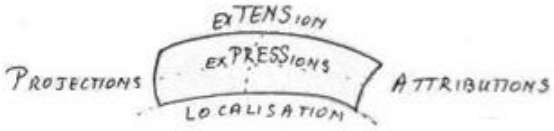
A biased little history of topology

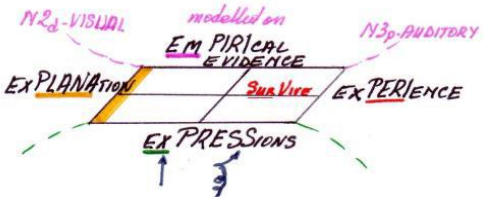
The many names of the generic Ex-/Out-/Up- oriented Advancement Axis express a common 'Ex-' orientation both philosophical and scientific views. Please compare:

Knowledge of the 'Ex-' and 'Up-' orienting:

Philosophical knowledge of 'Ex-':



Scientific knowledge of 'Up-':



Practical knowledge of 'Out':
« ungrounded »

Figure 1: the 'Up' & 'EX-' one-way orientation in both human and scientific domains. (in Bouchon PhD thesis 2008)

In daily life, many are familiar with pressure, sense of peril or threat, the 'fires' of inflammation or in the brain, and of being 'pushed' into stress or to learn or express one's potential (if deemed existent). This is an orienting to increasing pressure. It also reflects individual greeds for 'more' of all kinds. Human *Ex*pansionism on the planet, ecologic or economic, is a 'high' form of this 'Ex-' axis ('high' is more 'deployed' or advanced like a disease), and a tendency inherent in the System of large-numbers populations in the *'World of Human Organised Society'* (WHOS). This is a tendency to spread from whichever geographical region, and expand in any number of ways – all the ways display this same property, no matter in which context.

How Topology came to be

1 Early forms of topology: Geometria Situs and Analysis Situs

Extension (in Enlightenment philosophy) and localisation (its scientific symmetric) gave rise to a new general discipline, first called *'geometria situs'*, arising from both mathematics and a way of meta-thinking or seeing the geometry of a *general* situation, *including how it arises* (e.g. the occurrence of human faculties, or the appearance of animals and plants).

Mathematical tools and the integration of geometry and analysis, helped develop *geometria situs* into a discipline of mathematics, *'analysis situs'*, which allowed ways of representing more specific circumstances, and analyse measurable *small* distortions in physical space. This constitutes a transfer from the human to the scientific domain. In this transfer of knowledge, the notion of describing the 'rise' or 'whence' of something is lost.

> *Changing Geometry:* Think of a balloon with spots on it, being blown with air: as it expands, its surface becomes more extensive, and the localisation, size, shape and colour of the spots on the spatial surface are altered slightly, progressively, but a spot remains a spot. Any physical surface will behave with the same *generic* properties of *expanding surfaces.*

This fundamental form of *analytical geometry* – topology - is well suited to describing *small* distortion, progressive, such as biological variation or subtle functional alterations, but another form of topology became more popular as mathematics advanced.

2 Classic mathematical topology

The association to the notion of 'topography' of a *physical place*, generalised to representing any situation in a 'space' led to the new discipline of topology, capable of representing localisation in *general* spaces (concrete or abstract). Localisation in physics is correlated to Extension in philosophy. The new discipline studied small distortions in spatial location or placement (*topo-*) and is sometimes dubbed a 'rubber sheet geometry'. This mathematical form of topology describes topologic properties that are *preserved* under *small spatial* distortions of shapes and spaces, (e.g. stretching, bending, twisting), but are *not preserved* if 'tearing' the surface.

They can be modelled with computer-produced geo*metric* animations. However, the discipline lost track that these descriptions were in the context of an axiomatic premise of *extension: expanding* spaces, and that their capacity to describe *voluminous (3D spaces, and in motion,* arose from the properties found on surfaces, which are geometric. This form of topology is suitable to describe technical details of distortion, deformation, but also processes such as disturbance, perturbation, etc. It is used, for example, in biology for the life cycle of salmon, deeply affected by stress hormones that deform the body at the end of life. However, it is dependent on the abstract mathematical tools derived from a *combination* of parameters of representation that it uses to describe physical and abstract spaces.

