out that there is a very specific relationship between archetypal and detailed observation. Bortoft calls the process of abstraction usually applied ("all mushrooms are edible") as **unity in multiplicity**. It requires a gradual loss of detail as the level of abstraction increases, thus taking the observer more and more into a non-material model, and away from the real world. Ultimately, the abstraction bears no relationship at all to any of the real-world objects that it is based on. Nouns tend to takes us into this state of abstracted "unity in multiplicity", because they automatically invoke an abstracted form. Modern art takes these abstractions and unpackages them again into a myriad of forms that bear little relationship to real examples, but instead express the almost unlimited and often ill-defined universe of potential unfoldings from an abstracted rootstock.

> The moment we eat from the Tree of Knowledge we cleave into opposites of divine conflict and our shadow is born. We begin to separate and fragment ourselves.
>
> – C.G Jung

The antidote to this way of abstracted thinking – **multiplicity in unity** sees the detail lead to an almost fractal-like unravelling of more and more information, as the true artchetypal pattern reveals itself in more and more intricate ways. If the correct archetype is selected through a process one might compare to *grokking*[55] or perhaps to "*taking into ones heart*", then the details all make sense within a clear framework that reveals further truths about the process or object under observation. Following this path of observation, the observer is led closer and closer to the specific and real object of observation, because the method of observation is subjective – instead of objective. Instead of standing separate and observing as if there is no connection – the observer feels the effect of the observed acting inside himself. Thus, Goethe's method of observation leads to an act of participation in the world, in which the normal pathways of meaning and movement embedded in all life are encouraged to rise into consciousness. Through this way of participating in the world, we are led into a direct experience of relationship. It is impossible to be in the presence of anything else in existence and not be moved by its presence – whether that is emotionally, or though movement leaking from the premotor cortex, or by some other mutual resonance; or all of these and other things besides. A system of observation and analysis that attempts to remove ourselves from the real world and stand apart as - if we ever were able to be truly apart – is not only a way to lose much of the richness of information, but is at a fundamental level a Dis-Association.

Ian McGilchrist[56] attributes these two ways of thinking – increasingly objectified abstraction from the detail vs increasingly participatory unfolding of detail from a well-tempered abstraction – as respective attributes of the left and right brains. As humans we are wired somewhat differently from many other animals, with a significant corpus callosum providing a finely tuned communication between and separation of the two hemispheres. The specific balance of restricted communication allows us to potentially live in these two worlds (observational and relational stances) at once, and to consciously switch between them. It is not that one is good and one is bad – because each have their place in living in, surviving in, and experiencing the world. The Left brain's propensity to "*unity in multiplicity*" or abstraction provides a wonderful way of navigating simply in a complex world, and of being able to ignore what is not of immediate importance. However, this mode of thought and experience is very survival-oriented, is conservative, and is very intolerant of new experiences or of the possibility of nuance and changes in meaning. It is only with the Right brain's curiosity and ability to unfold the world's detail like a Mandelbrot fractal image – discovering layer upon layer of *specific* meaning and newness within the same landscape) that we can explore, invent, take risks, and expand meaning beyond the claustrophobic confines of safety and the known.

> Consciousness is what makes the mind-body problem really intractable.
>
> – Thomas Nagel in "What is it like to be a bat?"

Most of the above discussion is centred around humans, and at the least, mammals or

other creatures with a significantly complex central nervous system. It is worth also considering the work of Guenter Albrecht-Buehler[57], who investigated the behaviour of single celled organisms (amoeba). He showed that they exhibit movements that are hard to explain unless one assumes that there is some level of conscious awareness along with some degree of intelligent organisation and direction of motility. So "motion" (and therefore "meaning") in many of the contexts discussed above applies at a cellular level of organisation, in addition to a cortical/conscious level, and probably also at several intermediate levels of organisation. On a slightly different tack, research into *drosophila* (fruit flies) has also shown that their quality of motion (i.e. their relationship with their environment and the qualitative background state of meaning that their actions are based on – is dependent on octopamine (an insect version of noradrenaline), which in turn is dependent on the presence of certain strains of gut bacteria[58]. So it is the ***whole*** organism that is involved in the sense-meaning-response cycle, and not just parts of the (human) central nervous system.

