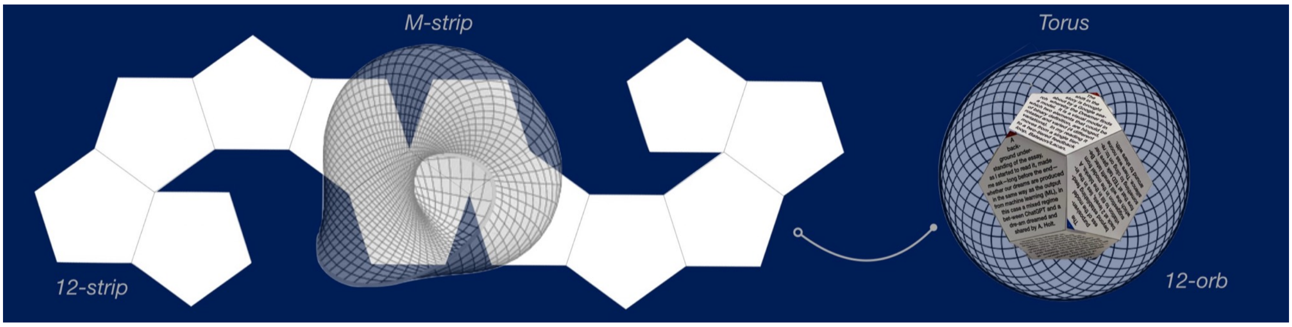


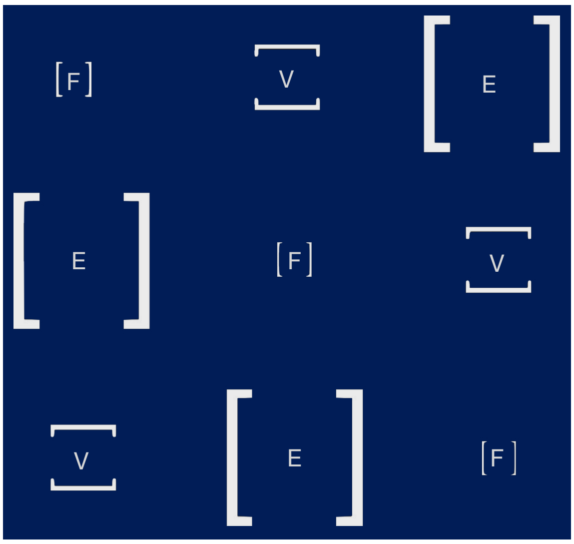
Box 1: “Topology deals with aspects of points in space in terms of neighbourhoods, open sets, divisors, locations and functions of the kind ‘interior of’ and ‘exterior of’ and so on.”

John W.P. Phillips published the article (2013)—*On Topology* [no pun intended]—in which a real attempt is made to discuss topology philosophically on its own mathematical terms. It presents some interesting problems which I should like to discuss here, as an anthropologist working in the design-field. I believe in a direct approach. My questions relate to the unconcern with *empirical* test and argument in mathematics, in tandem with a disregard for its *experimental* nature: commonly, rigour in mathematics is commonly equated with the mathematical *proof* (not mathematical *labour*).

Proofs are the equivalents of *editions* in mathematics: behind this *operative* schein, however, lies sometimes years of *distributed* efforts. One scholar to have addressed this difference specifically is Gilles Gaston Granger (1989), in his work on mathematical style while he held his chair in comparative epistemology at the *Collège de France*: specifically, his comparative study of the mathematical *style* in Descartes’ and Desargues’ research. He addresses mathematics *stylistically* as the relation between form and content in their notebooks *unfolds* different struggles with meaning.

When the proof subsequently *enfolds* these findings, the marks of *style* too are incorporated: but they have moved *to* the *opus operatum* of the proof, *from* the *modus operandi* of the query. I must ask: which one is the *frontline* activity? While the proof clearly is *propositional* (styled as the workings of operations) and the labours leading up to it are *experimental* (in the style of distributed efforts), the said *marks*—as they migrate *from* the distributed efforts of the query *to* the operational mode of the proof—arguably display what distinguishes mathematics from propositional logic.

Let me give a hands-on example from the topological study of polyhedra (cf, Phillips p. 6). Let the polyhedra with an Euler-characteristic χ = 2 (**Box 2**)—which covers a fuller range from the *dodecahedron* above through the *disdyakis tricontahedron* to the *sphere*—be presented unfolded as a *strip*, and enfolded as an *orb*. Mounting the strip *into* an orb, the faces of the polyhedron will *tile* one after the other, as we join and glue edge to edge, in the form of a *montage*: in the ensuing cinematography will not only spiral 360˚ from the base to the top, but turn 180˚ on itself.



Box 2. The Euler characteristic χ is determined by this equation: χ = V - E + F. Where V (vertices), E (edges) and F (faces). A dodecahedron has 20 vertices, 30 edges and 12 faces. Hence χ = 2.

We can naively be led to think that the polyhedron hides a Möbius-strip: however, it only indicates or implies it, through the exact same *deixis* that we see in films (which is why we call them movies). So, the M-strip is indicated virtually. It is not actually there. However, there is another sense of montage applicable to the **strip—> orb** manufacture of the polyhedron. Which is the transition from a 2D surface (strip) to a 3D volume (orb). This montage is inherent to the form: it is actual and not virtual. However, if we combine the two —virtual and actual montage—what we get is a hyperdimensional rotation, as we move from the 2D surface to the 3D volume.