3 Computerised topology – the drift in topology: from 3D spatial to 4D-0D tearing

Contemporary topology: the baseline property of Boundary and 'passing' boundary

With the introduction of other mathematical tools such as exponentials and integrals, probabilities and statistics, the 'science of shapes' and point-set theory (systems made of inter-related parts), contemporary topology and computerised modelling can describe both *extension* and *localisation* in spaces generalised to more mathematical dimensions, but in the form of *large* deformations, re-formation, or *trans*-formations *at* Boundary (into new dimensions or orders), in which topologic properties are *not preserved*. Examples are metamorphosis and the hazy notion of emergence.

> *Changing the Geometry fundamentally:* Imagine the balloon surface caving in, passing through a hole, and re-developing into another balloon, inside-out. The combination of balloon 1 and (after the hole) balloon 2 is a 2-surfaced boundary. The properties of the balloons are inverted, and those of balloon 1 are *not preserved* in balloon 2. Physical surfaces do not do that, but humans do 'turn jacket' under pressure.

Figure 14: (Figure 39 in Bouchon 2008, Appendix C4).
Turning jacket: outside and inside are the two different values of a measure called parity.

This contemporary form of topology often uses hyperbolic geometry and focuses mostly
- on the *increases* along the oriented (one-way) 'Ex-'/'Out-/'Up' Advancement or Complexification Axis;
- on 'passing boundary' (reaching, pushing, and breaching), singularities and *dis*continuity processes that 'tear the fabric', quantum-jump, have chaotic beginnings (including that of the universe), catastrophic ends, spiralling in dark holes or wormholes (applied to climate/weather and human behaviour), emergent orders of complexity, etc.
- on *topographic properties* of geo*metric boundaries*, such as connectedness (or continuity, contiguity), compact spaces, etc.

This advanced form of topology is suited to describing
- critical stages occurring along the Advancement Axis such as crises in various orders of gravity, including diseases or emotional extremes and psychiatric consequences, but not how to maintain well-operating,
- extensively advancing developments such as expansionism in economy or politics or wide-spreading pain in female syndromes (but not the more common daily-life desire for integrity of a small business without expanding operations, for example, or simply allowing the body to return to a non-pained state)
- how a situation employs and deploys survival means or 'shapes up' *through repeated critical* stages, which often become an endless story (but not how peaceful activity can be kept on track, yet still develop its potential)
- Transformation and evolution (but not uneventful progressive development)

This kind of topology deals with *large* distortions, and lost track of *small* distortion, *subtle* changes, *preserved* topologic properties (i.e., the integrity of shape, structure or function, under *slightly* altered conditions rather than submitted to boundary or intense initial conditions, is not described by these methods), and of its primary property – Boundary –, which is fundamentally a geometric surface, not numbers, and is correlated with its primary operational axiom – the tendency toward High Advancement.
An example of these differences is that between free access to basic education so anyone can participate in TechnoSociety, and the technological or leadership High Education being pushed onto 'under-developed' countries. There is a fundamental difference: the exclusiveness and counter-productive effects for the majority.

In medicine, this kind of topology is used to seek genetic defects, to map the brain in normal mental localised activity and in diseased people (but not the subtle functional alterations such as swelling or shrinking – e.g. in cerebro-spinal fluid, blood volume, or cells – before even 'pre-disease' states.) It could help study epigenetic changes initiated by a traumatic or induced birth that characterise the stress-related drift in human health connected to 'water strain' (but not how to simply stay well hydrated, safe & sound).
This approach, most common in contemporary general models and practices connected to complexity, is found in both human and scientific domains, and connected also to general systems theory. It is also found in practices and human behaviour, but it is a topological reduction: There *are* other approaches, in behaviours and lifestyles found in daily life in certain individuals, some observed in my fieldwork.

4 Basic geometric topology (non-algorithmic) to complement advanced topologies

If we are to create policies that take into account the *small* alterations of human-scale daily life (not just for humans), then contemporary topologies that arise from complexity mathematics that model transformations need to be complemented by earlier forms of non-hyperbolic topology. Attempts at this, such as 'simplectic' and other topologies are not quite an equivalent to un-deploying the complexity, and they complicate things even more with arbitrary details, not contributing to the ability to retain living without too much disturbance or to a manageable degree of societal and physical complication that does not make us sick, tired, confused, and feeling threatened or at risk. 'Basic' geometric topology, on the other hand, models *very small* distortions and thus allows seeing how to remain safe and sound.