Manfred Clynes concept of Sentics[59] is central to any biological understanding of meaning. A polymath-scientist-musician-inventor, he has been particularly interested in neurophysiology, and in the way that music interacts with the mind. In a series of experiments spanning several decades, he found that each emotion or mental state creates a very specific and repeatable tendency to engage in certain patterns of movement. As has been stated previously, emotions are a form of information – a whole-organism statement of the "state of the nation", and what is considered on a biological level to be of most pressing concern. Peter Godfrey Smith[60] notes that the brain is integrated such that sensory information affects the motor arc, just as motion affects the sensory arc, with meaning as an intermediary between the two. Clynes research fleshed that statement out. He asked people to vary the pressure of their fingertips according to the emotion they were experiencing. The resultant micro-movements were recorded and compared, first between professional musicians, and later with as wide a range of subjects as he could find. What Clynes found was that the shapes and pressure patterns of these micro-movements were consistent and replicable for the specific emotions that were being experienced or expressed. Furthermore, if another person then saw the pattern (or felt it as a micro-movement) they could easily infer the emotional message that the gesture contained. He referred back to music (Clynes is a concert pianist), and found that the emotional message conveyed by the music could be seen to have similar patterns of motion in its rhythm or tune. He checked this out cross-culturally, and found that Australian Aborigines – linguistically and culturally about as far from a European mindset as it is possible to get – and found the patterns of e-motion produced by a European using touch could be interpreted accurately for emotive content by these first people. He even checked with animals, and – so far as he could tell – they also interpreted the movements and touch similarly.

Although Clynes is viewed as something of a maverick (and so his research is not really taken very seriously and has largely been consigned to library stacks), the core principle of his findings is widely recognised. Ask anyone to describe a peaceful

experience or stillness or a slow Irish flute melody in terms of shape or movement, and they will most often draw something round. Ask them to describe the texture of clouds, and – even though one cannot touch a cloud except through direct experience as fog or rain – they are universally described as "fluffy and soft" and are used as analogies for fluffiness and softness and make movements demonstrating holding that fluffy object. Ask someone to draw the qualitative experience of frustration or anger or disturbed music and they will usually produce jagged lines. There is an innate relationship between shape, movement, sound and visual shape/representation that finds universal expression. Clynes is not the only person to have demonstrated his correlation, which has also been identifies in studies of simple touch[61] with no deliberate associated movement.

> *Our results show how the spectral centroid, or the balance of high-frequency versus low-frequency energy present in sounds, shapes and movements, allows us to express and understand emotional arousal … The spectral centroid is essentially a multi-sensory measure of spikyness. The results explain why Zen gardens and brutalist architecture have very different emotional effects, as well as why things like clouds and lullabies seem to go together even though one is seen and the other is heard: We match them based on the spectral centroid. In a series of studies, we demonstrate that people automatically perceive the frequency spectrum of whatever is coming into their ears and eyes and compute the average—the spectral centroid. This is how people quickly identify the amount of emotional arousal in a person's voices and movements but also in abstract shapes and sounds, such as why spiky shapes seem to convey higher arousal than rounded shapes[62].*

