

Chapter 8.3

Consciousness :

Models of Organisation

The Flower of Life · Loose Coupling · Expanding loose coupling to the community · Identity as a core organiser (but what does “identity” mean?) · The extended body · Coherence · Bringing it back to the Brain · Holacracy & Holons · Holographs · Summary

HOW IT SEEMS TO ME

by Ursula K. Le Guin

*In the vast abyss before time, self
is not, and soul commingles
with mist, and rock, and light. In time,
soul brings the misty self to be.
Then slow time hardens self to stone
while ever lightening the soul,
till soul can loose its hold of self
and both are free and can return
to vastness and dissolve in light,
the long light after time.*

Loose coupling is the mechanism by which temporary shifts are possible in the relationship between - and priority given to - locally vs centrally sourced commands. This occurs not just between different anatomical units, but also between different parallel systems of physiology and less physical systems (awareness/consciousness, energetic layers, identity). One fundamental rule that applies to all life at least as complex as a single cell is that **Loose Coupling** is a normal and necessary part of complex organisation. Central (efferent) commands tend to bring the organism back towards integration and coordinated gestalt action, whereas local (afferent) commands increase functionality and adaptation, and decrease reaction time. Clearly, there is a constantly shifting (homeostatic) balance between these two contradictory qualities, strengths and demands. The Vagus nerve is primarily afferent, and passes far more information back to the brain than the brain passes to the body, therefore representing a distributed intelligence.

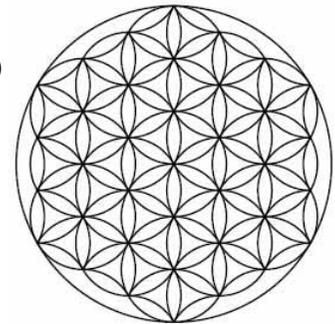
There is a recurring principle of division and polarity as a fundamental property of wholeness. Perhaps more accurately - it is polarity and division that makes wholeness possible and from/within which wholeness grows itself, constantly seeking new ways to divide and polarise so that its expression can continue to become ever richer.

*The point of tension and conflict in this world is to generate a third and creative thing.
Whenever there is an intense polarity, what is really trying to happen is a deeper
awakening that produces the third thing that no-one saw until the tension became great
enough.*

-- Michael Meade (Living Myth podcast)

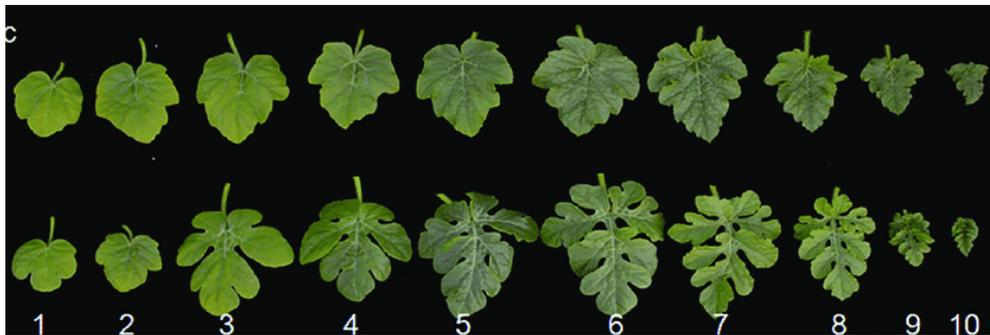
The **Flower of Life** provides a particularly useful image to understand loose coupling. The plain vanilla version shown opposite is the neutral state of greatest potential (minimum entropy), equivalent to a unicyclist balancing in an apparently static position. As various elements of the whole (arcs, intersections and areas) are given more priority, the generalised adaptive potential decreases, but the specific adaptation increases. In Goethe's world, the Tree of Life is representative of the universal and near-infinite potential of the ur-leaf. This universal form is transcendent and probably bears some resemblance to the Socratic "really-real". All derived expressions of this potential inherently possess less adaptive potential, but instead express the exuberant variety that we experience as the beauty of Life. This is also beautifully described by the Japanese (Daoist/Buddhist) concept of *Wabi Sabi* (侘寂) – an aesthetic and way of living and seeing the world that finds beauty in imperfection, which celebrates the natural and perpetually impermanent cycle of growth and decay. The point made by Goethe, in the Koran, in Daoism, by Socrates and Plato, and in many other spiritual traditions and philosophical systems – is that absolute perfection is a spiritual and therefore dead template, rather than something that truly exists in the physical and messy world of living things; and that Life exists exactly because of the multifaceted variations that might be mistaken for imperfection or statistical "noise".

In the schema of the Flower of Life, loose coupling is the way in which many elements



can shift their expression and relationship to other elements as a means by which a single organism, ecosystem, organisation or society can adapt to environmental demands. Just as the petal of one six-pointed “flower” can become the petal of another, extreme cold temperatures shift metabolic energy production towards brown adipose tissue, along with a host of other secondary adaptations that reduce blood sugar and oxygen demand from other parts of the physiology. Life adapts. The death of one member of a small family business results in everyone having to redistribute tasks between themselves. Life adapts. Unusually high rainfall in summer causes a decrease in flowering plants (because their seeds are more likely to rot), and an increase in fruit and fungi – with all the other concomitant knock-on effects to insects, birds and animals. Adaptation always seeks an optimal to balance all internal and external factors with the minimum expenditure of energy and the maximum retained adaptive capacity.

Thus, external and internal relationships shift in a continuous dance as Life optimises itself. Over the course of evolution, each living thing has experienced many deaths, famines, droughts, cold winters and rainy summers, and the capacity to shift internal



and external relationships to optimise future survival is etched deeply into our structure. Just as Ukhtomsky pointed out, this adaptive capacity is always (in a Janus-like manner) looking forwards by looking backwards; and the present arrangement of internal metabolic function and external relationship is always balanced between past experience (evolutionary, familial, personal) and an expected future. If there were no responsive consciousness, none of this would be possible, because no part of Life would be able to balance on this nexus between past and future. One interesting thing about consciousness is that consciousness itself is also just another circle in the Flower of Life, and its relationship with the external world, and internal processes, tissues and fluids - is also adaptive. That is, consciousness does not have an absolutely rigid or hard-wired relationship to physical tissue (including neural tissue), and *the ability of consciousness to modulate its degree of occupancy in physical body tissue is an important part of the adaptive homeostatic range. That is not to say that consciousness is not always in all living tissue – but rather that there is a fractal hierarchy of consciousness that has an organisational capacity according to its particular fractal scale.* Although David Korten doesn't talk this way in terms of consciousness, he does describe the interrelationship of Life on Earth in exactly this way¹.

What is usually mis-taken is the idea that life has a trajectory towards some end

product – a fish or a human being. In reality the process of Life is one in which each stage of development is perfectly adapted² from the very start to its “external” environment, through its internal organisation and its internal and external responsive motilities – such that there is a continuity, because the external environment must necessarily also adapt to the presence of that life-form and its behaviour. So each specific living organism and each species of organism are waymarkers along the path of a continuous rolling surf of adaptation that goes wheresoever it goes. The tadpole is perfectly adapted to its life swimming in a pond, as are the various predators that feed on it and arrive at exactly the right time in the frog’s reproductive cycle to feast. In this sense, “perfectly” means that an optimum compromise has been made given all of the internal factors in the tadpole and all the external factors in the environment. That perfection continues right from being newly laid frogspawn, and throughout the metamorphosis that it undergoes; and each perfection continues to inform the next evolving stage of development. Regardless of the apparent harshness of the environment in which they lived, countless trillions of cells smaller than can be seen with the eye eventually changed the composition of the atmosphere of an entire planet (Earth) to end up with about 20% oxygen, and each life-form along that transformation was adapted to the oxygenation levels in which it lived. Some were squeezed into smaller and smaller, more subterranean habitats. Others proliferated as their energy source became more abundant.

Internal multiplication of cells during embryological development is a rolling metamorphosis, at each “stage” (or point in time) of which the organism is similarly perfectly adapted. Multiplication creates the potential for diversity and specialisation, and one can look at the planet or a single complex organism (such as a human being) more or less in the same light – that there is a gradual metamorphosis towards differentiation and complexity that creates more possibilities. At some point we reach the shape and size of an adult and cease to metamorphose physically, but as humans we then continue to metamorphose through experience and psychological growth, and the stuff we are made of is also able to reorganise itself so that its totality is better tuned to the demands it is meeting. **This metamorphosis can be seen on reflection to be an evolving adaptation through increasing complexity, in which *separation* is the tool by which that complexity is achieved.** Not that the cells in a tadpole are truly separate from each other, or the organelles in each cell separate, or the tadpole separate from its environment. But the degree of interconnection and coupling is relaxed to to embrace differentiation and the separation that arises with adaptation (and the idea of “loose coupling” will be further expanded in the following parts of this Chapter). For instance, it is separation that allows for different organs to form and have their own homeostatic territory – a microclimate embedded in the total body homeostasis. Or for different parts and layers of the brain to differentiate so that they can specialise in different functions³.

When I am among the trees,
especially the willows and the honey locust,
equally the beech, the oaks and the pines,
they give off such hints of gladness.
I would almost say that they save me, and daily.
I am so distant from the hope of myself,
in which I have goodness, and discernment,
and never hurry through the world
but walk slowly, and bow often.
Around me the trees stir in their leaves
and call out, "Stay awhile."
The light flows from their branches.
And they call again, "It's simple," they say,
"and you too have come
into the world to do this, to go easy, to be filled
with light, and to shine."

- Mary Oliver

Loose Coupling

I first started to consider the principle of loose coupling when I was trying to get to grips with Dissociative Identity Disorder (DID). Here, in extremis, the personality fragments; such that each fragmented part is stuck in a particular timeframe, holding and constantly re-living part of the trauma. In DID the capacity to fragment may be seen to be a two-way street, as parts/fragments of identity may become autonomous from the whole, and the greater whole/core identity (if the trauma is not so extreme that a greater whole no longer remains) may become "autonomous" from the parts. These changes to internal organisation in response to stress are healthy and creatively adaptive changes – until they become chronic and maladaptive as a result of not being able to complete their adaptive process. The question that eventually led to the principle of loose coupling was – *exactly what is the nature of the health that in an extreme expression eventually becomes a pathological fragmentation?*

Loose coupling in many ways the opposite to "hard wired". All organic systems possess a fractal hierarchy of intelligence. Superficially, this is controlled "top-down", with the greater organism directing its "component parts". But the perception of a hierarchical top-down control that is familiar in human-constructed technology and organisations does not really describe everyday embodied experience.

The constructed principle of loose coupling (that is perhaps culturally more familiar) is

used in the design of many modern technological systems, such as computer architecture :

The goal of a loose coupling architecture is to reduce the risk that a change made within one element will create unanticipated changes within other elements⁴.

Indeed, that too (a stability of function and interrelationship) is one important aspect of differentiation within a single organism, so that there is a homeostatic range that is maintained under all but the most extreme of circumstances. *Whilst at the same time*, whatever changes in one affect everything else associated with it. The very idea of “component parts” is contrary to the principles of biology, because living organisms are not constructed from building blocks (components) in the same way as a computer or a plumbing system. However, life *does* organise itself to “reduce the risk that a change made within one element will create unanticipated changes within other elements “. It optimises its adaptive capacity and resilience by *changing the qualitative relationship and degree of hard/soft coupling between different quasi-autonomous “parts”*. When not hard-coupled, each “part” can maintain its own environment, see to its particular tasks, is something of a master of its own domain, and can find its own stability whilst at the same time being responsive to the demands of the greater organism. A practical example of this is the capacity of each organ of the body to coordinate its own internal clock and maintain phase coherence between cells purely by means of intracellular communication - without the need for any coordinating signal from the central nervous system⁵.

This loosely connected way of being provides simultaneously for greater stability and adaptive capacity, and ensures that signals from a central control (i.e. the CNS) cannot accidentally create havoc locally – that demands for collective resources cannot usually over-stretch local resources, except along pathways that have evolved to be available in extremis. Local autonomy has many benefits – provided that autonomy is relative rather than absolute. However, a loosely coupled can only work if the various “parts” *also* have a sense of the whole – that they are responsive to the *idea* of wholeness and recognise their existence is part of a greater whole. This, on reflection, applies to the individual cells and organs of a complex animal such as a human, just as much as it applies to individuals in a society, or to individual organisms existing in an ecosystem, and ecosystems existing in the ever-fertile womb of Gaia. *Life grows itself*, and each “part” and metabolic process references itself to all other parts and processes in a totally integrated manner throughout that period of growth⁶ and beyond.