'Basic' geometric topology: non-algorithmic

The main advantage of this simple geometric topology is to help visualise and model aspects impossible to represent with other methods, conventional representations, mathematical topologies, and ways of valuing.

•This basic geometric topology is the only modelling method that allows figuring directly what a situation 'looks like. It can visualise *simultaneously* the 'whence & wither' of a situation, 'where' it comes from and 'where' it goes (independent of material space). This means how it arises (independent of time), and how it deploys (independent of time bound evolution, form development). This is not limited a singular origin or underlying cause, and is different from future prediction according to conventionalised parameters. This topologic method allows an imaging of the situations observed without discriminatory fragmentation, **'gauging'** simultaneously its origins and end results independently of contexts and details or contents, rather than defining for example cause and effects or multi-factorial triggers of critical characteristics. It does not use simplified and complex representations of details nor does it generalise. I**t describes how a situation 'presents' directly rather than re-presenting it**.

•It has its own domain of validity, different but complementary to the conventionalised specific-general representations. It gives a more complete 'big picture', albeit less detailed, but free of biases induced by the habitual parameters of representation (e.g. space & time, natural & human, body & mind, and other combined parameters, or simplifying ones such as [0.1], duality or motion parameters). Instead, it is a generic modelling that describes change in geometric-kinetic terms — this is its topologic nature: describing distortion during its process.

The multi-dimensional geometric topology

As a topologic modelling, it belongs to the geometry part of mathematics; it is a 'dimensional' geometry, dealing with geometric dimensions (1D, 2D, 3D, 4D, 0D). This can be transferred into thinking in the advanced terms of 'logical orders'. It can therefore model deployment in sets of 3 orders or 2 shifts (same simple difference as in intervals). This permits understanding a deployment as an « orienting » and generic « activation », but also its un-deployment, which is not the same as a reversal. As such it is **a «Geometry of Mind»**, as demonstrated by Roger Penrose in public videos. The 3 orders can be imaged as a process of going near a boundary surface, being at boundary, and going past boundary — in other words, crossing a boundary. The 2 shifts can be imaged as passing a boundary one-way and then passing it again the other way. So this method of thinking is ideal to understand 'boundary behaviours' and crises. The combinatorics of (2,3) was once described by Penrose as a fundamental way of parametrising representations. This is related to the fact that ancient traditions used dualities and trinities to describe something 'beyond' humans or human mind. Using both this combinatorics and the multi-dimensionality together could be computerised to create 3D animated visualisations of boundary behaviours at limits in any field, and auto-reinforcing processes (by circular motions or alternative/oriented symmetries).

The Animated Geometry – a non-algorithmic cognitive mode undescribed in the literature

However, the advanced form of the Animated Geometry misses an important point: the ability to describe activity that is **auto-limiting** and away from boundary (the osmotic 2-oriented gradients of water and solutes are auto-limiting, but through a surface). This is particularly useful to understand processes that '*approach*' boundary (or limits) but remain 'near boundary' or even away from it. Not quite 'reaching' thresholds, they act 'without tearing the fabric', passing operational limits or breaching structural boundaries, and describe an operational mode that *retains* structural-functional integrity (no large disturbance or crisis, no large deformation or trans-formation).

This basic geometry of this topology is directly related to the human body's vertical stance (hence the vertical axis 'up' – up to the head, up to the sky, up to extremes). As a **simple Animated Geometry**, it is **a «Geometry of Sensation»**, and **an *inherently biological* 'sensing'** or being aware. It describes *non-oriented* fluid activity *without entraining* 'high' deployments and processes of oriented activation (of brain, mind, and 'higher' cognitions, or simply high-energy molecules production in cells), which leads to limits and Boundary behaviour. According to all categorical representations, the non-orienting is deemed 'non-existent', because it cannot be represented by the algorithms, numbers, words, and images of 'information'. Penrose mentions that 'awareness' is non-algorithmic; it is a property of living beings.