So through all the complexity of different cultures and languages, it would appear that there is a universal language of touch - and that at least some types of experience are truly universal, maybe even throughout the entire range of living organisms. There has been a lot of criticism of people who watch animals and infer human emotions from their facial expressions and body movements. However, Clyne's research points to a commonality of experience that is shared throughout the animal kingdom. Considering Stanley Keleman's fundamental biology of gesture based on polarity, movement (gesture) and meaning share a common basis amongst all living animals – maybe even amongst bacteria and plants. If an amoeba recoils from contact with another microbe, we know instinctively that its recoil is in essence no different from the recoil that a sea anemone makes when it accidentally touches a starfish (its main predator), or the recoil that a human makes when putting a hand in a shoe and coming into contact with a spider. Every organism is aware of the difference between moving towards (in exploration) and being moved towards (i.e. being touched by something else alive "on the outside"). Recent research has demonstrated climbing plants (french beans) detect the presence of a nearby structure they can attach to, and deliberately grow *and* move their tendrils towards it. They express a movement pattern peaking at between 3 and 10 seconds[63], suggesting that they "think (whatever that means for a plant?!) about 30-

100 times slower than we do. Although (strangely) not universally accepted, animals talk to humans through gesture, noise and facial expression. Pet dogs and cats are often quite clear in their communication. I recall a cat once dismissing her masters failed DIY attempt to install a cat flap in the back door. The cat pushed the new flap with her paw, and when it failed to move she turned round and walked slowly away whilst eloquently expressing contemptuous disdain (something cats happen to be past masters of). We all knew exactly what was being conveyed. Similarly horses communicate meaningfully with their owners[64]. Dr Doolittle was not so eccentric after all.

> If we could talk to the animals, just imagine it
> Chatting to a chimp in chimpanzee
> Imagine talking to a tiger, chatting to a cheetah
> What a neat achievement that would be.
>
> If we could talk to the animals, learn their languages
> Maybe take an animal degree.
> We'd study elephant and eagle, buffalo and beagle,
> Alligator, guinea pig, and flea.
>
> We would converse in polar bear and python,
> And we could curse in fluent kangaroo.
> If people asked us, can you speak in rhinoceros,
> We'd say, "Of courserous, can't you?"

In the same way as gesture, the meaning of passive (touched) vs active (touching) contact is universal, and is one facet of the way in which self-other is experienced. This awareness of passive/active contact, inside/outside and self/other is part of an evolutionary journey that has optimised the relationship between movement and sensory integration. The point that all organisms can turn their attention inwards or outwards in this way (whatever "attention" might mean in each specific case), and understand the difference is one of the arguments for a more universal model of consciousness. This is somewhat at odds with the usual scientific wisdom that consciousness and demonstrable intelligence (or at least a substantial central nervous system) are inextricably linked[65]. Denton considered that the "primal emotions" of suffocation, hunger, pain (etc) are a basis for the beginnings of awareness. These are perceived because the organism turns its attention inwards. The relationships between even a very primitive capacity for movement and the awareness of of internal/external are strong arguments that conscious awareness is not just dependent on having a central nervous system.

The fact that meaning is a multifaceted thing (and cannot be derived by unintegrated sensors) has polarised the vertebrate and human nervous system in more ways than just a simple left-right hemispheric axis. Vision is processed to determine many layers of information, two of the main ones being "what?" and "where?" So it should perhaps

not come as a surprise that visual processing occurs in (at least) two streams. The "what?" occupies ventral nerves, and the "where?" (which is of much more interest to feedback loops into somatic control of movement) is processed by dorsal pathways in the brain. Therefore there is not (even in primitive fish) a single inner visualisation of the outside world – rather there is a representation related to description and discrimination of form; and a representation related to position and movement. Experiments on amphibians suggests that the "where?" representation is further divided into pathways related to normal (voluntary) locomotion vs pathways related to reflex (re-)actions. We can further divide the internal representations of vision according to foveal (detail, conscious), which has a pathway direct to the visual cortex; and peripheral vision, which passes first through the limbic system / midbrain, and is more related to feelings/"instinct", unconscious pathways and subjective experience. The "Hakalau" state of awareness practiced in Hawaiian culture is a deliberate conscious settling into peripheral vision, and generates a very different, more holistic and integrated experience of the world. The deliberate choice of the particular internal representation more strongly connected to peripheral vision is a way to link conscious awareness to the Right brain and simultaneously to have conscious access to parts of the brain that are usually non-conscious.

