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MA Research Architecture Conflicts and Negotiations

Word Count: 13298*

*less section V (*Cosmicity Machines*) which is included as a seedbed of further praxis the word count is 9,061.



I am staring at a foam chamber



pumping a dazzling neighbourhood of aqualine spheres



bending their inner contexts to gravity,
scattering light.

INTRODUCTION

In this short chrysalis opening of an essay, I want to trace a thread of spherical thoughts to their stellar constellational juncture where continental philosophy meets its European counterpart shifting under a weight of gravitational pull eastward.

I want to suggest - following from Sloterdijk - that elevating foam to the level of space-theoretical research praxis propels a novel language into the linguistic games of the infrastructural fold.

The experimental field I introduce this language into is the real-surreal fold of the Belt and Road Initiative, the Chinese-led \$1 trillion infrastructure initiative to develop high-speed rail systems, energy pipelines, coastal harbours, ports and trading hubs throughout the Asian, European, and African continents.

Elevating foam to the level of space-theoretical research praxis abridges a media theory with a material theory of the infrastructural fold. From a semantics-critical point of view, foam equates to a 'mental paper currency emitted without being covered by any material or functional value'; foam captures in an image infrastructural life in its 'boundlessly manifold space-forming effects' whereby 'life articulates itself on nested simultaneous stages, producing and devouring itself in interconnected workshops.'

Shine a torch through a foamy aqualine neighbourhood and the light will scatter. In media terms, foam therefore further offers a theory of the infrastructural fold which attends to its complexifying hypercubist progenies. No one lordly point of view can prevail because 'every point in the foam only offers glimpses of the bordering ones' (Sloterdijk, 2016). In foam comprehensive views are not available. Type *The New Silk Road, Belt and Road Initiative, BRI, OBOR* into a search engine - and depending on your respective location and your respective language, a different view on the Road will unfold: *sphere filter effects of a hyper-cube foam*. In this sense, foam thereby also offers redress to the strained metaphor of the network and its overtly reductive geometry by instead emphasising the independent volume, spatiality and experience of communicators in their respective spheres of influence.

The New Silk Road is a hypercubist, multiperspectival tension sculpture par excellence, a litmus to the poly-plural pin-universe of co-fragile influence spheres we now live in east-west convergence times. In this sense, where light scatters, foamologists and *aphrogrammetrists* enter, recording a fractal of opinions, hopes, losses, dreams, optimisms, closures, drifting the foam chamber of a world hothouse with many rooms, capturing edges.

Elevating foam to the level of space-theoretical research praxis relies on a 'cosmicity on the side of the dreamer.' Cosmicity, Bachelard writes, 'is performed by the sleepless philosopher who trains his mind to hear the ebb and flow of a vast ocean in the hubbub of the chaotic, nighttime city' (Bachelard, 1958). Cosmicity is the secret of the infrastructural fold, its expansion of horizons: life chances and life risk multiplication.



Multiplication (Source: <https://networkaesthetics.wordpress.com/2013/12/03/networks-and-spheres/>)

Structure

‘Almost nothing, yet not nothing. A something, if only a delicate web of cavities and subtle walls. An actual thing, but a construct fearful of contact that yields and bursts at the slightest touch. That is foam as encountered in everyday experience. Through the addition of air, a liquid or solid loses its density; what had seemed autonomous, homogenous and solid is transformed into loosened structures’ (Sloterdijk, 2016).

This essay traces a story of foam through its entry into space-theoretical research praxis. As Sloterdijk notes, ‘delicate things become objects late on’, ‘only called to thematic and technical careers through their recently proven manipulability in both the constructive and destructive senses’ (Sloterdijk, 2016). Foam in this sense enters its kernel of political economy at the advent of the nineteenth and twentieth centuries and their departure from the ‘old cosmos of essences.’ In Sloterdijk’s memorable formulation: “God is dead, the One Orb has imploded - now the foams are alive.” The lively thought image of foam enters its experimental fields and technical machines in biology (Jacob von Uexküll), psychology (Freud), physics (Boys), philosophy (Bloch, Sloterdijk) architecture (Frei, Le Corbusier). *Part I* traces two such experiments, documented in Cold War America in the labs of Radiometric Technology, Inc. at 28C Vernon Street, Wakefield, Massachusetts and the Naval Research Laboratory, Washington D.C., *Fluid Dynamics Branch, Marine Technology Division*. Here, foam’s proven manipulability in both the constructive and destructive senses is evident in its entry to objecthood. *Part II* traces a thread of spherical thoughts through Deleuze and Sloterdijk and their borrowings from the soap bubble universe of the 19th Century experimental biologist, Jacob von Uexküll.