The reductionist materialist way of seeing (that has been universally adopted in Western culture) is to identify parts by applying a particular observational filter by which they can be isolated, and then to say that part exists as if it is an independent unit that has certain tasks. In particular, we have become used to seeing ourselves as independent creatures standing apart from the ecological (and even social, historical, geographical, environmental, etc.) milieu in which we exist. This illusion of separateness has consequently been projected internally as a way of seeing the body, in addition to its external projection onto other natural processes, relationships or living organisms. As one example, connective tissue (which is now known to be a primary organ and system that controls much of embryological growth and is central to

homeostasis and many vital biological functions, possibly including consciousness itself) was historically ignored by Vesalius and subsequent anatomists during dissection. The Interstitium – just one part of whole mass of connective tissue – is probably the biggest organ of the body.

This way of anatomical seeing internal structures was inherited from hunters who wanted to butcher for edible meat. Therefore, muscles and bones were, by default, considered to be the most salient anatomical feature right up to modern times; and so tend to dominate anatomical atlases and anatomical and physiological ways of perceiving the body - because we think of them in that way (though have largely forgotten what it means to hunt and kill our own food). The anatomical atlas is part of a cultural feedback loop in which separated and individually labelled muscles and bones give the impression that this level of tissue organisation and identifiable separateness – is reality. Vesalius was, I'm sure, initially informed by a hunter or butcher's view of the body as a carcass, in which edible muscles are important; but tough, inedible stringy fascia is just a distraction from the meat.

Similarly, modern scientific magazines carry images of the brain saying “here is the Amygdala, and this is what it does”, giving the impression of a body and brain composed of components – very much like a computer or a car is made of components. Although this is not totally incorrect – in that many parts of the body do perform very specialised functions - it is also very misleading. It is absolutely true that a complex animal organism - such as a human being or an octopus – has certain organs that have a very specific function and purpose. Sometimes these parts are also – in an apparently similar way to a computer – indispensable. Although many animals can potentially survive the loss of a leg, or a spleen, or an eye, or a patch of skin; there is a limit as to how many of those they can lose before they cease to be viable organisms, and die. But some specific parts (such as the liver or the brainstem or the heart or the blood or the urinary tract) are more critical to the survival of every other part.

Perhaps the simplest way to understand the interconnectedness that exists within a *single* organism is to realise that everything grew as-a-whole from an egg, all the while moving. The egg moves, the blastocyst and its individual cells move, the embryo writhes and kicks as soon as it has a midline around which it can twist and a length that it can curl – a long time before it has legs and arms. If it were made of parts, then it would first need something to control it, so there would first (according to the myth of modern neurology) would need to be a brain so that the movements could be controlled. But of course – there isn't a brain, and organisation arises from the body itself, with the brain only (gradually) integrating itself into its functional place when the whole organism is nearing some final state in which everything else is also present. But even before everything was in its place, everything was moving and functioning metabolically – *as a whole*. We separate muscles and nerves anatomically because they are identifiably (to our way of seeing) component parts, but each muscle develops along with its innervation, the two being inseparable. To the extent that embryologically, the nerve grows *back from the muscle into the spine* to seek a connection to something more central. So the body develops with an inherent autonomy from the brain, and although it deigns to allow itself to be directed, it always

retains a more primitive, “visceral” capacity to direct itself. There is a degree of anatomical separation that creates functionality, but that separation is not the separation that we see by comparing tissue types and fascial compartments, because functionality demands that *everything* contributes and plays its part, and although fascia does separate, it also connects (hence the term “connective tissue”).

From this perspective we can see that the relative size of each organ must reflect one way or another its functional contribution to the whole, because otherwise it would be “dead weight” and would demand more than it contributed, and be a survival liability. This equation is not so straightforward with respect to external decorations (shapes such as horns, colours, etc) because if these help to ensure reproduction or fend off a predator, their contribution over time is substantial, even though their usage is infrequent. Nevertheless, there is a limit beyond which even the contribution from greater procreation would weigh too heavily on the whole animal. Peacocks are close to that edge, as were 18th century dandies. So the liver is the perfect size (obviously in a range of possible sizes), as is the brain, the kidneys, the microbiome, and so on. The effort to grow them, maintain them, metabolise through them, carry their weight and physical bulk, integrate them into everything else – must pay its way. One has to recognise that the organs inside the body, being integrated, make a positive and direct contribution to survival, and so can reach quite a substantial size relative to the whole animal they are part of.

Extending that principle into the ecosystem, all creatures and symbiotic couplings of life forms contribute by (one could say) *accidental* reciprocity. Unless they are foreign invasive species that have yet to assimilate they have, like organs of the developing body, grown into each other through evolutionary time. An ancient woodland contains a complementary richness, but it can only do so if each organism contributing “accidentally” is small enough for its presence to have a certain degree of randomness. As soon as anything dominates (such as in the quaking aspen Pando tree⁷ of Utah, USA), then there is less richness and less adaptive resilience (the tree is now dying as a result of human activity in the area). And as soon as any one organism grows beyond a certain size, the ecosystem that it is in can no longer support it or sustain itself. So a brontosaurus or an elephant would not do so well in a typical city park. Its influence is no longer random enough. Whales can only grow to 150 tons in weight because of the vastness of the ocean and the lack of restriction in movement within it. These ecological limitations have been severely exceeded in modern globalised economics and the size of a few corporations. Google eats everything, and as such is rather like a brontosaurus lurching round the confines of a small woodland.

The cultural habit is to compare this organic self-grown wholeness to human-constructions. Looking at any simple piece of human technology, such as a hand torch - if any functional part is removed, then in most cases the torch ceases to function. I could take away the rubberised handle, and the torch would still work. I could take away the lens, and the torch would still work, but it would not be waterproof and its beam would be unfocussed. If I remove any wires or the battery or the bulb, then the rest of the torch is no longer – by practical definition - a torch. However, when compared to a living organism, the torch is very hard-coupled or uncoupled, with very little intermediate nuance. Each part has either total reliance or

absolutely no reliance on other parts. No component has any kind of subtle or nuanced and contingent response to the general state of other parts. Making the case out of wood or plastic or diamond studded titanium would have little effect on its practical function. It has no capacity to change its state or respond – other than for an electric current to switch on or off. The manufacture of the parts can take place in totally opposite sides of the globe, and each part has no specific relationship to the others until they are assembled. The bulb cannot decide to work on its own or of itself determine the correct degree of brightness, because it has no innate intelligence. It is true that I can add a light sensor that can switch the torch on automatically, in which case the level of complexity increases – with there being two possible routes to the light being switched on. But there is still an uncompromisingly fixed relationship between all parts. It is very “WYSIWIG” (what you see is what you get).

In contrast, biological processes are not necessarily so obvious, and there is rarely a consistent or universal direct one-to-one relationship. For instance, excessive dietary calcium is as least as likely to produce osteoporosis as is low dietary calcium⁸. A poor quality diet is (if not too depleted in calories as to cause starvation) as likely to induce obesity as is an excessively rich diet. The body goes into a pre-famine metabolism, and saves as much as it can for a rainy cold day. Not only that – the richness of diet is so survival critical that both poor diet and threat-survival-stress cause metabolic shifts that are epigenetically transmitted across several subsequent generations. Although the message in western popularised medicine for 40 years has been that dietary fat creates body fat, the most recent research contradicts that. Excess calories in any form create body fat, but fats in general are indispensable to the body, being a primary metabolic route for energy absorption/release and for formation of healthy (e.g.) neural tissue. And we now know that excessively high peaks of ingested sugars – and particularly fructoses (fruit sugars) induce deposition of fat, something realised by the health and fitness profession over the past decade as people on high aerobic exercise programmes and “extremely healthy” diets still tended to lay down too much fat in their bodies. The realisation was that the body recognises fructose as being a seasonal (autumnal) sugar, and preferentially converts it into fat as a safeguard for the coming winter. The fact is that any but the most generalised and contingent soundbite about health is inevitably wrong. The general principle that awareness is good – also has to be tempered by the fact that there is a limit as to how much information can be experienced simultaneously and still retain meaning – so it is necessary to have a limit to even “good” information. In this way, homeostasis is a far richer concept than is usually realised, but not one very dissimilar from ideas put forward by its discoverer, the French physiologist Claude Bernard in 1865.

...“The sensitive nervous system is part of the external world. And the external world is an event in the nervous system. The inside of the box is outside the box, and the outside is inside. I mean, you know, it seems to flip flop perpetually.”

- Alan Watts

The definition of “loose coupling” used in computer architecture deals with a linear man-made machine, and so is inevitably one of a fixed relational connection between distinct and separate components. They are isolated from each other to reduce the risk

of complex faults. On the other hand, the definition of Loose Coupling in biology is one of variable global agency vs. local autonomy and a continuous stream of top-down (efferent) agency interacting with bottom-up (afferent) modulation of the entire organism, held together through feedback loops that inter-communicate states of being across different scales, hierarchies of control, physical and biochemical processes, anatomical zones, etc. The living organism begins as an essentially fault-free system that is fully integrated internally and into its external environment. For instance, oxygen depletion (e.g. due to high altitude, or prolonged aerobic activity such as long distance running) is detected by the mitochondria^{9,10} who then collectively signal the body (i.e. the human DNA) to increase production of a signalling molecule (erythropoietin) that increases production of red blood cells – thus increasing the capacity to absorb and transport oxygen. This is not the only instance found in which mitochondrial cells direct processes far beyond their cozy little homes. So not only is the brain not the direct origin of these signals - they don't even come from something that is formed from human DNA!

In this totally interconnected environment that is the human body, small changes to the degree of internal and external communication are used to “re-configure” the organic capacity to respond and act to achieve different response-ranges according to necessity. The qualitative and extent of information transfer is yet another variable that can be used to fine tune the adaptive organic response. Whereas evolutionary changes in DNA may on one level be considered to be the hard-wired means by which an animal can adapt to its environment – an increased stomach acidity and broader teeth (etc.) to deal with tougher food, or a longer neck or tongue to exploit a niche in the food chain – there are still many different moment-to-moment or generation-to-generation demands to adapt that require faster and less fixed adaptations. And as in the oxygen example above, genetic capacities might lay dormant for somebody's entire life without being used, and do not necessarily have to be located in human DNA. So the office staffing metaphor used in Chapter 3 (Wellness) must be applied with caution. The body does not prepare for the possible worst by growing a set of cells that have a redundant function that might or might not be used only once in a lifetime. The cost of keeping these cellular freeloaders alive and carrying them around when they are not being used - to cater for every possible future contingency - would be too high. But a short sequence of DNA that can produce a unique and recognisable signal is a much smaller overhead, that can encode many apparently redundant capacities from our evolutionary past.

It is perhaps convenient to assume in the sloppy way that popularised genetics allows - that communities living at high altitude for generations “must have” genetically adapted to that environment. It is true that this is not impossible. But in fact, as the recent Nobel Prize research has demonstrated, almost everyone, regardless of where they live, carries that adaptive capacity in their mitochondria to trigger a mechanism designed to adapt to high levels of aerobic exercise. Simply being conceived, gestated and born at high altitude will cause the whole-body systemic to cellular mitochondrial homeostatic balance to shift, resulting in a higher erythrocyte load to be a normal adaptive function of homeostasis. The physiology of most humans is therefore still capable of adapting to high altitude given a few weeks exposure to lower oxygen levels regardless of where they have been born. So oxygen deficiency is a nice

example of loose coupling from both directions. On the one hand the mitochondria do not usually dictate higher level or systemic processes, but are able to exercise that kind of control if necessary (e.g. by determining some aspects of how the whole homeostatic management of energy is optimised during gestation and early childhood for someone living in Cuzco; or by making a less comprehensive shift for a tourist). On the other hand, the higher (conscious) behavioural organisational level can recognise limits on metabolic demand, and modulate activity according to perceived capacity...

I can remember arriving in Cusco in Peru (altitude 3400m ASL) and initially (for maybe 10 or 20 minutes) I was unaware of the altitude, and was deluded enough to think that I wouldn't need to acclimatise. Then the oxygen deficit kicked in, I had to pace myself, and I slept a lot for several days. As my need to engage with my metabolism temporarily became more conscious, my capacity to direct conscious activity elsewhere beyond the immediate needs of my body decreased. It's pretty simple. If walking a dozen steps uphill causes the whole body to go into blood-oxygen deficiency, I can tell you from direct experience – that certainly grabs the conscious attention and demands a change in behaviour! The higher demand in one critical area of activity (maintaining blood oxygen levels) reduced my total capacity to de-couple mental-attention process from physical activity. More of my organic and conscious self had to be directed towards oxygen.