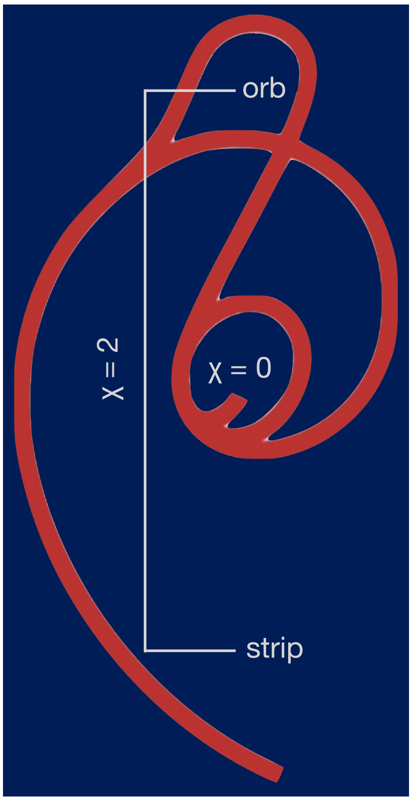
Hence we have two montages: one proceeding by indication (the M-strip), the other by materialisation (2D to 3D). Which means that while materialising a polyhedron with χ = 2, it indicates a space with χ = 0 (the M-strip). The vectorial sum between the two thereby features a phenomenal limbo—a no-wo/man's land—when the polyhedron in construction is *neither* strip *nor* orb, but maintaining its unity owing to the apperception of the M-strip. The way from-strip-to-orb: the M-strip yields a sense of orientation, although it is not actually there, but is *indicated* within the two-tiered constraints exerted by the artefact and the manufacture. What happens when it has served its purpose? As $\chi = 0$ how can we know if the transformational geometry *shifts*?

In the limbo there are two major variables: the experience and skill in mounting an orb from a strip, and the particularities of the individual that is being mounted. These variables of a hyper-D rotation yield a wealth of marks, attributable to style (Granger): a growth, development, flowering which—when intercepted—appear to be self-explanatory (as, generally, aesthetic qualities). The generative process of the limbo called *anaptúxis*. We are here at the threshold—*in limine*—between the experimental and empirical: of *findings* and what they might reveal (of topological purchase/value).

<u>Question</u>: will the acuity of *theoretical* understandings in topology be necessarily diluted by their using their power of convertibility in topological *models*? More precisely, what is the role played by *contingencies* in passing from a theoretical understanding of topology, to their inclusion—without the loss of precision—into an *active* repertoire? Although the truth is the same, the impact of an agent seeing *others* work their way from strip to orb, clearly is something else (and certainly *contingent*). Topological modelling as a possible realm of weak signals and -friction *before* physics.

If, as Badiou states, that there are only bodies and languages, except there are also *truths*. But if there are truths entangled with bodies and languages, there must also be *impacts* (as far knowledge is affected). So, the **agent —> other** scope articulates at two levels: **(1)** at the level of the agent oriented by the M-strip in mounting an orb from a strip; **(2)** at the level of the agents learning from the process and outcomes of *others* mounting polyhedra, which will feed back to **(1)**. The compound of which is *anaptúxis*. Hence the dynamics of crowdsourcing and swarm-intelligence.

<u>An empirical example</u>: let there be an *Ambassador K.* and his wife *La Kahina*. They are a husband-and-wife team operating at various missions abroad for the Foreign Services of their country. Over the years, *La Kahina* writes 71 diaries (1961-2005): a record/replay of a day-to-day *manufacture* of everyday life in a diplomatic residence. *Ambassador K.*, on the other hand, leaves behind a carefully selected sample of documents featuring a trail of mile-stones from the years he worked with international fossil fuels trade. He didn't write much, but the documents are carefully edited.



Box 3—SWIRL diagram featuring the strip-and-orb compound relating to M-strip/Torys ($\chi = 0$).

Hence the contrast between the manufacture and edition of their joint work—moving from one residence to another—will be seen here as a topological compound (of the same fundamental kind as mathematical labour/proof, and the strip/orb modes of a polyhedron). They had both viewpoints on each other's work: he on her diaries, and she on his documents. From this the learned something about the compound life-form. The nature and understanding of each *doing their bit* evolved in time. What affected their *anaptúxis* was the computerisation of the fossil fuels sector.

Open access overtook confidentiality *up to a point* (where business confidentiality took over). The need to talk outside meetings decreased, along with the domestic framework for such exchange. The styles of diplomatic conviviality no longer played the same role as before. This turn is clearly readable from the vantage points of both the diaries and the documents. The step-by-step and the orbital roundups remain within the same actual topological model $\chi = 2$. But the virtual topological model $\chi = 0$ *changed* from the M-strip—in which the *internal* and *external* exteriority *alternate*—to the Torus in which there is *no* such alternation (given that $\chi = 0$ for the M-strip, the Torus and the Klein's bottle). Why did Lacan favour the Torus over the M-strip in his topology? A question turned to cultural theory and mathematics jointly. Engaging topology in the *modelling* of empirical queries, can also serve to enrich the theory. **Q.E.D.**