Part III takes a turn and begins to documents foam’s elevation into the linguistic games of modern architecture and computation. Multicellular foam and its geometric application becomes evident in exhibitions and projects such as Von Neumann-Ulam’s *cellular automaton*, Le Corbusier’s *Ville Radieuse*, Frei Otto’s *Soap Bubbles*, and the *Growth and Form Exhibition* held at the ICA in 1951 which drew together artists, architects, psychologists, cyberneticists, physicists and biologists toward a developmental embryology of the biological and built form as foam. *Part IV* enters a subsequent theory of neighbourhoods and the accounts of current spatial practitioners and thinkers (Simone, Merrifield, Weizman) with a debt to foam in their documentings of the layering and density of human living conditions in tension sculptures of volume.

Part V is the scraggiest, a return to cosmicity and a free-associative concrete daydream through the speculative foams of the *New Silk Road*. If the New Silk Road is a cosmic machine, scattering a neighbourhood of aqualine spheres across the spine of three continents, weaving polyhedral oases in black, grey and fractal foams, this notebook is a first failed levitation at elevating a media *and* material theory of its forms and spheres of influence. *Part VI* then returns to foam as a theory of co-fragile systems and opens out a number of trajectories for further space-theoretical research praxes - an *aphrogrammetry* to the fore of urban and industrial design; a soap bubble phenomenology to the fore of international relations and the hothouse sciences; and an *umweltology* to the fore of ethnography and material anthropologies. Elevating foam to the level of space-theoretical research praxis in this sense opens out toward a theory of media, communication and matter which does not dispose of position, place and perspective but rather takes as its first image-step the occupation of the problem in volume.



I. TENSION SCULPTURES

For Sloterdijk, ‘foams can be precisely described as tension sculptures of film membranes. In the physical context, foams are defined as multi-chambered systems of air pockets within solid and liquid materials whose cells are separated by film-like walls’ (Sloterdijk, 2016).

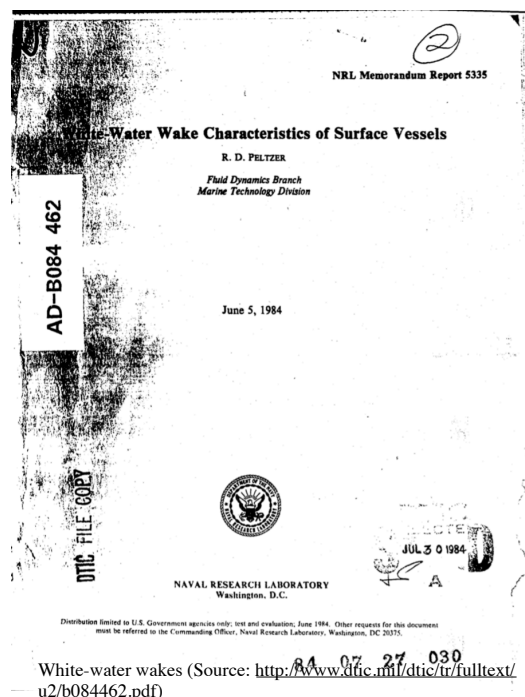
The visual properties of wet and dry foams were laid out by the British physicist Charles Vernon Boys in 1890 in a popular set of lectures on the colours of soap bubbles, published collectively in 1896 in a book wondrously entitled: *Soap Bubbles and the Forces Which Mould Them*. Boys opens the preface to his audience: ‘I do not suppose that there is any one in this room who has not occasionally blown a common soap-bubble, and while admiring the perfection of its form, and the marvellous brilliancy of its colours, wondered how it is that such a magnificent object can be so easily produced. I hope that none of you are yet tired of playing with bubbles, because, as I hope we shall see during the week, there is more in a common bubble than those who have only played with them generally imagine’ (Boys, 1890).

Following Boys at the turn of the nineteenth century, the twentieth century saw further research on foams and their structural composition. In 1976, a research paper was prepared for NASA by Radiometric Technology, Inc. at 28C Vernon Street, Wakefield, Massachusetts with the title *Ocean Foam Generation and Modelling*. Section 6 of the report reads: ‘Toward the End of this project, a full-scale foam generator was designed for fabrication and use by the NASA Langley Research Center. This unit will be mounted in the NASA roof-top wave tank and will permit radiometric measurements of the apparent temperatures of ocean foam’ (NASA, 1976).