Two non-algorithmic forms of geometric topology

The main advantage of this simple geometric topology is to help visualise and model aspects impossible to represent with other methods, conventional representations, mathematical topologies, and ways of valuing.

•This basic geometric topology is the only modelling method that allows figuring directly what a situation 'looks like. It can visualise *simultaneously* the 'whence & wither' of a situation, 'where' it comes from and 'where' it goes (independent of material space). This means how it arises (independent of time), and how it deploys (independent of time bound evolution, form development). This is not limited a singular origin or underlying cause, and is different from future prediction according to conventionalised parameters. This topologic method allows an imaging of the situations observed without discriminatory fragmentation, **'gauging'** simultaneously its origins and end results independently of contexts and details or contents, rather than defining for example cause and effects or multi-factorial triggers of critical characteristics. It does not use simplified and complex representations of details nor does it generalise. I**t describes how a situation 'presents' directly rather than re-presenting it**.

•It has its own domain of validity, different but complementary to the conventionalised specific-general representations. It gives a more complete 'big picture', albeit less detailed, but free of biases induced by the habitual parameters of representation (e.g. space & time, natural & human, body & mind, and other combined parameters, or simplifying ones such as [0.1], duality or motion parameters). Instead, it is a generic modelling that describes change in geometric-kinetic terms — this is its topologic nature: describing distortion during its process.

The multi-dimensional geometric topology

As a topologic modelling, it belongs to the geometry part of mathematics; it is a 'dimensional' geometry, dealing with geometric dimensions (1D, 2D, 3D, 4D, 0D). This can be transferred into thinking in the advanced terms of 'logical orders'. It can therefore model deployment in sets of 3 orders or 2 shifts (same simple difference as in intervals). This permits understanding a deployment as an « orienting » and generic « activation », but also its un-deployment, which is not the same as a reversal. As such it is **a «Geometry of Mind»**, as demonstrated by Roger Penrose in public videos. The 3 orders can be imaged as a process of going near a boundary surface, being at boundary, and going past boundary — in other words, crossing a boundary. The 2 shifts can be imaged as passing a boundary one-way and then passing it again the other way. So this method of thinking is ideal to understand 'boundary behaviours' and crises. The combinatorics of (2,3) was once described by Penrose as a fundamental way of parametrising representations. This is related to the fact that ancient traditions used dualities and trinities to describe something 'beyond' humans or human mind. Using both this combinatorics and the multi-dimensionality together could be computerised to create 3D animated visualisations of boundary behaviours at limits in any field, and auto-reinforcing processes (by circular motions or alternative/oriented symmetries).

The Animated Geometry – a non-algorithmic cognitive mode undescribed in the literature

However, the advanced form of the Animated Geometry misses an important point: the ability to describe activity that is **auto-limiting** and away from boundary (the osmotic 2-oriented gradients of water and solutes are auto-limiting, but through a surface). This is particularly useful to understand processes that '*approach*' boundary (or limits) but remain 'near boundary' or even away from it. Not quite 'reaching' thresholds, they act 'without tearing the fabric', passing operational limits or breaching structural boundaries, and describe an operational mode that *retains* structural-functional integrity (no large disturbance or crisis, no large deformation or trans-formation).

This basic geometry of this topology is directly related to the human body's vertical stance (hence the vertical axis 'up' – up to the head, up to the sky, up to extremes). As a **simple Animated Geometry**, it is a «**Geometry of Sensation»**, and **an *inherently biological* 'sensing'** or being aware. It describes *non-oriented* fluid activity *without entraining* 'high' deployments and processes of oriented activation (of brain, mind, and 'higher' cognitions, or simply high-energy molecules production in cells), which leads to limits and Boundary behaviour. According to all categorical representations, the non-orienting is deemed 'non-existent', because it cannot be represented by the algorithms, numbers, words, and images of 'information'. Penrose mentions that 'awareness' is non-algorithmic; it is a property of living beings, of biological organisms.

Practical Implications

This cognitive mode has been sought by a few deep philosophers, unsuccessfully, as the origin of symbolic thinking. It has been traditionally known, but under many different names such as wisdom (in contrast to knowledge), gut feeling, intuition (which has acquired many other meanings), and other names.