> The Bushmen in the Kalahari Desert talk about the two "hungers". There is the Great Hunger and there is the Little Hunger. The Little Hunger wants food for the belly; but the Great Hunger, the greatest hunger of all, is the hunger for meaning… There is ultimately only one thing that makes human beings deeply and profoundly bitter, and that is to have thrust upon them a life without meaning. There is nothing wrong in searching for happiness. But of far more comfort to the soul is something greater than happiness or unhappiness, and that is meaning. Because meaning transfigures all. Once what you are doing has for you meaning, it is irrelevant whether you're happy or unhappy. You are content - you are not alone in your Spirit - you belong.
>
> – Laurens van der Post, Bushmen of the Kalahari

The human ability to process both left and right vision and "what?" and "where?" pathways simultaneously is unusual. Some fish have a markedly greater ability to see other fish of their kind (i.e. socialisation) through one eye, and to detect potential danger through the opposite eye. So they deliberately live on small shoals organised so that the fish on the outside of the shoal are oriented with their "danger" detecting eye looking outwards (and their socialising eye pointing inwards towards the shoal). McGilchrist points out that it is the capacity to separate left and right brain functions that gives them utility, and at the same time, it is the ability to integrate them that allows us to consciously choose which side of the brain we use, and to have working binocular vision. So there is something about the organisation of humans brains that optimises the the advantages of connection *and* the advantages of disconnection

between left and right hemispheres. Compare this to a chicken, that (typically of animals that have lateral instead of forward-facing binocular eyes) has virtually no communication between its two hemispheres. In order to recognise its food (or anything else) in detail, it must somehow feed the same information into both brain hemispheres. So when a chicken approaches an object it employs a characteristic weaving dance of head and neck, which allows both eyes to alternately see what is there. It is only in this way that it can (alternately) engage both sides of its brain on a particular object, and so determine the full meaning of what is in front of it.

Finding internal meaning through the external

> *People think things through by thinking through things.*
>
> – Melinda Alliker Rabb

McGilchrist's work has quite profound implications for the meanings that we attribute to everything, including our personal lives. The above quotation from Rabb is a rather more sophisticated version of the saying "*if you've got a hammer in your hand, everything looks like a nail*", and the tools with which we order our mind are inevitably what we will see. The means employed to make meaning generates meaning that is in its own image. So visual Gestalts generate the image of the world that we see through our eyes that conforms to the Gestalt; and optical illusions are a good reminder that *all* preconceived notions of the structure of the world will hit a wall of illusion as soon as the world does not conform to those notions. Tools (via the Left hemisphere of the brain) are so important to the tool-making animals that are humans that holding any tool in the hand or in the minds eye will change what we see. Carrying a gun alters the world because thinking of the world through the gun introduces a certain range of possible actions that might not spring to mind if instead it were a fishing rod. And it is a salutary thought that the "things" that we tend to think of the world through – the glasses that we put on to make sense of it – are almost always man-made objects. Seen in this light, Jung's system of archetypes is far more fundamental to how meaning works in the brain and with respect to the living human organism than is any system of knowledge. Language is (as has been described) also a tool by which we perceive meaning, and so non-symbolic (i.e. a language-oriented understanding of meaning) is limited by the grammatical construction and limitations in vocabulary of that specific language. Self-identity (ideas of who we are, what we may or may not be capable of, what resources we have or have not available to use, etc.) is also a very specific and powerful set of blinkers.

Higher versions of meaning

> *I cannot know in another being what I do not know in myself…we cannot*

know the great things of the universe until we know ourselves to be great things.

– The Courage to Teach (Parker J Palmer)

So far I have been describing biological aspects of meaning – which focus on aspects of sensory and cognitive recognition. There are also more transcendental versions of meaning, related to self-actualisation. Many people are engaged in the search for a sense of *meaning* in their lives. In some ways the issue is the same, but instead of recognising something external (in the context of its relationship to what is internal), this higher form of meaning runs in the opposite direction – it is a search for who we are. *What am I here for? How do I fit into this world?* How *should* I fit into this world? So it is about recognising something internal in the context of the external.