The levels to which such investigation required novel instrumentation extended to the photographic techniques and analytical procedures developed, ‘photographs were obtained of natural ocean foam, generated by the action of ocean swells at a rocky promontory in Marblehead, Massachusetts, ‘near the Lydia Pinkham mansion on Marblehead neck [...] A metre stick with millimeter divisions was mounted on the end of a long wooden boom and extended close to the ocean surface. The metre stick was held in a manner that would allow it to lie near the surface of the foam produced by the wave action. To avoid spray from striking the camera lens, the camera was mounted on a tripod, at some distance from the water, and a 230mm telephoto lens was used to photograph the metre stick during its immersions in foam. Out of a total of 36 photographs, taken during the observations, only three (3) were found to have satisfactory information for further analysis’ (NASA, 1976).

Photographs of the foam bubbles, recorded at the ocean, were then compared with foam bubbles produced in the laboratory. In order to photograph the column of foam bubbles, a polaroid Model MP-4 camera, using Polaroid Type 105 positive/negative film, was positioned ‘so that its lens was 23cm from the front plexiglass window of the foam generator. Lighting was carefully orchestrated such that in addition to a rear flood lamp, an identical lamp was mounted above the foam surface and a small incandescent lamp positioned between the camera and the front of the box to illuminate the scale and the front surface of the foam. To reduce the depth of field the largest lens aperture available (f:4.5) was used; the fastest shutter speed available (1/125 second) was found to be satisfactory in stopping bubble motion’ (Porter and Bechis, 1976).

Eight years later in 1984, a similarly themed report was produced



by the Naval Research Laboratory, Washington D.C., Fluid Dynamics Branch, Marine Technology Division entitled: *White-Water Wake Characteristics of Surface Vessels*. The opening abstract makes evident its military application in ship and marine hydrodynamics, 'the visible white-water wake generated by a vessel underway is a streak of foamy, aerated turbulent water. Aerial photographs showing the white-water wakes generated by vessels underway were examined [and] the major variables that influenced the production, geometry, persistence and visibility of the foamy white-water analysed.

Table 1
Ship Data Employed In the White-Water Study

Ship Type	Abbreviation	Data pt. number(s)
Aircraft Carrier	CV	1 - 6
Heavy Cruiser	CA	7
Light Cruiser	CL	8 - 11
Battleship	BB	12 - 13
Destroyer	DD	14 - 23
Attack Cargo Ship	AKA	26 - 29
Ammunition Ship	AE	30
Oiler	AO	31 - 32
Submarine	SS	33 - 38
Infantry Landing Craft	LCI	39 - 52
Tank Landing Ship	LST	53 - 61
Motor Minesweeper	YMS	62
Submarine Chaser	SC	63 - 64
Utility Landing Craft	LCU	65
Ferry Boat, Uncatena	PER	66 (partial)
German Submarine	SS	67 (partial)

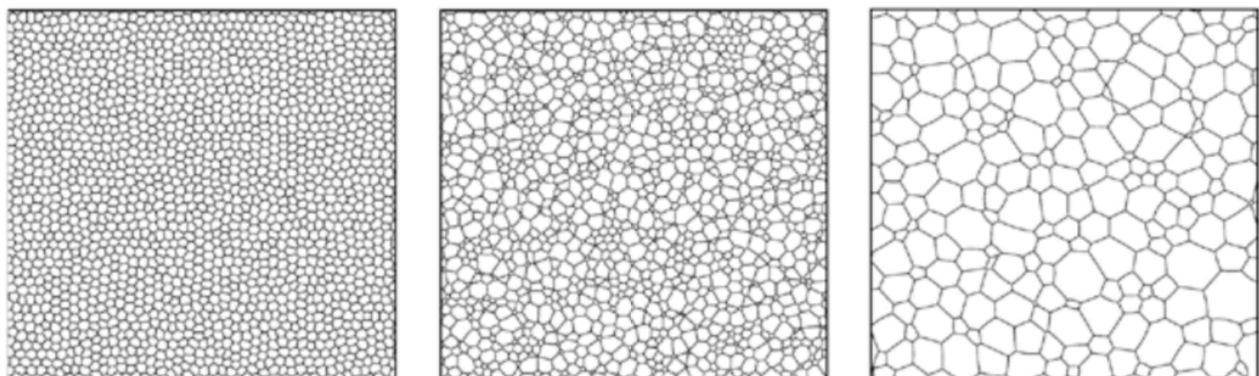
Vessel foams (Source: <http://www.dtic.mil/dtic/tr/fulltext/u2/b084462.pdf>)