Loose coupling is therefore not merely the capacity to de-couple (or multitask) – but also is about the capacity to drop into a more hard-wired and less adaptive, less multiple form of activity. This is a particularly useful general observation, because it clearly demonstrates that there is an optimum *homeostatic* degree of normal background (e.g.) body-mind (or e.g. mitochondrial-systemic) coupling/decoupling, which adapts for any specific combination of stress-demands. Acute metabolic demands such as oxygen, food, water tend to decrease the level of loose coupling, as practically speaking it becomes necessary to put more conscious attention on just putting one foot in front of another. Conversely, immediate external demands (socialisation, traffic, loud noises, the possibility of tigers) tend to increase the level of loose (de-)coupling between mind and metabolism as both conscious and non-conscious (survival) attentions are constantly pulled by distractions until the whole sensory organism normalises itself to this background environmental noise by adapting to it. From a sensory point of view, physiological adaptation to lower oxygen simply means that the organism no longer demands conscious attention to breath – whereas adaptation to a continuous external noise requires that its continuous presence is filtered. According to information theory, continuous noise is equivalent to no noise at all, but nevertheless, energy and other resources have to be allocated to the filtering process so that what might be important comes once more to the forefront of attention. The similarity between oxygen-depletion and continuous noise can therefore be seen as a short-term (acute) leading to long-term (chronic) change in whole-body energy management - in which the greater energy expenditure required leads (so long as it is enacted) to a reduction in total adaptive capacity. This (once again) can be related directly to Ukhtomsky's theory of Dominants. Organically, the adaptive intelligence demands that these changes are optimised so that net energy usage is minimised, so net retained adaptive capacity to cater for further stressors is as high as possible.

Homeostatically the kind of information, the degree to which it dominates various organisational levels, its contingent meaning (given that received meaning is not necessarily related to transmitted message), and the quantity of efferent vs afferent signalling are all variables that alter local, systemic and conscious function. This is very plainly seen in the way that Vagal “tone” plays such an important role in stress metabolism.

Returning to the torch analogy, since each identifiable anatomical part (such as a liver or a particular branch of the Autonomic Nervous System) has its own particular sphere of action and influence, the body itself is functionally organised around – and indeed specific organs derive their usefulness from – a certain degree of separation and autonomy. The brain is so rich in potential exactly because it contains structurally different elements and physical geometries, each of which enables a certain specialised task to be locally optimised. Connective tissue is contractile – all of it. But muscle cells are more efficient and effective and specialise in that particular task, so it is usually difficult to detect the contractility of the connective tissue matrix when there is so much muscle attached to it. A single cell effectively runs itself as if it had a liver, a brain, a circulatory system – and indeed, even cells have specialised organs (organelles) that take up specific roles. An “organism” (such as a human being or nematode or fruit fly) is a specialised “organ” in its ecosystem, and it is the separation and reduction of communication that creates richness. But reduction does not mean absence. Once communication is reduced, then it is more specific, more controllable. This specificity and reduced communication carries more inherent meaning because there is less noise and the specific now becomes obvious because it stands out and is not drowned by a cacophony. If light is too bright, or noise too unstructured and too loud (such as a simultaneous broadcast of every piece of music ever composed by Wagner), then nothing can be easily seen or heard.

Cells do not divide.

Organisms subdivide themselves.

Cells multiply.

The organism organises.

- Jaap van der Wal

If we look at more primitive organisms, many are perfectly functional without having the same degree of specialisation and differentiation of more complex organisms, yet they still live! Sophistication and specialisation is also a characteristic of human society, and we easily recognise that a village works far better for its inhabitants if individuals take up certain jobs full-time. So it’s absolutely normal in the development of cultures and civilisations that certain people become good at milling grain, or hunting, or weaving, or making tools - to the enrichment of everyone else. The society itself becomes like a living breathing thing. It has developed its own ecosystem or differentiated its own cells, muscles and internal organs. The people in that village can come and go as they please – but still need to coordinate and communicate with each other to some contingent degree so that the village continues to function as a community. Some communication is simply about maintaining a sense of community and communal purpose. Some is more about one person letting other villagers know

that he needs help drawing water, or that he will be able to loan his horse next week, or that he has spotted some possible raiders crawling through his field. This kind of communication is so (generically) familiar to us in daily life that it is almost invisible, and is rarely acknowledged in organisational charts describing the management of companies. It takes place in passing smiles and nods, apparently trivial comments or jokes, in shared language, customs, clothing, music and dance. As the function of any kind of organisation (be that a village or a corporation or a single cell or a walrus becomes softer and more about relationship, this loosely coupled arrangement becomes more and more obvious.

Perhaps the most simple and visible manifestation of loose coupling is in the group swarming of starlings in a murmuration, or herrings in a shoal, or locusts¹¹.

The locusts have no king, yet go they forth all of them by bands (Proverb 30:27)

Like the cells of a plant, this collective intelligence and decision-making “has no king” – i.e. no central nervous system, no leader, no identifiable part (rather like plants) that can be identified as a brain. But the collective has a life force and organisation that transcends the individual and makes the individuals both less (because they have lost most of their individuality) and at the same time more than they were. Humans too can join in this mass merging where personal, individual identity subsumes itself to something bigger. We have many examples in history of this being a good thing, and a bad thing.

Loose coupling allows for rigid and focussed pooling of resources in (e.g.) times of invasion, just as much as it allows for children to explore the local fields and woods for as far as they can walk and run. It allows for one person to go about his business undisturbed, unaffected; just as much as it allows for several people to combine their sheep to herd them 50 miles to the nearest market. Some relationships naturally become more coupled than others – as in marriage or business or trading partnerships – whilst other villagers might accompany Marco Polo on his travels to China and return 20 years later. I travelled from Cusco to Lima by coach in 1982 along the so-called pan-American highway. In those days parts of it were still a narrow dirt track, and on one of these sections a tractor’s axle had become decoupled from its carriage, blocking the road. Within a few minutes, the men on the coach had organised themselves, discussed possible options. Then apparently out of nowhere about a dozen spades appeared, and they excavated a new road round the crippled tractor within another five minutes, and we were on our way again. Although one leader emerged from the initial conversation, this was not a hierarchical organisation, and the shovels had not been carried specifically for this task.

Loose coupling also allows for very subtle and almost subliminal perturbations to create a higher level of organisational coherence. In everyday village life it is not necessary that Mr Smith the blacksmith strike his anvil at exactly the same time that Mrs Wood the carpenter strikes her chisel at exactly the same time that Mr Bean the gardener pushes his hoe to weed the garden. Like organs in the body, each works more or less independently. But on the other hand they are not independent, and the rhythms of their work might come together into a harmonic, resonant pattern (see the farm workers digging in the film *The Blind Swordsman: Zatoichi*^{12,13}) that also reflects

the rhythms of the seasons, or even the rhythms of life and death over generations. Extend this quality of gestalt awareness and communication through resonance out to the entire surrounding ecosystem, and interesting things can start to happen as more and more subtle harmonics interweave relationships between actions and events. Causality itself can become indeterminate. A crow flight across a field or the pause of a deer under a tree can now be simultaneous with a birth happening some miles away, and be part of the same gathered meaning in time.

One interesting experience was a drumming workshop I attended on a farm in rural Wales. Each of us was assigned a large field of our own, and the steep rolling nature landscape essentially placed us in our own little bubbles. We were told to “drum the landscape”, and with that apparently inadequate instruction went and sat in our respective fields, alone. I noticed a blade of grass moving in the wind, and tried to play with that – then I noticed sounds from a river in the distance, and then a road. I moved the rhythm to meet the sounds, and then after a short while strange things began to happen. Everything – the shifts in gusts and directions of wind, cars in the distance, river noises, birdsong – all of it somehow fell within the rhythm that my hands had found by themselves.

So as the quality of communication within the body increases and as there is space for that to become more and more subtle in nature, the looseness of coupling between organelles, cells, organs, systems, consciousness – becomes a means by which the whole becomes more and more integrated, rhythmic, synchronous, and efficient in its every action. Let’s attempt some sort of definition ...

Loose coupling is the capacity of a complex and apparently unitary organism to temporarily re-organise itself into sub-compartmentalised organisational relationships, so that a particular set of potentially conflicting demands can be accommodated as efficiently as possible.

Ukhtomsky’s *Dominants* are the answer to “what” it is that is loosely coupled, that de-couples, and that re-couples. In the creative act of de-coupling, an organism creates multiple sub-Dominants that have their own limited sphere of influence, and which – when no longer needed are re-assimilated into the core Dominant. Consider walking down the street looking at shop windows and talking with a group of friends. There is no need to be consciously aware of what the legs are doing or the lungs – they just get on with the task we have set them, and the primary conscious Dominant is the you that is talking and looking. Your legs and feet and your breathing are no longer under conscious control, and although they are still under the control of the primary Dominant (which is walking and looking and interacting, the fact that control has been delegated to non-conscious levels means that they also have their own temporary sub-Dominant /Gestalt / organisational identity / Consciousness that organises them such that you carry on walking and breathing. But they may also be re-assimilated back into the consciously controlled core conscious Dominant at any time. The malleable and multiple identity of the body, and its importance in conscious processes has been recognised in many spiritual traditions (see also Chapter 8.4). Here is a quotation from Celtic Christianity :

Your mind can deceive you and put all kinds of barriers between you and your nature;

but your body does not lie. Your body tells you, if you attend to it, how your life is and if you are living from your soul or from the labyrinths of your negativity. . . . The human body is the most complex, refined, and harmonious totality.

Your body is, in essence, a crowd of different members who work in harmony to make your belonging in the world possible. . . . The soul is not simply within the body, hidden somewhere within its recesses. The truth is rather the converse. Your body is in the soul. And the soul suffuses you completely.

-John O'Donohue

Although loose coupling can be a direct experience, it is also well illustrated by example, and there are many examples in biology and practical everyday experience of these temporary (adaptive) passing of control from central to local organisers.

- i. Any slime mold can be split into many different fragments, and each will continue to be viable. And each fragment will remain capable of re-aggregating with any or all of its previous compatriots. The efficiency of each sub-colony will be slightly impaired for a short time, and then it will re-establish its functional network of flow channels – a branching vasculature of decreased viscosity – and then it becomes a viable colony in its own right. The peculiarity of slime mold is that it has no cell walls, but instead manipulates the viscosity of the slime/fluid that surrounds each nucleus and glues each to its neighbour. This gel/fluid forms an extracellular system of communication, nutrient supply and waste disposal, with the complexity and appearance of an inner-city field of underwater skyscrapers. More rigid cellular colonies such as sponges can be shredded with a meat grinder, and each fragment that emerges is capable of living and growing. Not only that - it is capable of detecting the proximity of its sibling cells and re-connecting to them as if (!) the total colony already has a sense of identity.
- ii. Herd animals are, as a herd, a loosely bound organism that is designed to be able to lose a member more easily than a salamander loses a limb. Considering my own responses and the emotional “memories” I have seen arising in clients, my sense from this is that sadness is an emotion that occurs when fragmentation has taken place¹⁴. The physiological state that creates the sensations we call sadness must have certain functions, which could include reducing visibility to external threats (sadness is a turning inwards), and repairing gaps in the body-mind and re-integrating what is left to return to as efficient a state as possible – again, that internalised introspective state could possibly be turned to good use. The sensations associated with strong sadness (grief) are remarkably similar to symptoms of dissociation and parasympathetic states of shock¹⁵. In the Daoist system, sadness transforms into compassion when it is allowed to move fully through the body (instead of being pinned down in a mental loop) – again, a useful state in time of personal or collective loss.
- iii. The octopus is the ultimate example of loose coupling in action in a single higher organism. Each limb senses and responds to stimuli by itself (whilst

reporting back whatever it finds to the middle) and is also (as and when necessary) subject to central control. An octopus has a nervous system of about half a million neurons, half of which is located in its eight limbs. Interestingly, this is equal to the number of neurons in the human enteric nervous system.