Learn how to read
the love letters sent
by the wind and
rain,
the snow and moon.
~Ikkyu

On one level the biological approach I am taking has a direct answer to this question, and on another level is something of a distraction. After all, the purpose of communicating with our biological aspects is so that we are free. Trauma and fragmentation on a biological level create dissociation and fragmentation on an identity level, and make it far harder to have a strong sense of self or purpose. The biological (mal-) adaptations separate us from ourselves. So the purpose of bringing order to the cells and tissues and primitive parts of the neurology is to renew that order, and so provide an opportunity for self-meaning to be once more important and accessible.

Therefore – even though there is no direct answer, there is an indirect answer, and a valuable one at that. The body is a container of much wisdom and a link to the greater wisdom found in the Natural world; but its potential to connect us to these numinous and integrated states is only consistently available when the body itself is at peace.

Here we have a crucial paradox, because *if the body is not at peace*, the meanings that it supplies us with through the sensory system are far more related to survival than to Love. These higher meanings usually come to us in the form of stories, and the conscious way of arriving at meaning is to tell a story… this happened, and then that, and therefore … When these causal stories come from perception that has been filtered by parts of the body and nervous system that are locked in a survival response, the story is almost never one that expands the world or transcends. More often than not, it shrinks the world. So as society has become increasingly fragmented (and so biologically perceived safety has diminished), the tendency has been to attempt to discern the truth as a material fact instead of an allegorical gesture. We have gradually moved more and more into the domain of the left brain and its bland "unity in

multiplicity".

> Franz Kafka, the story goes, encountered a little girl in the park where he went walking daily. She was crying. She had lost her doll and was desolate. Kafka offered to help her look for the doll and arranged to meet her the next day at the same spot.
>
> Unable to find the doll he composed a letter from the doll and read it to her when they met, which read "Please do not mourn me, I have gone on a trip to see the world. I will write you of my adventures."
>
> This was the beginning of many letters. When he and the little girl met he read her from these carefully composed letters the imagined adventures of the beloved doll. The little girl was comforted.
>
> When the meetings came to an end Kafka presented her with a doll. She obviously looked different from the original doll. An attached letter explained "My travels have changed me."
>
> Many years later, the now grown girl found a letter stuffed into an unnoticed crevice in the cherished replacement doll.
>
> In summary it said: "Every thing that you love, you will eventually lose, but in the end, love will return in a different form."
>
> —Kafka and the Doll, The Pervasiveness of Loss

A left brain dominated mind will seek to ascertain whether Kafka truly had this letter-writing relationship with a child. No doubt this is useful. A right-brain dominated mind will probably not care so much where the story came from. It doesn't matter whether in fact the story is True or False in a factual Aristotlean manner. Rather, it is the allegory and the message that is contained that is of value.

> And now here is my secret, a very simple secret: It is only with the heart that one can see rightly; what is essential is invisible to the eye.
>
> – from "The Little Prince" by Antoine de Saint-Exupéry

The allegorical content has to be experienced – somatically – in order to be fully understood; and this level of understanding is more difficult to experience when the biological self is looking for meanings that are survival-critical. It is also more difficult to experience in its full sense(!) if the somatic response of the body is excluded from the definition – and experience – of meaning. Stephen Porges has written extensively on the way that the mind/brain and Vagus/viscera (and especially the heart) are locked in a mutual relationship, one affecting the other. In a recent summary[66], he quotes Darwin[67] :

> *… when the mind is strongly excited, we might expect that it would instantly affect in a direct manner the heart; and this is universally acknowledged …*

> *when the heart is affected it reacts on the brain; and the state of the brain again reacts through the pneumogastric [Vagus] nerve to the heart; so that under any excitement there will be much mutual action and reaction* between these, the two most important organs of the body.