'In a majority of the non-dimensional plots involving these variables, the data appeared to collapse onto curves unique to each vessel class with the propeller tip to surface clearance of each vessel class determining the relative location of these curves on the plots. Vessels with minimal tip to surface clearance had longer, stronger and wider white-water wakes than those with significantly deeper propellers' (Peltzer, 1984). Aside the abstract, a scribble, by Peltzer reads: 'graphics' - in foam analysis, the scientific and technical regime of persuasion is resolutely visual.

Levitation Machines

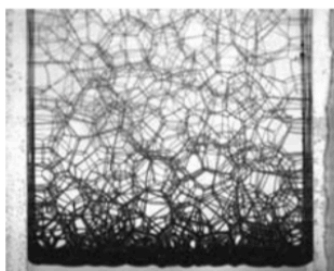
The twentieth century's most important innovation in the analysis of foam was the introduction of time. Scientists learned that 'foams are processes, and that there are constant leaps, redistributions and reformattings inside the multi-celled chaos.' This restlessness, Sloterdijk writes, 'has a direction: it leads to greater stability and inclusivity. One can recognise old foam by the fact that its bubbles are larger than in young foam - because bursting young cells die into their neighbours, as it were, bequeathing their volume to them. The wetter and younger a foam is, the smaller, rounder, more mobile and more autonomous the bubbles concentrated inside it will be; the drier and older it is, on the other hand, the more individual bubbles will already have given up the ghost, the larger the surviving cells will become, the more strongly they will affect one another and the more Plateau's laws of neighbourhood geometry will be in evidence in the mutual deformation of the magnified bubbles' (Sloterdijk, 2016).

Giving up the ghost in this sense is a process scientifically known as coarsening whereby as foams age, gravity drains their liquid downward, and smaller bubbles are absorbed by larger ones. Today, the foam generator of 1976 in the rooftop wave tank of NASA Langley Research Center is adjoined by a larger assemblage of technical, foam-generating and foam-suspending machines. At Boston University, a group of scientists led by Glynn Holt (who was like the roofed machine also trained by NASA as a payload specialist for spaceflights) use sound waves to levitate drops of foam allowing the scientists to manipulate the structure and squeeze the bubbles to make them oscillate. A video camera hooked up to a monitor records the complex vibrations that propagate within the foam, which can then be analysed to understand the foam's mechanical properties - most notably the point at which it begins to act more like a solid.

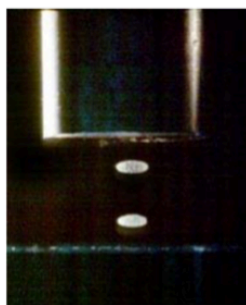


On Space-time foam (Source: https://www.researchgate.net/figure/Appearance-of-polymer-enhanced-foam-changes-over-time-N-2-foam-a-and-CO-2-foam-b-at_fig8_312541748)

For Douglas Durian, a different technique of foam analysis was developed known as diffusing wave spectroscopy. In 1990, for a research paper (again wondrously entitled) *Scaling Behavior in Shaving Cream*, Durian ‘placed some shaving cream in a small glass cell, shone a laser beam through one end, and measured the amount of light that emerged through the opposite side. Over time, Durian and his co-researchers, noted that the light's intensity fluctuated as the bubbles both consolidated and rapidly shifted position.’ (Oullette, 2002). As the foam shifted, its internal stresses grew, until groups of tightly packed bubbles suddenly snapped from one configuration to another like a slow-motion avalanche. When Durian applied enough pressure, the bubbles would rearrange constantly, flowing like a liquid.

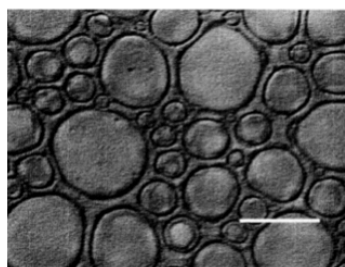


Bubbles in a soapy froth, held in a Plexiglas container one inch wide, clump in complex geometrical formations first conjectured by England's Lord Kelvin in the 19th century. Photograph courtesy of John Sullivan, Matt Fetterman, and Sigg Thoroddsen



Suspended on a 30 kHz cushion of sound waves, two drops of aqueous foam float for researchers at Boston University.