- iv. The management structure and staff in an organisation are loosely coupled. If each employee was hard coupled to every other employee, only one task could be done at a time, and all of them would be doing that one task simultaneously. Imagine letter writing, with the hands of each person connected by a rod so that each pen in each hand makes the same movement at the same time. Similarly, management needs to be firm enough such that the individual employees in each department and the whole company are all going in the same direction, but not so rigid that the skills of each individual cannot be creatively and usefully expressed. The core Dominant for such an organisation would be the overriding policy laid out by the board of directors. And just as each organ in the body has its own sub-Dominant, so each department would have a certain autonomy within that overarching policy. The departments are loosely coupled to the company, and the individual workers are loosely coupled to their particular department.
- v. In terms of human experience, consider the simple task of driving a car. Most people experience attention time lapses when driving, where their thoughts wander to things other than the road. Interestingly (and fortunately), a background awareness remains which is capable of drawing us seamlessly back to full 100% attention if necessary. However, the body and senses are perfectly capable of operating the vehicle with only maybe a few % of attention remaining on the total task, and zero attention to the minutiae of pedal pressures and steering wheel movements. This is a rather more complex example of the fact that movements learned through repetition are remembered by the local spinal nerve plexi as well as by the (non-conscious) cerebellum. A jazz pianist's fingers move so quickly that neurotransmitter-mediated nerve synapse signalling speeds are incapable of controlling this entirely from the central nervous system – some of the movements have to be generated locally. The brain indicates a gesture, and the local synapse translates this into necessary details, just as the employed artists in Damien Hirst's studio might respond to his instructions.
- vi. An ant or termite colony operates as a single super-organism, but individual ants stray away from the main transport pathways to explore new possibilities. Then, when a new source of food is discovered by their autonomous action, the colony reorganises itself into the most efficient transport path between the nest and that particular location. This is a good example of how important autonomy and a certain fuzziness of central control can be. Any system that is locked down too hard will have less chance of survival than one capable of making random investigations. We sometimes call this randomness "curiosity". It may have killed one or two cats, but it has helped billions of cat-ancestors to survive. Curious ants deviate from the single track, and so

they find more food before the first food source ran out.

- vii. Watching a dog (or any other animal) in motion, there are at least three primary movement patterns that are visible : (a) the rear end pushes hard to clear an obstacle, and the front end responds by avoiding the obstacle and then preparing to land; (b) the front end moves towards something and the rear end catches it up; (c) the nose senses something interesting (food? gross smells? a tree?) and then the head, neck, fore-body, hindquarters respond in turn to orient to and move towards that. Sometimes this is an instant whole body motion, but more usually the movement sequences front to back¹⁶. This rear \Leftrightarrow front and front \Leftrightarrow rear motion (or a centre \Leftrightarrow periphery motion) be seen in many circumstances. It is also related to the more primitive peristaltic motion from which it originates. One muscle spasms, then another, and so on, the first contraction providing the local signal for the next contraction to take place.
- viii. The behaviour of a hunter-gatherer community is a continuous cycle of fragmentation and re-grouping. The males head off into the forest or veldt, and enter another world. Their senses adjust to this different pace. They become more like the animals they are hunting. On their return, there is a ceremony, re-welcoming them into the human world.
- ix. The lizard, salamander or newt takes fragmentation one step further by being able to literally leave part of its body behind in a sacrifice to save the remainder. So loose coupling is amongst other things, the process that allows us to be able to lose a limb or a kidney or a piece of of brain tissue or some veins and still be able to function.

Expanding loose coupling to the community

In order for loose coupling to be a valuable adaptation for a complex organism (such as a human being), the following conditions must normally apply :

- the linkage between central and local command centres must be loose and in its normal range of function allow for varying degrees of “fragmentation” (through local autonomy and compartmentalisation), up to full integration and coherence. Thus, a society may include groups of families, model train enthusiast clubs, football supporters, and so on – they are in some situations more closely coupled to each other than to the wider society – but the strength of those relationships are contingent and shift according to the immediate demands of the moment. Similarly the body is a set of communities – such as mitochondria¹⁷ - that are potentially more closely linked to each other than to the whole. But if this fraternal relationship exceeds its homeostatic bounds the mitochondria will cease to exist – they depend on the health of the whole organism.
- there must be an ability to re-connect back to the whole – the organism must have some internal sense of identity/control priority and self-recognition. It is

not enough that there is a nerve synapse route between the brain/CNS and a (e.g.) limb - if that limb is able to be operated locally by a local synapse. The limb must recognise that it is part of the whole, and the whole must recognise it as being part of it. And this sense of local/global identity requires internal/external awareness in BOTH the local and global systems. What is being described here is remarkably close to a Hologram; where each part of the holographic “image” contains a complete image of the whole.

For our current purposes, there are also two other requirements :

- (a) that wholeness/ integration is seen by both/all parts as being advantageous, and
- (b) that complete integration (of the kind envisaged by someone familiar with integration in man-made devices) is indeed possible.

These caveats are in deep conflict with any agenda that *demand*s integration to be a prerequisite of health. Having held an idealist position for some years, my clinical experience has gradually brought me to recognise that an idealised integration is not necessarily congruent with natural expression of health. Taking a similar example, a proportion of babies are born with ambiguous genitalia, or with an internal sexual identity that strongly contradicts the genital identity of their body. Over the past decades we have come to recognise that these expressions of humanity are not pathological, but rather are part of the normal range of expression of life. I would suggest that in some (but not all) circumstances, an inability to join identity parts that other people do easily integrate is also in the natural range of expression.

The evidence for a reciprocal/bi-directional relationship between central organiser (brain) and peripheral organs/limbs, and its physiological basis (as far as we currently know) is described in Taylor et al (2010)¹⁸. These are also more or less categorised by Raul Espejo (with respect to management structures) as a necessary complementary tension between cohesive processes and the ability to adapt¹⁹.

The importance of the whole having a symbolic identity that can be referred to by its component parts (and various combinations of, and the whole) is discussed by Rocha. He states that

Von Neumann showed that there is an advantage of symbolic, localized memory over purely dynamic, or distributed, memory in self-replication because if we do not have symbolic descriptions directing self-replication, then an organism must replicate through self-inspection of its parts²⁰.

Michael Church has also considered this topic in some detail with respect to organisational management²¹, and in particular the importance of a “loose vertical and horizontal coupling” as opposed to other less or more structured arrangements, with some retention of autonomy and limitation of top-down interference at each level of organisation. We can see this in the way that the digestive system more or less runs itself regardless of what we do and is not (usually) directly subject to any form of conscious control. But nevertheless

- i. the digestive system is responsive to the whole body ANS balance, and
- ii. if we consciously focus on certain items that relate to digestion, then it will alter

its activity to suit that higher level orientation (e.g. even thinking of a lemon usually evokes an increase in salivation).

So the higher level of organisation – ultimately the conscious will and conscious focus of attention – cannot normally alter enzyme production, ATP metabolism detail etc, but is still capable of directing and influencing its general direction of organisation with respect to the whole organism. Likewise, it would be inappropriate for a managing director of a major corporation to get involved with the detail of how each cleaner holds a brush and in which order they empty waste baskets. But he is still capable of altering global policy which in turn may affect when cleaners start work etc.

How this hierarchical relationship works is much more obvious in an organisation than in a human body. If the cleaners somehow become fixated on sweeping not just the office but also all the streets for a hundred metres in all directions, it is easy – someone will talk to them, explain this is not necessary, and issue a clear instruction as to the sensible limits of their work. But how does the conscious mind bring a lower level of the organic hierarchy back into a coherent and ecological state? Clearly cells do not talk any higher human language. So we must somehow communicate with the body in a way that it understands. This is the dilemma we are faced with daily. Usually we avoid the question – instead we just surgically cut things out and chemically force a new order in an extremely crude way. Surely more than this is possible? The role of emotions are particularly important in this regard, and their global function as an integrative sense is discussed in Chapter 4 (Senses).

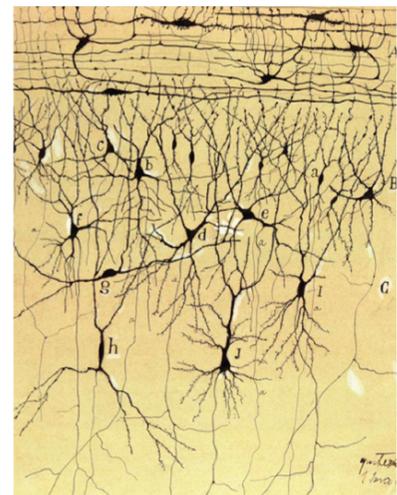
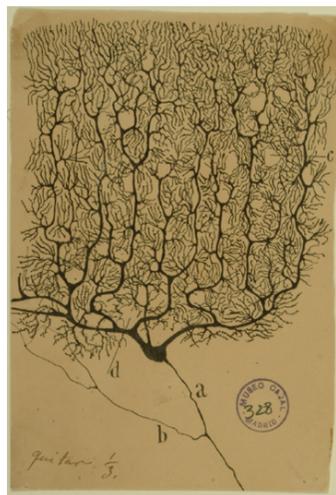
Identity

Identity as a core organiser (but what does “identity” mean?)

The loose coupling hypothesis has implications for not only the immune system, but for all ways that the archetype of identity expresses on all levels – cellular, organism, psychological and social. A close inspection of the ways that identity is defined in real life raises significant questions as to how this is done and how the immune system really works. It would be nice and neat to think that the body recognises its own DNA as being “friendly” and all other DNA as being “hostile”. In fact, the situation is far more nuanced than this simplistic DNA-recognition model. The relationship between immune self-identity (which includes all our internal and external symbionts) and psychological self-identity was perhaps brought a little closer by recent research²² that showed the role of astrocytes in consolidating neural structure by reducing the inherent plasticity.

We are composed of not only human cells, but also bacterial cells that are absolutely vital to our continued survival. Firstly, the most important known bacteria is the mitochondrial bacteria inside each cell that drives the production of ATP. How does the immune system recognise our personal mitochondria? OK – it might have one template for mitochondrial DNA and another for personal human DNA. But then, what about all the various gut flora and other bacteria that have been symbiotic with us for so long (in evolutionary terms). Our bodies have even stopped producing certain enzymes – because the bacteria do it for us. We even seem to be symbiotic with some species of gut parasite, without which we may actually suffer from a range of serious autoimmune conditions. And we are certainly externally symbiotic with domesticated animals and cultivated plants – dogs, chickens, cattle, roses, wheat, potatoes (etc.) – though this is not the usual way that the relationship is described.

Identity from an immune point of view is more to do with symbiotic compatibility than precise DNA-identity. This is particularly brought home in studies of traditional food fermentation. The cauliflower-shaped mass of organisms that is called Kefir is in fact a symbiotic colony of about 20 different species of bacteria and yeasts in a matrix of proteins, lipids, and sugars. Although Kefir looks like a single organism, it is really an ecosystem. So the ability to come together is not dependent on species – but is instead dependent on each cell's utility to its neighbour. And if this combination of bacteria (etc) is put in a jar with nutrients, it will not form a Kefir-organism. Either we are somehow missing one of the life-forms (maybe it



is something like a slime-mold and has no need for cell walls?) Or we are missing something else – a Kefir-identity, a Gestalt that informs the various parts that they are part of a whole.

Although we may talk lightly about symbiosis, the depths to which it can go are quite startling. A recent study of plant communication²³ shows that the mycorrhizae around plant roots also provide a powerful signalling network, allowing plants to signal to each other when one is attacked by aphids. Almost as if the fungal strands act like a nervous system for the plants in that area. I personally find it is interesting that whilst the nervous system looks rather like an upside-down tree and individual neurons look remarkably like roots, the Glia (immune cells forming the matrix of the brain) also have a remarkable physical resemblance to mycorrhizae.

One possible relationship between human cells and non-human cells is Germ Theory, devised originally by Louis Pasteur. This is the basis of most of modern medicine – the principle that germs are harmful, that they cause disease, and that the disease will go when the germ is killed (using antibiotics). A different theory was proposed by Antoine Béchamp, who more or less stated that disease is a state of the body, and if there are bacteria, then the disease has caused them to act differently – i.e. to cease to act as (and be treated by the body as) part of the whole body ecology. Some of the most virulent “pathogens” known are routinely transferred between people as they exchange coins and banknotes, but for some reason this rarely has any effect on us. There is some inherent contradiction here in how the immune system is viewed in conventional medicine. Béchamp is explained in more detail in three articles on the BSO website^{24, 25, 26}.

A recent TED talk by Mina Bissell²⁷ pointed out that there are between 10 trillion (that's 10,000,000,000,000) and 70 trillion cells in a human body; and most times there is no cancer. How does that vast colony of cells regulate itself? She has found that it is the extracellular matrix – the connective tissue - that gives the cell a geographic and functional context; and once it has context it self-regulates. This to the extent that cancer cells revert to normal cells when their extracellular matrix is normalised to the area they inhabit. They also cease to behave randomly, and rotate (!) like normal cells. It would seem that, in a healthy state, all cells behave somewhat like embryos, and the matrix that allows cells to group together to form colonies is somehow giving the cells information about where they are and what their function is at their specific location. The phrase “the glue that binds us together” is rather more apt than you might think²⁸.