… and Claude Bernard[68] :

> *In man the heart is not only the central organ of circulation of blood, it is a center influenced by all sensory influences. They may be transmitted from the periphery through the spinal cord, from the organs through the sympathetic nervous system, or from the central nervous system itself. In fact the sensory stimuli coming from the brain exhibit their strongest effects on the heart.*

What should be recognised in reading this is that Darwin and Bernard are not only referring to the heart as part of the vascular system. In addition to its physiological nature, Victorian medicine considered the heart to also be the organ of emotion and "sensibility"; so people suffering from what we now might call trauma were considered in Darwin's time to be suffering from a *disturbance of the heart*. A similar understanding of the heart as a feeling, experiencing, emotive organ underlies the principles of Traditional Chinese Medicine. When talking of movement, the modern bias is to think of skeletal muscles. But it goes much deeper than that – for meaning is an inseparable aspect of organic motion – the motion of muscles, viscera, blood, physiological shifts, and the associated e-motions that arise with these physico-chemical shifts.

> *Everyone should consider his body as a priceless gift from one whom he loves above all, a marvellous work of art, of indescribable beauty, and mystery beyond human conception, and so delicate that a word, a breath, a look, nay, a thought may injure it.*
>
> Nikola Tesla

In later chapters we will look at ways to bring the body back from a survival state into its "normal adaptive (ANS) range", otherwise known in psychology as the "window of tolerance". It is relevant that Love as a *state of being* (in reality it is rather too profound to simply call it "an" emotion) is also capable of bringing the ANS into a perfectly balanced state. It is both fitting and natural and wholly in line with the principles of Alchemy that a mundane survival state can be re-calibrated to reality by exposing it to the Sun – to the fire of Love. For the transcendent is so-called because it takes us to a higher place of seeing, and Gudel's frame of reference expands outwards – maybe almost to infinity. From this higher place of meaning, the more biological meanings fall into place and their shouts and gesticulations no longer dominate the sense of reality. Which is more powerful? Like the dog and the wolf, in the end it's the one that

we give the most attention to that wins out.

> *An old Cherokee is teaching his grandson about life:*
>
> *"A fight is going on inside me," he said to the boy.*
>
> *"It is a terrible fight and it is between two wolves. One is evil–he is anger, envy, sorrow, regret, greed, arrogance, self-pity, guilt, resentment, inferiority, lies, false pride, superiority, and ego."*
>
> *He continued, "The other is good – he is joy, peace, love, hope, serenity, humility, kindness, benevolence, empathy, generosity, truth, compassion, and faith. The same fight is going on inside you–and inside every other person, too."*
>
> *The grandson thought about it for a minute and then asked his grandfather: "Which wolf will win?"*
>
> *The old Cherokee simply replied, "The one you feed."*

And whilst attention (food for the wolf) is apparently an act of will, there is something about Love that can even transcend the necessity for the "will to go on". I leave the last word to Viktor Frankl[69], describing his experience in a concentration camp as a memory of his wife came to him…

> *We stumbled on in the darkness, over big stones and through large puddles, along the one road leading from the camp. The accompanying guards kept shouting at us and driving us with the butts of their rifles. Anyone with very sore feet supported himself on his neighbor's arm. Hardly a word was spoken; the icy wind did not encourage talk.*
>
> *...*
>
> *Occasionally I looked at the sky, where the stars were fading and the pink light of the morning was beginning to spread behind a dark bank of clouds. But my mind clung to my wife's image, imagining it with an uncanny acuteness. I heard her answering me, saw her smile, her frank and encouraging look. Real or not, her look was then more luminous than the sun which was beginning to rise. A thought transfixed me: for the first time in my life I saw the truth as it is set into song by so many poets, proclaimed as the final wisdom by so many thinkers. The truth—that love is the ultimate and the highest goal to which man can aspire. Then I grasped the meaning of the greatest secret that human poetry and human thought and belief have to impart: The salvation of man is through love and in love. I understood how a man who has nothing left in this world still may know bliss, be it only for a brief moment, in the contemplation of his beloved. In a position of utter desolation, when man cannot express himself in positive action, when his only achievement may consist in enduring his sufferings in the right way—an honourable way—in such a position man can, through loving contemplation of the image he carries of his beloved, achieve*