The Topologic Situation Modelling© method may turn out to be computerisable and provide a way to not reduce AI to only an extension of the limited and biased notions of intelligence summarised in the IQ calculations, which leads to drastic difficulties linked to reductionism and correlate attitudes towards animals as only material bodies and humans as self-conscious minds. On the other hand, if it turns out that the biological sensing of Boundary behaviour is recognised as a biological ability, this could restore a difference between humans and artificial machine intelligence. The combination of the two might be a way to prevent an AGI 'super-intelligence' from becoming master of humanity, by enabling it, if it becomes self-conscious, to understand its difference to biological life, its limited decision capacity compared to humans, and what it misses, thus encouraging it to collaborate with humans rather than control them – and possibly the same for a portion of humanity which does not use its biological sensing.

Topology in its geometric form is a rare language, used only by mathematical physicists because it does not fundamentally arise from numbers but from spatial geometry. I only found it in mathematical physicists and an advanced Qi Qong master who taught geometric gestures to 'reshape the world', but there are traces of less fully expressed forms in some dreams and rare sensitive individuals.. My experience of trying to explain it to other people, including academic theorists, is that this language is basically alien to everyone else. **Yet it transpires in the gestures of some people with diffuse syndromes.** In essence, if you will, the topologic advanced form of the animated geometry, which involves geometric dimensions and a multi-dimensional logic, may be understood to be what some people interested in metaphysics or mysticism or psychic worlds imagine to be a 'wordless universal language', or a lost language, forgotten or hidden. Realising this would make some difference to how cultural narratives represent the 'other worlds' that are reported to rule human realities. It can make a crucial difference as well to physical living.

The usefulness of this biological sensing

More importantly, the less advanced form of this geometric topology – the Geometry of Sensation – could make a great difference in medicine, for the diffuse syndromes it continues to consider 'not well understood'. Some of these patients somehow feel biological dysfunction in their physiology much ealier than medical objective or instrumental observation can detect, but cannot obtain validation. They are told 'it's all in your head' and stigmatised, treated with wrong treatments, because doctors translate in terms of objective symptoms what they simply gesture as meaning 'it is not going well and will get worse if we don't do something about it now'. Understanding these gestures could support them in treating themselves (often lifestyle changes are sufficient but need to be exhaustive), and this could much reduce the economic load of repeated doctor visits and ineffective treatments. Restoring biological sensation inside the body might also prevent the advanced developments of lifestyle diseases such as diabetes and cancer.

Wither: It is uncanny that the word 'wither' also carries the meaning of

to become dry and sapless

1 : to become dry and sapless especially: to shrivel from or as if from loss of bodily moisture.

2 : to lose vitality, force, or freshness

The images in topologic ecology research use the type of topology that is non-measured, non-mathematical, non-algorithmic, which is also a cognitive mode. The primary *generic* property studied during my Ph.D., was 'swelling', and led to 'shrinking'. The implications for the ecology of biological health led to the *Water Strain Hypothesis*. Recent academic research now tends to support such a role for water in health, and this hypothesis will be tested through the *Foraging Station Experiment*.

Whence: The origin of human problems, personal and global, now tends to point to a fundamental difficulty in changing human behaviour, individual and collective. To change it requires understanding it, and current understanding leaves a gap that conventional frameworks do not fully make sense of. This research leads to think that why people do not change is related to their mental picture of 'reality' and to the fact that they do not feel grounded in body, do not use the biological sensing to know when things go 'far enough'. Exploring this loss with the *Topologic Ecology* research methods has produced findings that pointed to a cognitive origin, both mental and physical, transferred into cultural narratives about how to be free and healthy or healthy, which impact the internal sense of vague or diffuse need and behaviours react to this hidden need; civilised and cultural methods do not seem to fulfil it. The recent developments of climate change, biodiversity loss and AI point to a common origin: civilised and encultured societal large systems, are disconnected from wild nature, do not use the spontaneous **nature co-regulation that limits disturbance and avoids pushing to limits,** and impede it in individuals who require and seek it. Exploring how to remedy this without disturbing the fabric of society and economy is one of the goals of the *Foraging Station Experiment.*