A quote from Mina Bissell ...

I theorized that the ECM [extra-cellular matrix]—which of course is the product of the genes—can itself influence the genes, once it gets out and reorganizes. Cells make three-dimensional organizations that are not necessarily specified by the genome but by what is surrounding them.

Next I said, "These things have information. They must have receptors so that they can send the information." At the time, the receptors for the ECM molecules had not really been discovered or at least appreciated. I thought, "How would this receptor work? It would have to be attached to the scaffolding cytoskeleton inside the cell."

I theorized that it is then attached indirectly to the nuclear matrix, which at that time people didn't even believe existed. Then I postulated—again, by reading some literature and thinking in 3-D—that the chromatin, the structures into which DNA is packed, is probably attached to the nuclear matrix. If something from the outside behaves like a pulley and it is pushed and pulled, it sends information all the way to the nucleus. Some people think that it is either all biochemical or all mechanical, but I suggested that the control is both mechanical and biochemical. If you destroy this unit of control at any given point, then dynamic reciprocity is lost and the cells could go awry.

This made a lot of sense to me and to some of my colleagues. So we set out to show, step by step, how it happens and where the process can go wrong in disease and, specifically, in cancer.

The view that the exact composition of DNA for a specific human determines an immune identity is further compromised by recent advances in genetic profiling. It has been found²⁹ that although there is (usually?) a dominant DNA signature, (most or many) humans contain multiple DNA types, absorbed from relatives, fragments absorbed in or by the womb, or even maybe physical contact.

In the mid-1900s, scientists began to get clues that this was not always true. In 1953, for example, a British woman donated a pint of blood. It turned out that some of her blood was Type O and some was Type A. The scientists who studied her concluded that she had acquired some of her blood from her twin brother in the womb, including his genomes in his blood cells.

*Chimerism, as such conditions came to be known, seemed for many years to be a rarity. But “it can be commoner than we realized,” said Dr. Linda Randolph, a paediatrician at Children’s Hospital in Los Angeles who is an author of a review of chimerism published in *The American Journal of Medical Genetics* in July.*

Twins can end up with a mixed supply of blood when they get nutrients in the womb through the same set of blood vessels. In other cases, two fertilized eggs may fuse together. These so-called embryonic chimeras may go through life blissfully unaware of their origins.

One woman discovered she was a chimera as late as age 52. In need of a kidney transplant, she was tested so that she might find a match. The results indicated that she was not the mother of two of her three biological children. It turned out that she had originated from two genomes. One genome gave rise to her blood and some of her eggs; other eggs carried a separate genome.

This genetic variation across supposedly similar tissues in the body has also been identified in a recent detailed study of the brain³⁰. Different brain areas were found to be a “patchwork” of DNA, and did not contain a uniformity of DNA as has previously been assumed. These two findings were obvious some time ago when it was discovered that tuberculosis alters DNA, but now we have it in black and white.

The extended body

The way this plays out at higher levels is particularly interesting. It is normal for us to think of organisms as being limited to their external shell wall – be that a unicellular membrane or the skin of a rhino. But the symbiotic nature of identity produces a very

fluid and malleable arrangement both within the organism and in the organisms environment. Remembering that cells became multi-cellular colonies by learning to manipulate their immediate environment, humans have many ways of doing this. We make clothes, roads, cars. We domesticate animals and many varieties of plants. We coppice trees. We build houses. All of these are extensions of the body-identity and the extended human-colony-identity. We extend out personal identity out into group identities which in turn are capable of increasing our ability to influence the environment we inhabit. Thus, the environment becomes a co-opted part of the super-organism we call a “society”. One can almost think of humans as being organelles and nuclei in a slime-mold-like societal colony. That colony includes cows, dogs, cats and goldfish. For the Dinka people of the Sahel, the symbiosis with cattle is as hardwired and fundamental to their individual and collective identities as the interrelationships between bacteria and fungi found in a Kefir colony. For Australian Aborigines (and many other indigenous communities) there is a relationship with the land they live on/in that places humans and animals as movable features in a total landscape. I feel instinctively that this is a correct relationship, and that somehow, sometime in the long march of western civilisation, we have convinced ourselves otherwise for not very good reasons. As living organisms we are naturally embedded in and part of the living landscape; and people respond to landscape in very interesting ways. Perhaps I am more aware of my own responses to landscape having once trained as a geologist.

So, where does the definition of an organism (and its identity) begin and end? On analysis it becomes clear that the ability to fragment/separate/become autonomous and the ability to re-connect/socialise/regroup are themselves mutually interdependent. This is a true polarity in which the existence of one end of the pole requires the existence of the other, just as a North magnetic pole demands that a south pole also exists. We come together. We separate. The function of identity must be strong enough for each part so that it does not shatter into a million shards, but not so strong that it prevents a recognition of the greater identity from which it has been loosened. The looser the relationship is allowed to be to achieve whatever functional advantage, the greater the creativity and ability to adapt and improvise. But glue of commonality of identity must be proportionately stronger to bring them back together. Ants do it through smell. As a “Western” society, individualism and personal creativity is particularly strong, and one can see in daily life how this generates both cultural and individual stresses and strains that are capable of damaging the wholeness. In the UK we often hear people speak of a national identity, but as individualism strengthens, the ability to connect with that common ground seems to be weakening. It is a felt sense of commonality that is capable of dissolving and disappearing in a puff of fairy dust as soon as it is opened to the slightest critical scrutiny.

One quite extreme aspect of this is the ecological relationship between butterflies and their main food source. In fact, the caterpillars of many butterfly species are dependent on a single species of plant for food, and so without that plant, the butterfly would not exist. For example, the Monarch butterfly is completely dependent on the milkweed; and the brimstone butterfly caterpillar is reliant for food on the leaves of Buckthorn shrubs. So – does the milkweed have some shared level of identity with the Monarch butterfly? Or with the identity of the Monarch caterpillar? And what is the

relationship between the identities of the caterpillar and the butterfly? This latter question is relevant to the human embryo, which at one stage is mainly composed of cells that will eventually become the placenta. So – how does the identity of the placenta relate to the identity of the embryo and that of the final adult?

Of great importance in this example is the way that cells have organised their complex symbiotic relationship by manipulating their shared environment. In fact, it is thought that the ability of cells to come together at all into viable colonies (whether simple monocultures or complex specialisations, symbiotises, mutualisms or commensalisms) was made possible by cells developing the ability to modify their immediate environment. Note that lipids are in fact the building block of cell walls, and the most common protein and binding agent/ communication medium in animal bodies is collagen. It is perhaps necessary to think back to a stage before lipid-walled cells as we know them and to consider the structure of slime molds. Here we have nuclei in an altered matrix of protoplasm. The (slimy – i.e. viscous) matrix is manipulated by the various embedded organelles such that it forms a dendritic network of channels, reminiscent of the vascular system, whereby nutrients and waste may be distributed internally and carried outwards in less viscous streams. Here there is no distinction between cells as such – but nevertheless, the colony has a self-identity which may be separated and re-united – the reaction in both cases is a reordering of the distribution of viscosity and organelles such that the whole operates as efficiently as possible.

If identity is not so rigid, there exists an even deeper question when considering loose coupling... *How is identity defined and detected on all appropriate scales when the organism is not necessarily excluding all things genotypically “foreign”?* The principle of mutuality (or at least apparent mutuality, for many organisms at all levels of complexity have found ways to subvert and parasitise the principle of mutuality) seems to be of importance.

Expressing that in more general terms, society's recognition of a person as being part of it is complementary to an individual having a sense of belonging to society. One recognition is useless without the other. In terms of Dissociated fragments of personality, there has to be sufficient empathic sense of mutuality and commonality (compassion?) in the major core fragment before the lost part may be reintegrated; and the lost part has to be capable of recognising its identity as being a part of the core (and not having/being an identity in its own right). In fact, on a societal level, one person starts to be rejected when something about their behaviour (and/or other significant attributes) falls outside the range of normality that is acceptable. Historically, this tolerance range has varied according to different external pressures. In the UK it is now (generally) far more open to different race, religion, language, but I would say that it has become less open to ranges of mental ability and variations in behaviour than we were 40 years ago. On the other foot, an individual has to recognise something of himself in the society that welcomes him in, or at least an ecological niche that he can comfortably inhabit.

The perception and expression of normality – which then defines the identity, the “us” of society – is very strong. Clothing, habits, behaviour, language, accent, body language, and many other factors, some too subtle to identify with any clarity, are all signs that we are part of a greater whole, so then the whole recognises us as being part

of it. This wider recognition is strong even in young children, who first identify family/not-family and then rapidly go on to identify all of the signs that say (safe) larger social group/outlander. I once sat on a bus behind a woman and her roughly three year old grandson, and a guy with a mohican hairstyle got on the bus at the next stop and sat in front of them. The grandmother clearly looked nervous as the little boy was transfixed by the almost foot-long red spiky hair. After a whole minute of taking in this newness and obviously trying to fit it onto his map of the world, the three year old turned to his gran and shouted “Nan! Why does that man look like a chicken-birdie?”

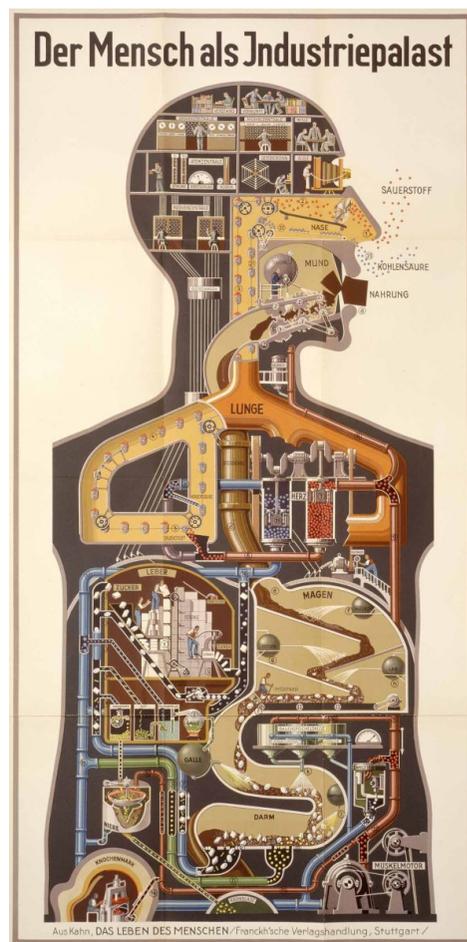
Coherence

We will stop regarding body tissue, emotions/psychology and the brain as separate entities [or] talk about them as such. We are systems. We will improve our language and our thinking. Otherwise, it is better to be silent.

- Giuseppe Gueli

In medical biology we now have grown entire organs that behave autonomously when on their own, but which work as a part of the whole when transplanted into the body. It seems reasonable that this inherent potential for autonomy may be natural to all tissue. Judging from everyday human experience – especially of dissociated states – wholeness, fragmentation and partial autonomy of those fragments may also be natural for consciousness. Dana Zohar³¹ proposed that the field of consciousness may literally be a Bose-Einstein Condensate (BEC) field that is generated by quantum states held in certain types of biological structure. Stuart Hameroff and Roger Penrose³² have taken up her suggestion that these structures are microtubules – which are found far more densely in neural tissue but also in most other types of tissue, because microtubules also orchestrate genetic mitosis during cell division. In theory, a single BEC may connect all tissue equally or there may be several BEC's coexisting within the same body.

Of course, if a part of the body is not fully coherent with the whole (and has its own internal coherence that is to whatever degree independent of the coherence of the complete organism), it is still a physical part of the whole – and so there is still some interaction. Blood and lymph flow, neurological connectivity, musculoskeletal and fascial continuity etc etc are all more or less preserved, but something has been changed. Clinically, it can be observed that the fragment becomes less able to take part if the wholeness – its structures are less able to repair themselves, the ANS (of the whole) is less able to maintain quite as wide a range of normal adaptation before it falls into an emergency response, and in DID the fragment may dominate the whole body physiology for a short time³³. So – what has happened? Is this a de-



coherence, or a dis coherence, or maybe an incoherence? The issues that arise when considering the extended body help to give some clearer picture of what may be occurring, and provide many useful analogies. In particular they indicate that we may often be far too hasty in defining an autonomous (autopoietic) entity.

Bringing it back to the Brain

There is some scientific work that points in the same direction as this loose coupling hypothesis. One of the foremost neurology researchers, Dr. Rodolfo Llinás, has formulated the theory of Thalamocortical Dysrhythmia. Here, the thalamus and certain cortical functions lose their normal rhythmic/coherent connection, whilst other thalamocortical functions remain normal. Since the thalamus conducts/orchestrates cortical activity (it is a central organiser), the cortex can no longer communicate or receive sensory information freely. An interesting corollary of this research is that cortical (i.e. conscious) activity is largely orchestrated by midbrain (i.e. often non-conscious, mammalian) processing.