fulfillment. For the first time in my life I was able to understand the meaning of the words, "The angels are lost in perpetual contemplation of an infinite glory. …"

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1 https://www.yourgenome.org/stories/the-discovery-of-dna

2 Henri Bortoft (1996) The Wholeness of Nature: Goethe's Way of Science. Publ. Floris ISBN-13: 978-0863152382

3 "The Kardishev scale has three designated categories : A Type I civilization — also called a planetary civilization — can use and store all of the energy which reaches its planet from its parent star. A Type II civilization — also called a stellar civilization — can harness the total energy of its planet's parent star (the most popular hypothetical concept being the Dyson sphere—a device which would encompass the entire star and transfer its energy to the planet(s)). A Type III civilization — also called a galactic civilization — can control energy on the scale of its entire host galaxy." (from Wikipedia : https://en.wikipedia.org/wiki/Kardashev_scale). That would make early 21st century Earth a Type 0 civilisation.

4 Oliver Sacks (2011) The man who mistook his wife for a hat. Publ. Picador reprint edition (originally published 1985). ISBN-13: 978-0330523622

5 Christoph J. Völter et al, Dogs' looking times and pupil dilation response reveal expectations about contact causality, Biology Letters (2021). DOI: 10.1098/rsbl.2021.0465 and summary at https://phys.org/news/2021-12-dogs-animations-violate-laws-physics.html

6 John O'Donohue (1997) Anam Cara: Spiritual Wisdom from the Celtic World. Publ. Bantam ISBN-13: 978-0553505924

7 The very individual and contextual meanings attributed by dragonflies and tree roots are sympathetically understandable – communicable - because gestures are universal. But on the other hand, the inner meanings (as experienced by the dragonfly or tree) are not comprehensible – because the body making the gestures is foreign, and so the means by which its gestural response occurs is inconceivable as an experience. That is – unless we inhabit the stream of consciousness of that organism – a depth of connection that is central to Shamanic practices in every corner of the globe.

8 Citation: Wang S, Segev I, Borst A, Palmer S (2021) Maximally efficient prediction in the early fly visual system may support evasive flight maneuvers. PLoS Comput Biol 17(5): e1008965. https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1008965

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22 https://www.gondwana-collection.com/blog/how-do-namibian-himbas-see-colour/ It is probably important that the most common type of organic (i.e. hardwired rather than perceptual) colour blindness is red-blindness, which also confers the ability distinguish many more subtle variations of the colour green. Clearly, perception of green is important in this chlorophyll-saturated planet. The specific colours that have to be lost in order to see green are also interesting in that they are the two extremes of the rainbow spectrum. Goethe noted that red is light seen through darkness (think of a sunset in which sunlight glances through a thousand miles of atmosphere instead of the usual 30 or 40). And blue is darkness seen through light (think of the daytime sky – we peer at the blackness of space through a lens of diffused sunlight. Climbing to 4000 metres above sea level reveals a daytime sky that is more black than blue).

23 Meir Schneider (1989) Self-Healing: My Life And Vision. Publ. Arkana/Penguin ISBN-13: 978-0140191271

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26 Max Planck Society (February 23, 2021) Researchers find a single-celled slime mold with no nervous system that remembers food locations. Phys.Org | Biology | Cell & Microbiology https://phys.org/news/2021-02-single-celled-slime-mold-nervous-food.html

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29 There is now slightly more nuance in this statement, since the introduction of artificial intelligence (AI) to control focus and colour rendering in cameras. Regardless of how well the AI can distinguish a cat, and label it to be a cat in 15 different languages, it has no sense of the meaning of a cat (it does not experience cats or understand their context), or even the meaning of the nouns that it attributes to the cat-images. The very fact that I have to say this – says a lot about how confused society is in general about the difference between information (data) and meaning.