Mae Wan Ho approaches this from a very different angle³⁴. She describes how living organisms have an integrating coherence that defines their thermodynamic state and allows highly efficient energy transfers between processes (and local energy storage) to take place. In particular, energy is coherent and cyclic – i.e. the body recognises a process and its location in that process. Furthermore, there appears to be a quantum-state control of coherence over large (in terms of molecular physics) volumes. Dana Zohar originally proposed this model, and one aspect of these quantum coherent states is that the presence of a single state is not an absolute rule. Instead, many self-coherent states can exist in parallel, and their relative inter-coherence may be malleable. Neuronal activity in particular is considered to be of a quantum nature (see coherence discussion above). I have seen anecdotal descriptions of serious illness disappearing when people enter certain levels of Samahdi meditation, and both Zohar and Austin³⁵ associate some meditation states with increased brain and tissue coherence.

Management systems

It is always natural to attempt to compare the organisational and control systems of the body with familiar social-scale systems to provide an accessible and familiar analogy. Social or management structures appear to be the most directly relevant, though even industrial processes and factories have been used to represent the working of the brain and body. Unfortunately, this kind of analogy doesn't work most of the time, because almost all management and social structures in the Western world are strongly hierarchical. It is hard to separate the very hierarchical brain-centred view of the human being from the social structures that we are so familiar with, because science at any one time always works with the framework of archetypes, analogies and belief systems that are current in that historical timeframe and society. Nevertheless, there are (less well-known) models of management structures in our culture that do provide a more accurate working analogy to the organisation of the body-mind, and one of

these is **Holacracy**. In fact, the Holacratic model is so organic in nature that it's worth knowing about precisely because it gives a far more accessible (and possibly realistic) representation of the inner organisation of living systems.

It is a truism that Nature is a wonderful resource that can be copied to provide highly efficient and practical social structures. Elinor Ostrom's **Common Pool Resource** is another management model that reflects and attempts to duplicate natural systems of organisation. A well functioning system modelled on Nature should *also* be able to tell us (through the particular mechanisms that have to be in place for it to work) something about how Nature organises itself.

Holacracy and the Holon

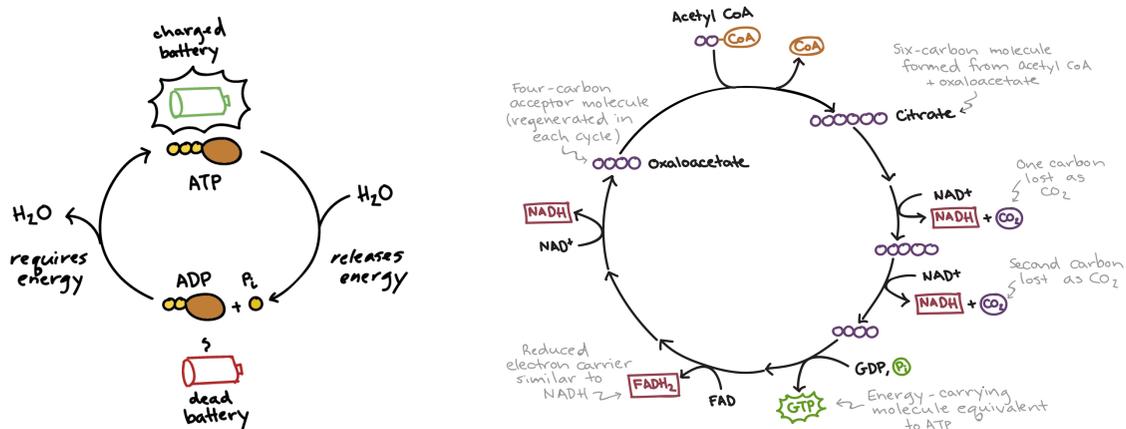
Holacracy³⁶ is "a method of decentralized management and organizational governance, in which authority and decision-making are distributed throughout a holarchy of self-organizing teams rather than being vested in a management hierarchy." It originated from the classic social-philosophical book "*The Ghost in the Machine*" written by Arthur Koestler in 1967. Here, Koestler developed the idea of a **Holon**³⁷. Holons are "autonomous and self-reliant [sub-elements, that are] also dependent on the greater whole of which they are part". As such the whole (the Holacracy) is inseparable from the Holons from which it is composed, just as they are inseparable from the whole of which they are part. In an organisation there is always the option to add or remove Holons – one can hire and fire, change physical office space, provide IT, etc. In an organism this is not an option so far as the metabolic and homeostatic functions are concerned – except that organisms have done this! Single cells group into colonies, and then differentiate. Individual organisms can group together with their own species. They may form symbiotic or parasitic relationships with other species, such as the relationship between plant roots and mycorrhizae or the microbiome and virome that co-exists in and around all "higher" animals. Or they may use tools or clothing, or dig burrows. The fixity (e.g. an artificial limb or a lifelong partnership) or looseness (e.g. a commercial business partner in another continent who is contacted as a mentor once every few years) of relationship determines the Holocratic structure. Not only is a tool or piece of clothing itself a passive kind of Holon – because it can be picked up and then put down again. But also the capacity to use a tool (or a shelter or to enter a particular relationship) is a Holon, since this ability can be used or not, and when it is used it affects the workings of many other Holons. Clothing changes the energy balance of the body and the degree to which thermoregulation dominates daily activity.

On an organisational level, running a Holacracy is not a comfortable process³⁸. All societies and companies (and scientific models, and personal lives) operate with "givens" that are supposedly so blindingly obvious that everyone should know and understand them. In reality when these givens (or a priori assumptions) are unpicked then they are often revealed to be straw men or self contradictory, or have a mythological nature, or at least exhibit extremely fuzziness, having as many different definitions as there are people using them. The nature of a Holocracy is that the kind of inconsistencies inherent in these implicit assumptions rapidly cause conflicts between different parts of the organisation, and so as each conflict is recognised, the

underlying assumptions have to be recognised, clarified and redefined. Which can often be an unpleasant experience - since implicit givens are almost always attached to belief systems, and belief systems are not pieces of knowledge, but rather are closely held near to (or even within) the sense of personal identity. In the same way, different agendas operating in a single living organism will at some point cause problems – mental and/or physical pathologies, with the net effect being at least partly dependent on the organisations levels at which these contradictions are held.

The idea of a Holon is not a million miles away from the idea of Fractals – self-similar patterns that often arise as a form of self-organisation out of chaotic systems. The word Fractal and the mathematical principles behind it were defined by Benoit Mandelbrot³⁹. Fractals are inherently self-referential, and exhibit “self-similar” patterns at multiple scales. Turbulence is one kind of Fractal pattern, as is landscape (!), as are the dendritic structures of trees, the vascular system and the bronchiole/alveolar network of the lungs. So a Holon could be viewed as a recognisable feature or pattern within a Fractal network; and whilst that way of thinking about it would not be completely correct, it would correctly convey its qualitative relationship to the rest of the system in which it is embedded.

Organs, physiological systems, biochemical cycles – can also be considered to be examples of Holons. In a very generic sense, the ATP cycle and the mitochondria that control it (or the Krebs cycle, or any of the other many self-referential cycles that maintain responsive homeostasis) can function in its own sphere as a Holon with simultaneously a certain independence and an inextricable embeddedness in the whole organism. The fact that we focus on certain metabolic cycles because the particular way of seeing singles them out does not mean that they are the only ones of significance.

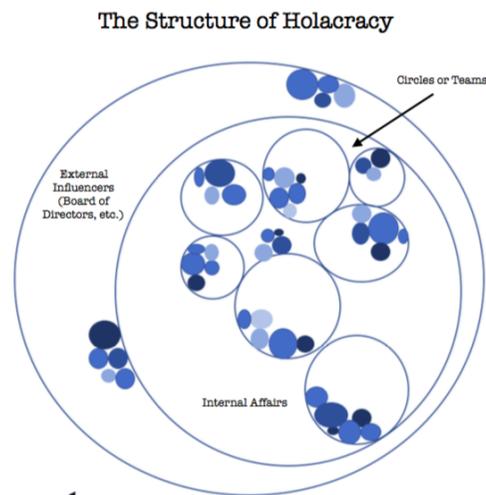


Each biochemical Holon has an intelligence in that it is responsive to the usual way that the body signals to it. Which fact means that each Holon is *also* capable of responding to signals that consequently take the entire organism further from a state of health. However, a Holon is more related to its whole-organism function than the reduced function that is visible by using a reductionist way of seeing. Jaap van der

Wal⁴⁰ showed that each muscle cannot be functionally or embryologically separated from its neural, fascial and vascular connections – so if I were to just use a single muscle as a response to some stimulus, the entire muscular, fascial, vascular neurological, and even lymphatic and immunological anatomical parts associated with that muscle would essentially form a single Holon. In reality, no single muscle is used alone, if only because the action of one muscle is almost always balanced by at least its oppositional muscle, and also by other muscles in the rest of the body that balance out various torsional forces through the entire musculoskeletal complex. Certain groups of muscles often work systemically together in a “train” of action, and one possible categorisation of these has been produced (supported by examination of anatomical dissections) by Tom Myers⁴¹.

If we took a fight-flight response in which a person was running away from a lion, each muscle and its immediate associated systems would be a Holon, as would the entire musculoskeletal system engaging in the running movement, as would the parts of the ATP cycle and other physiological homeostatic systems that were contributing towards that movement. And at the same time, many of these systems (and also maybe the muscles and/or their associated fascial or neurological or vascular or immune systems) would be involved in other processes – thermal regulation, digestion, immune response, maybe preparation for a change to a possible fight response via mirror neurons in the premotor cortex.... So the Holon is part of a Fractal system that crosses and connects parts of systemic anatomical and physiological boundaries as described in text books; and itself contains other Holons which are also multi-systemic; and these Holons are not discrete, but also overlap other Holons that are simultaneously engaged in other metabolic (etc.) activities. As the fight-flight response is no longer needed, the Holocratic body reorganises itself into a different set of Holons to most efficiently meet their new set of challenges.

The principle of Holons plays out naturally in human society if that society is not deliberately structured. We talk of organ-ising something, implying that the different parts will come together in an organic way as if they were the organs of the body. There is an innate flexibility in “unstructured” human connections that allows for a Holocratic structure to emerge. If a more hierarchical structure is imposed on a small group, the people in it often (always?) take up organisational informal archetypal roles – the clown, the organiser etc. (there are about 20 possibilities) that either enhance or subvert the imposed organisation, and nudge it back towards something that is more organic in nature. Holacracy as an organisational tool simply takes that human propensity to adopt roles instead of structure and defines the organisation in terms of roles. This attempt to formalise the informal (to take control of the uncontrollable) can actually destroy the flexibility that it was meant to create. The whole meaning of “organic” is that it is something that



creators

grows itself of itself. So something organic cannot be constructed – it evolves. Human interactions in a group evolve, are nuanced, can transcend imposed roles and labels, and are multidimensional - and so whilst the *idea* of Holacracy is correct, the principle does not sit easily in a culture that is fundamentally linear in its outlook and controlling in its nature⁴².

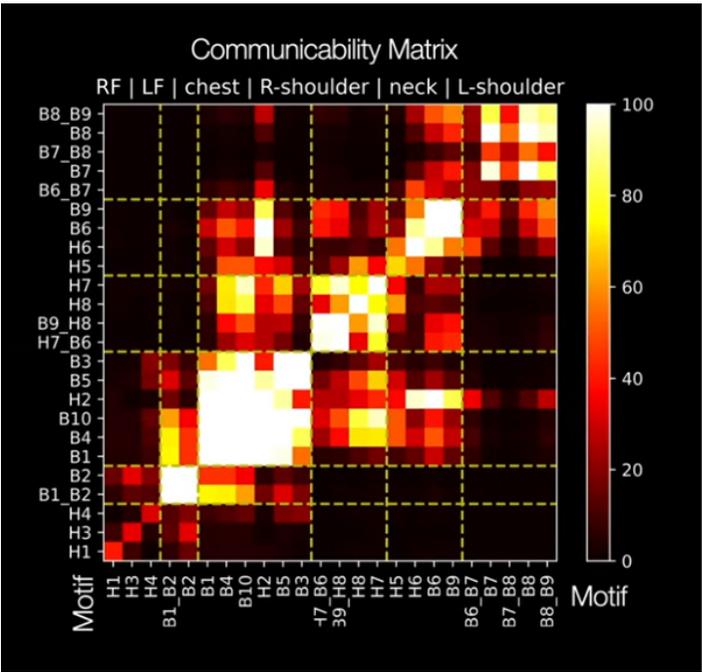
Each Holon at any one specific time and set of circumstances performs a more or less self-reliant role. But that role inside the organisation is not a fixed relationship, and can change as circumstances and demands also change. Although that role is part of the organisation, once set up it has a certain autonomy. In fact this is the weakness in Holacratic organisation, as it is the weakness in all management structures. In that some parts of the business can – if not fully integrated into the whole via excellent communication – be subject to personal empire-building or mushroom syndrome⁴³ and begin to have an agenda all of their own. This is not so different from the internal organisation of the human body-mind, in that given a free movement of consciousness through its entirety, every Holon (organ, structure, metabolic cycle, sensory system, cell, etc) continues to have both an independent life of its own in which it manages its own business, and at the same time is integrated with – coherent with – the whole. However, if there is a dis-association, then individual parts become more interested in their local agenda and are less able to participate in a coherence.

In our time there is much obsession with spiritual programmes. Such spiritual programmes tend to be very linear. The spiritual life is imagined as a journey with a sequence of stages. Each stage has its own methodology, negativity and possibilities. Such a programme often becomes an end in itself. It weights our natural presence against us. Such a programme can divide and separate us from what is most intimately ours. ... When time is reduced to linear progress, it is emptied of presence. Meister Eckhart radically revises the whole notion of spiritual programmes. He says that there is no such thing as a spiritual journey. If a little shocking, this is refreshing. ... You do not have to go away outside your self to come into real conversation with your soul and with the mysteries of the spiritual world. The eternal is at home - with you.

- John O'Donohue (Anam Cara)

What should be remembered in all these discussions of communication is that communication is never universally equal. There are always preferred communications that we pay more attention to, or that are more available. To take a modern analogy, if you use social media, you do not look at every item on the feed, and tend to look at the posts of friends, plus items that look particularly interesting – that catch your eye. And the Facebook algorithm also brings some items more to the fore and hides others. So it is in a living organism or ecosystem. So although the whole of your body is connected from the level of cell organelles right up to a macro musculoskeletal level via the tensegrity properties of the connective tissue matrix, certain directions of “signal” (tension) will pass more easily between some areas than others. This has been demonstrated on the level of the molecular motion and

interactions of proteins in computer simulations. The figure below⁴⁴ shows the communicability matrix for the many different “geographic” parts of a large protein (which have been anthropomorphically termed neck, shoulder, etc) – i.e. how easily a perturbation moves from one place to affect another. This works in two ways. Firstly there are certain preferential signal pathways where communication is more direct, coupling these areas together quite strongly. So for instance, the various hamstring muscles of your leg tend to work together most of the time, with small variations depending on the specific direction of force. Secondly, ease of communication in one area can inhibit communication elsewhere, or can temporarily disengage two areas. We experience this with our senses, as strong use of one sense (such as thinking) tends to reduce other senses (it’s hard to feel the body, or even hear sounds if there is a lot of mental concentration). So the large white area bottom left indicates parts of the protein that are so communicative that they are essentially operating as a block, such as might happen with a frozen shoulder – or where a part of the body is “locked” so as to increase strength in a limited movement. The dark areas in the figure indicate that these parts of the protein are working independently, and their activity is hardly affected at all by what is going on elsewhere. The interesting areas are those in the middle zone, say 20-70%, where there is plenty of communication, but not enough to lock them together. This is the arrangement of the L/R hemispheres of the brain – as we will discuss elsewhere.



Elinor Ostrom & Common Pool Resource

A resource arrangement that works in practice can work in theory.

(Ostrom's Law, as described by Lee Anne Fennell)

There are eight design principles that define Ostrom's system of organisation, which I have here related to biological analogies.

1. *Clearly defined (clear definition of the contents of the common pool resource and effective exclusion of external un-entitled parties).* This is equivalent to the overall template of the organism, perhaps something similar to, but more comprehensive than the Sheldrake's morphic resonance. It is unusual to ask the question "how do I define a human being?" But just an organisation needs to be clearly defined in terms of its location, purpose, ethics, etc., so there are somewhat implicit but nevertheless clear principles that define a living organism. Optimisation of function is one clearly defined principle.
2. *The appropriation and provision of common resources that are adapted to local conditions.* Here we are looking at the internal and external assimilation of resources (water, air, food, companionship, etc) that nurture life. This might include the storage of fat, or maybe storage of a memory of where to find salt. Or on a more local scale within the body this describes (e.g.) the local flow of blood, etc.
3. *Collective-choice arrangements that allow most resource appropriators to participate in the decision-making process.* At its simplest level this is essentially a description of the internal feedback loops that determine homeostatic balance.
4. *Effective monitoring by monitors who are part of or accountable to the appropriators.* All organisms maintain a set of checks and balances. Slightly more subtly (e.g.), the body is electrosensitive, but - within a range of signal that is not physically damaging - its sensitivity is not dose-dependent. Rather, it appears that cells and systems are capable of deciding whether the signal is generated internally or externally by checking its amplitude, and so excessively strong signals are ignored (rather like you would ignore traffic noises and vibrations from a street outside the house) just as weak signals are ignored.
5. *A scale of graduated sanctions for resource appropriators who violate community rules.* Cells that are not viable are subject to apoptosis. Cells that are not properly sanctioned become cancerous.
6. *Mechanisms of conflict resolution that are cheap and of easy access.* Another facet of homeostasis is that it is a continuously shifting balance between conflicting agendas, for which an optimum compromise has to be "agreed" by the whole body. If social structures could replicate the homeostatic balance achieved by just a single primitive cell, then we would live in a peaceful world.
7. *Self-determination of the community recognized by higher-level authorities.* This describes the body-mind, or the need for the body to be at least semi-autonomous (i.e. Loosely Coupled) – and indeed, all functioning systems to have their own responsive intelligence - so that the body works efficiently. "Recognised by higher authorities" in our case means that the conscious mind recognises the body-mind, cooperates with it, communicates with it as need be, looks after it through proper care and nourishment, provides a higher authority that guides the whole organism, and manages it appropriately by recognising the proper domains of conscious will and non-conscious

(physiological) intelligence. On a more mundane level, it means that the social position and potential contribution of any one individual is optimised when it is valued and supported by the whole community – especially by the leaders of the community/society.

8. *In the case of larger common-pool resources, organization in the form of multiple layers of nested enterprises, with small local CPRs at the base level.* This simply describes the Fractal/Holon basis for organisation of a complex multicellular organism living in an ecosystem and a society.

By far the most important of these principles – to the extent that all the rest will stand or fall by how well it is constructed – is the first principle of definition. The meaning of the whole organisation/organism and its self-identity as a functional whole existing within that meaning is the glue that binds everything else together. But outside and beyond the more obvious and mundane definitions that would lie behind a corporate organisational structure, these meanings are often intangible and resist easy definition. How would you define a Forest? Natural systems may sometimes appear to have clear boundaries – such as the skin, or to a marine animal the upper surface of the sea. But when looked at in detail, there are no natural systems with truly pristine, impenetrable and impermeable boundaries. Life depends on communication, which requires permeability; albeit controlled / controllable or qualitatively predictable permeability. The human being depends not only on a colony of bacteria, some of which (such as the subdermal bacteria responsible for antibiotic defence) physically live inside the body – but also on a virome, a relatively stable colony of viruses that also have regulatory and immune functions, which probably contribute to epigenetic and genetic adaptation, and which exist in a continuity with the (external) environmental virome. And since we are so reliant on farmed animals for our food security - battery chickens being the single most populous large animal on Earth- it could be said that the human organism also includes the battery chickens, just as a nest of leaf cutter ants includes a colony of fungus.

In a similar way, national identity clearly exists, but exactly what underpins it is not particularly easy to define beyond the particular piece of land that people live in or maybe also their language. Or, in the case of the Jewish peoples who had no land of their own for two millennia, their particular religious tradition. But national identity is more than just land – however powerful that may be. Churchill might have been flawed in many ways, but he understood the mysterious combination of loyalties, history, landscape, language (his speeches were deliberately filled with words that had ancient linguistic roots⁴⁵), place, food, clothing, ceremony, mannerisms, body language, and other even more ephemeral factors that hang a nation together. None of the above seem significant, but removal of just a few because they seem to be unimportant can result in the whole edifice collapsing. Amplifying a few of them likewise increases the internal pressure of nationalism so that it can take on “*a life of its own*”.

Olstrom and her co-workers have continued to develop the Common Pool Resource into a "Social Ecological Systems (SES) framework", which is still evolving as a possible template for the organisation of future non-hierarchical self-governing human societies. Self-organisation is recognised in all its forms – physical (such as the formation of crystals or weather systems), chemical, biological and societal – to be inherently

chaotic, but that “something” orders and organises the chaos. Chaos is inherently self-organising because of the 2nd Law of Thermodynamics⁴⁶. Physical and chemical systems always gravitate towards lower energy levels (increased entropy). Biological systems always defy the 2nd Law by optimising energy *expenditure*. This arises as they necessarily gravitate towards the optimisation of survival, which implicitly means the optimisation of energy usage by cyclic internal processes and through cyclic interrelationships in the wider ecosystem. But whether being driven by the 2nd Law or resisting its action through resource-(re)cycling, the underlying forces being dealt with are inevitably chaotic. It is odd that “civilised” human societies have instead historically shunned chaos, allowed themselves to be dominated by individuals who have interrupted this conserved recycling of resource by creating a hierarchy of power and dominating the flow of resources to a central point. The construction of solid stone or brick buildings seems to be one of the driving forces behind this conservatism. The creativity of organic chaos has been abandoned for something that is more certain and yet less life-giving, with different kinds of creativity. Since civilised society has staggered from one war to another through 10,000 years of history, it would seem that the priority for centralised stability has been the wrong choice, and it is the more primal stability that arises in the chaos of turbulence – the flux of interrelationship that we have evolved within, that is the real source of creative stability.

Whilst some factors in self-organisation might be very rigid, such as the presence of an atmosphere containing 20% oxygen, or the isolation of a country by mountains or sea, or the scarcity of certain nutrients in the environment, or the relative stasis of a group of cells growing more slowly in an embryo than the cells around them; the forces that cause this self-ordering to occur *without* creating a rigid (and therefore brittle and unresilient set of relationships) are on the whole delicate. Lao Tse described successful government as being similar to “cooking a small fish”. And is it not strange that our physical body can move as a result of a mere thought?

Critical Leadership Studies

As a means to summarise this chapter and point it deliberately back towards the human organism, trauma and overwhelm. Dr. Jem Bendell⁴⁷ is founder of the concept of Deep Adaptation⁴⁸. In a lecture⁴⁹ describing Critical Leadership Studies, he makes several points about leadership and management that can be translated directly into a description of biological loose coupling and the – let’s call it – evolved optimum relationship between the mind and the physical (biological/homeostatic) body. He begins by quoting one of his course participants :

Leadership is not about having followers, but following your passion and believing that a better world is possible -- Nandita Das

The fact is that if one is passionate, then that passion is infectious, and so people will follow it because they are inspired. The leadership then arises because of the attractive nature of joy, vision, clarity, and of someone doing what they love. Ideally we would all do what we love, but so few people actually do that in much of their

lives, and usually passion is channelled into something that is the personal rather than public sphere. But the way that passion rouses unexpectedly deep reserves from the body-mind was recognised by Goethe :

*The world of the happy is quite different from that of the unhappy*⁵⁰.

If you think of a dog out on a walk, then here we have a happy creature. It wags its tail, sniffs, explores. It is expressing constant appreciation, and curiosity – enjoyment. The world is one of endless possibilities. William Hutchinson Murray took Goethe’s quote and expanded it wildly, recognising how passion also taps into the collective unconscious and starts to manifest synchronicities :

Until one is committed, there is hesitancy, the chance to draw back. Concerning all acts of initiative (and creation), there is one elementary truth, the ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits oneself, then Providence moves too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, raising in one's favor all manner of unforeseen incidents and meetings and material assistance, which no man could have dreamed would have come his way. Whatever you can do, or dream you can do, begin it. Boldness has genius, power, and magic in it. Begin it now.