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34 Becca Cudmore (Jul 16, 2017) The Evolutionary Roots of Instinct: Did behaviors that seem ingrained become fixed through epigenetic mechanisms and ancestral learning? The Scientist. https://www.the-scientist.com/notebook/the-evolutionary-roots-of-instinct-31217

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36 Jan van IJken (www.janvanijken.com) Becoming: From zygote to tadpole, in six stunning minutes. https://www.youtube.com/watch?v=7Q9VyHJ1l2Q

37 Sachdeva V, Mora T, Walczak AM, Palmer SE (2021) Optimal prediction with resource constraints using the information bottleneck. PLoS Comput Biol 17(3): e1008743. https://doi.org/10.1371/journal.pcbi.1008743

38 Dr Alan Watkins (2013) Coherence: The Secret Science of Brilliant Leadership. Publ. Kogan Page ISBN-13: 978-0749470050

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41 http://www.trauma-pages.com/a/vdhart-89.php Pierre Janet (1859-1947) was a French psychologist, philosopher and psychotherapist. His compassionate and penetrating observations of the patients at Havre Asylum is one of the foundation stones in the field of dissociation and traumatic memory.

42 Marco Iacoboni (2008) The Mirror Neuron Revolution : Explaining what makes humans social. Scientific American July 1 , 2008 (17)

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44 This is very much analogous to an active noise control (ANC) device works. A sound is neutralised (using headphones) by producing an "anti-sound". In the case of ANC, the anti-sound is a signal equal to the noise but phase shifted exactly half a wavelength. In the case of the brain there must already be a "froth" of signal already present that can be reduced to balance the premotor activity and maintain the same total activity in that motor segment.

45 Stanley Keleman is more or less definitive on the biological origins and development of inhibition in body psychotherapy. e.g. see Keleman, S (1989) Emotional Anatomy ISBN 0934320101 and Keleman, S (1987) Embodying Experience: Forming a Personal Life. ISBN 0934320128

46 Described in http://www.hummingbird-one.co.uk/pdf/Muscles.pdf

47 Richard Epworth (2014) Bottleneck - Our human interface with reality: The disturbing and exciting implications of its true nature. Paperback 412 pp Publ. Goforich. ISBN-13: 978-0992672812 http://www.humanbottleneck.co.uk/

48 The EEG itself is not really a literal frequency of activity, but rather is a summation of all synaptic activity in the brain. So a "frequency" of the EEG is representative of a ripple of stimulation – i.e. it records the wavelength of increases and decreases of activity passing through that part of the brain (something like a Brazilian wave!) – rather than literally being the frequency of the actual synaptic signalling. And the amplitude of the EEG is representative of the relative number of synapses firing at any one moment.

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50 Thus, all currency is fundamentally based on debt. A useful read on this topic is David Graeber (2011) Debt : the first 5,000 years. Publ. Melville House ISBN 978-1-933633-86-2, available as a free online book at https://libcom.org/files/__Debt__The_First_5_000_Years.pdf

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52 ... although if an animal dreams, one might deduce that it is capable of telling itself stories. Dogs definitely dream, running and barking in their sleep; and it appears that many other animals also dream.

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55 The Martian word to "Grok" means to unreservedly embrace the whole of an idea or object – even sometimes to the point of physically eating and digesting it : such that the essence of the objects existence and everything about it is known to the eater – not only known, but it also becomes part of his/her being. "I grok in fullness." (Valentine Michael Smith), from the classic science fiction novel "Stranger in a strange land" by Robert Heinlein (1961). Publ, Hodder, ISBN-13: 978-0340938348

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