When analysing all possible definitions (and realising that “Leader” is different from “Leading” is different from “Leadership”) – Bendell states that “Leadership involves helping groups to understand why and how to work together for significant change.” There is a function of bringing together, in which the leader is not the engine that drives the enterprise (as Napoleon would have had it, stating that “The General IS the army”), but is more a locus of organisation around which things are lightly directed and then happen through the response of everyone. Having worked in hierarchical tightly controlled management systems (e.g. the mining industry) I can definitely say this isn’t how management or the process of being managed is usually viewed. But the quality of “Leadership” is not the same as “Dictatorship”, because it allows for everybody to express their best in the way that is natural for them to express it. As an analogy for a relationship between the conscious will and the body-mind, we are starting to see something useful here.

Quoting Kranz (1990)⁵¹ :

... at the center of this evolving drama is the critical need for organisations to adapt to constantly fluctuating environments ... this change renders large centralised hierarchies obsolete and selects for systems in which (leadership) resides in the outer boundaries as well as in the center.

This is the body. Although we would like to think that the brain is the place where intelligence resides and we “run” the brain by “thinking”, in fact intelligence is distributed through the body – even to the periphery, as the sensory organs of touch organise the motor (musculoskeletal) system to better feed them with information. If the body were a corporation, we could not abuse it as we do. It would need attention, motivation, nourishment, and whatever the corporate equivalent of Joy

might be. Bendell eventually comes to the conclusion :

*Critical leadership scholars and practitioners often suggest leadership to be construed as an **emergent**, **episodic** and **distributed** activity to help groups to develop and achieve significant purpose.*

From a biological point of view, one could say that whatever aspect of the whole body-mind complex is required to stand up to the plate and deal with a particular combination of circumstances – will do so in an emergent way, and may arise from any part of the body-mind complex – and it can only do so provided that the mind does not rule with an iron fist, or is not so preoccupied that it cannot hear, understand, or respond to the body's intelligent presence. Leadership – like “identity”, “human being”, and even concepts such as “intelligence” is mythologised, and so the common notion of it is badly out of synch with its true purpose. Simply put, if there is a misunderstanding of something's nature and process, then it cannot be properly used – i.e. it cannot be optimally used, its mis-use may (will) cause problems, and its full potential is not available or even visible.

Notes : Chapter 8.3

- 1 The Conversation: Episode 18, interview with David Korten. <https://www.findtheconversation.com/episode-eighteen-david-korten/>
- 2 Dr. Jaap van der Wal (Apr 26, 2020) What The Embryo Has To Say About Togetherness. <https://www.youtube.com/watch?v=IBMqXLVU1IQ&feature=youtu.be>
- 3 Moyle, M.W., Barnes, K.M., Kuchroo, M. et al. Structural and developmental principles of neuropil assembly in *C. elegans*. Nature (2021). <https://doi.org/10.1038/s41586-020-03169-5> with a summary at Neuroscience News | Artificial Intelligence (February 24, 2021) <https://neurosciencenews.com/imaging-brain-development-17874/> “Capturing the Choreography of a Developing Brain”
- 4 <https://searchnetworking.techtarget.com/definition/loose-coupling>
- 5 Flore Sinturel, Pascal Gos, Volodymyr Petrenko, Claudia Hagedorn, Florian Kreppel, Kai-Florian Storch, Darko Knutti, Andre Liani, Charles Weitz, Yann Emmenegger, Paul Franken, Luigi Bonacina, Charna Dibner & Ueli Schibler (2021) Circadian hepatocyte clocks keep synchrony in the absence of a master pacemaker in the suprachiasmatic nucleus or other extrahepatic clocks. Genes & Development 35:1–6 Feb doi:10.1101/gad.346460.120 and at <https://neurosciencenews.com/cellular-clock-synchronization-17837/>
- 6 ... and in the several developmental hiatuses during which small elements of the previous organisations are substantially re-organised – such as the re-routing of blood, conversion to ingested food and inhaled oxygen and other associated shifts immediately after birth. Or the less critical shift in brain function during adolescence.
- 7 Quote from Wikipedia: **Pando** (Latin for "I spread out"), also known as the trembling giant, is a clonal colony of an individual male quaking aspen (*Populus tremuloides*) determined to be a single living organism by identical genetic markers and assumed to have one massive underground root system... Pando occupies 43 hectares (106 acres) and is estimated to weigh collectively 6,000 tons, making it the heaviest known organism. The root system of Pando, at an estimated 80,000 years old, is among the oldest known living organisms. [https://en.wikipedia.org/wiki/Pando_\(tree\)](https://en.wikipedia.org/wiki/Pando_(tree))
- 8 Thijs R. Klompaker (2005) Lifetime high calcium intake increases osteoporotic fracture risk in old age. Medical Hypotheses 65(3): p552-558 <https://doi.org/10.1016/j.mehy.2005.04.022>, or at <http://www.4waisays.com/eng.htm> : Excessive Calcium Causes Osteoporosis. <http://www.4waisays.com/ExcessiveCalcium.htm>
- 9 James Gallagher (7 October 2019) How our cells sense oxygen wins Nobel prize. BBC news <https://www.bbc.co.uk/news/health-49959737>
- 10 Jeffrey Perkel (May 14, 2001) Seeking a Cellular Oxygen Sensor: The fundamental question of how cells sense oxygen has implications for embryogenesis, cancer, stroke, diabetes, and other ischemic diseases. <https://www.the-scientist.com/research/seeking-a-cellular-oxygen-sensor-54701>
- 11 Sophie Strand (1 Mar 2024) Swarm is Song <https://sophiestrand.substack.com/p/swarm-is-song>
- 12 https://www.youtube.com/watch?v=tuzd8I_mwc4
- 13 <https://www.youtube.com/watch?v=hXqg08xdhVw>
- 14 This is in the context of considering emotions to be higher level summaries of an appropriate response to a situation. In a similar vein (to make the comment on grief perhaps more understandable) anger is a gathering and eruption of outwardly directed

Notes : Chapter 8.3

energy, associated with a pumping up of the body's muscles ready for fight.

- 15 see <http://faculty.plts.edu/gpence/PS1012/PDF%20files/Grief.pdf>
- 16 In this case the spinal reflexes run locally generated movement patterns, and these are modified both locally and by the central organiser according to sensory feedback. The central organiser (“identity” or “whole organism”/animal) only pays attention to the motion or the sensory feedback in so far as it needs to modify it and organise its generic agenda. Otherwise the neural system external to the brain takes control and constitutes a semi-autonomous layer. As an extreme example, decapitated frogs are still capable of moving their limbs in an organised way to wipe away skin irritants. This arrangement is described in detail in Giszter SF, Moxon KA, Rybak I & Chapin JK (2000) A Neurobiological Perspective on Humanoid Robot Design. IEEE Intelligent Systems July/August, pp64-69
- 17 Katarina Zimmer (July 6, 2021) ‘Social’ Mitochondria, Whispering Between Cells, Influence Health: Mitochondria appear to communicate and cooperate with one another, both within and between cells. Biologists are only just beginning to understand how and why. Quanta Magazine | cell biology <https://www.quantamagazine.org/social-mitochondria-whispering-between-cells-influence-health-20210706>
- 18 Ann Gill Taylor, LE Goehler, DI Galper, KE Innes & C Bourguignon (2010) Top-Down and Bottom-Up Mechanisms in Mind-Body Medicine: Development of an Integrative Framework for Psychophysiological Research. Explore (NY) January ; 6(1): 29. doi:10.1016/j.explore.2009.10.004
- 19 Espejo, R (2003) The Viable System Model : A Briefing About Organisational Structure. <http://www.scribd.com/doc/22177797/The-Viable-System-Model-A-Briefing-about-Organizational-Structure>
- 20 Rocha, Luis M. (2000). "Syntactic autonomy, cellular automata, and RNA editing: or why self-organization needs symbols to evolve and how it might evolve them". In: Closure: Emergent Organizations and Their Dynamics. Chandler J.L.R. and G, Van de Vijver (Eds.) Annals of the New York Academy of Sciences. Vol. 901, pp 207-223. available online at <http://informatics.indiana.edu/rocha/ps/sa2.pdf>
- 21 Church, M. (2005) Adaptiveness In Human Social Organisation: Some Guiding Principles <http://www.flowmap.com/documents/human-adaptiveness.htm>
- 22 Ackerman, S.D., Perez-Catalan, N.A., Freeman, M.R. et al. (2021) Astrocytes close a motor circuit critical period. Nature 592, 414–420. <https://doi.org/10.1038/s41586-021-03441-2> and at <https://neurosciencenews.com/astrocytes-brain-plasticity-18201/>
- 23 <http://www.bbc.co.uk/news/science-environment-22462855> – a summary of Babikova et al (2013) Underground signals carried through common mycelial networks warn neighbouring plants of aphid attack. Ecology Letters, May DOI: 10.1111/ele.12115
- 24 http://www.british-institute-of-osteopathy.org/articles/germ_theory.aspx
- 25 http://www.british-institute-of-osteopathy.org/articles/origin_germs.aspx
- 26 http://www.british-institute-of-osteopathy.org/articles/the_role_of_micro_organisms.aspx
- 27 <http://www.youtube.com/watch?v=xukDIWFMI9Y>

Notes : Chapter 8.3

- 28 <http://www.lbl.gov/LBL-Programs/lifesciences/BissellLab/minapersonal/incyte.htm>
- 29 <http://www.nytimes.com/2013/09/17/science/dna-double-take.html>
- 30 <http://medicalxpress.com/news/2013-11-patchwork-genetic-variation-brain.html>
- 31 Dana Zohar (1990) Quantum Self. Publ Flamingo
- 32 <http://www.quantumconsciousness.org/penrose-hameroff/quantumcomputation.html>
- 33 Reinders et al (2012) Fact or Factitious? A Psychobiological Study of Authentic and Simulated Dissociative Identity States. PLoS ONE online journal <http://xa.yimg.com/kq/groups/21468484/887045984/name/Reinders%20et%20al%20plos%20one%202012.pdf>
- 34 Dr. Mae-Wan Ho (1995) Bioenergetics and the Coherence of Organisms. Neuronetwork World 5, pp 733-750, reproduced online at <http://www.i-sis.org.uk/prague.php>
- 35 James H Austin (1998) Zen and the Brain: Toward an Understanding of Meditation and Consciousness. MIT Press. ISBN 0262511096
- 36 <https://en.wikipedia.org/wiki/Holacracy>
- 37 [https://en.wikipedia.org/wiki/Holon_\(philosophy\)](https://en.wikipedia.org/wiki/Holon_(philosophy))
- 38 Michiel van Gerven (3/Apr/2019) Experiments with Holacracy: Why we stopped doing it, and what we learned along the way. <https://www.organizeagile.com/update/experiments-with-holacracy-why-we-stopped-doing-it-and-what-we-learned-along-the-way/>
- 39 Mandelbrot, Benoît B. (1983). The fractal geometry of nature. Macmillan. ISBN 978-0-7167-1186-5.
- 40 van der Wal J. (2009). The architecture of the connective tissue in the musculoskeletal system-an often overlooked functional parameter as to proprioception in the locomotor apparatus. International journal of therapeutic massage & bodywork, 2(4), 9–23.
- 41 Thomas W. Myers (2013) Anatomy Trains: Myofascial Meridians for Manual and Movement Therapists (3rd Edition) Publ. Churchill Livingstone ISBN-13: 978-0702046544
- 42 Jurgen Appelo (Jul 14, 2016, 07:45am EDT) Holacracy Is Fundamentally Broken. Forbes Magazine. <https://www.forbes.com/sites/jurgenappelo/2016/07/14/holacracy-is-fundamentally-broken/>
- 43 Mushroom syndrome: a state in which a group of people are largely ignored, left to their own devices and shouted at when something goes wrong ... “in a dark room full of shit.”
- 44 NanoRooms (Mar 29, 2024) Bringing Biology’s Molecules to Life Using Physics <https://www.youtube.com/watch?v=ncC-GMzF9RY>
- 45 Melvyn Bragg(2004) The Adventure Of English. Publ. Sceptre ISBN-13: 978-0340829936
- 46 Ilya Prigogine (1997) The End of Certainty: Time, Chaos and the New Laws of Nature. Publ. The Free Press ISBN-13: 978-0684837055
- 47 Professor of Sustainability Leadership at Cumbria University

Notes : Chapter 8.3

- 48 <https://deepadaptation.ning.com/events/deep-adaptation-leadership-q-a-with-prof-jem-bendell>
- 49 Dr Jem Bendell (Apr 15, 2020) An Introduction to Leadership - Lecture <https://www.youtube.com/watch?v=6jpoXcg84vc>
- 50 “Die Welt des Glücklichen ist eine andere als die des Unglücklichen.”
- 51 Krantz, j (1990) Lessons from the field: the crisis of leadership in contemporary organisations. Journal of Applied Behavioural Science 26(1), pp49-64