Photograph by Felice Frankel



Photograph of fresh Gillette Foamy Regular against a smooth glass surface. The size market is approximately 30µm
Photograph by Douglas J. Durian

Suspension (Source: <http://www.aquafoam.com/papers/Quellette.pdf>)

II. FORWARD PROGENY

Looking back at my final year of university, a foam analysis by less technical measure was there. Living in a honeycomb cocooned between 40 other individuals aside a quad we chased a parabolic orb over and never-smashed a window from, I wrote an essay for my Cultural Spaces submission entitled *Weatherworlds: affective experience, atmosphere and event*. The intro opens on Massumi:

For Massumi, our lived experience swims in an infinite cloud of infinitesimal monadic awarenesses, an uncontrollable, unspecified whole of the flow of things and the world. Affective experience stretches and ribbons on the cloud-edge of an advancing wave-crest. ‘The individual’, Deleuze writes, ‘is undulatory, launched in orbit, on a continuous beam. It surfs the flows, rides the waves. When surfing, the technology, the surfboard has to slice the wave to ride it. It cuts in, to extract a quantum of forward momentum [...] into the flow of labour extracting a wage. It cuts again with its wage, this time into a flow goods whose purchase extracts a quantum of life-satisfaction rewarding all the pain and sacrifice that has gone into energising the forward momentum, encouraging one to stay on the wave. Behind closed doors, it may also, depending on how it invests its sensual desires, cut into the flow of sexed bodies in such a way as to extract a quantum of progeny: a reproductive human-capital investment for its own future well-being (intergenerational caregivers for when the old machine starts going to rust). The subject of interest as human capital surfs its future in a range of ways, cutting into the flow of the days of its life to extract forward momentum from each of its investments in life-activity, endeavouring to sustain the momentum to the end as best it can’ (Deleuze, quoted in Massumi, 2015)



Levitation games (Source: Author)

Like Holt and Durian, Deleuze introduces time, the time of the enterprise-subject extracting forward progeny. Yet to Deleuze's prognosis there is also a Sloterdijkian sensibility¹ to space, and to the evolutionary forms of enterprise-being, the enterprise-subject, Deleuze writes, 'remains buoyant because rather than project an internal force outward, it borrows the energy of its outside and takes it into its own movement. It buoys itself on the quasi-chaotic air currents of the rapidly changing climate of life. Constantly banking, shifting, turning, churning with the flow, the life of the enterprise-subject continually assumes new shapes. It is dissipatively self-structuring, changing in nature as it goes. Its dynamics are nonclassical, far-from-equilibrium. They have no disciplinarily fixed form or "normal" structure. The enterprise-subject is a protean node of decisional autonomy, on the move in environmental spaces that are themselves moving, autonomous, and self-deciding, in the same way the weather is—and every bit as moody.' (Massumi, 2015)

A Universe of Soap Bubbles

There is certainly a nod to the theoretical biology of Jacob von Uexküll in Deleuze's anthropoeitic account of this constantly banking, shifting, buoyant borrower of the 20th Century. For Uexküll, writing as an outsider to the classical theoretical and taxonomic biologies of his time in 19th Century Germany (which consisted in studying living organisms according to their lineage and shared features, a type of Freudian depth-charge bioscopy) Uexküll proposed that one cannot know the organism without observing how it relates to its environment. For Uexküll, a living organism is first of all defined by the specific relationship it maintains with its environment, rather than by its specific corporeal features.

¹ In *Interiority in Sloterdijk and Deleuze (Nature, 2017)*, Judith Wambacq and Sjoerd Van Tuinen, explore the philosophical positions of Deleuze and Guattari vis-a-vis Sloterdijk. On the one hand, they write, while Deleuze believes in the generative qualities of the encounter with the exterior, Sloterdijk focuses more on the importance of closing off and selectively refusing participation. Instead of experimenting with all sorts of possible connections with what does not belong to an identity, Sloterdijk starts from the immunitary interests of particular beings. "By nature, life only comes out well in the finitude of an individualized immune system". There is a primacy of shielding above participation (Sloterdijk, 2004: 196). Another, maybe less polemic, way of describing the contrast between both philosophies is to say that Sloterdijk's spherology is motivated by an interest in spatializing the phenomenological description of *Umwelt*, whereas Deleuze and Guattari's approach (especially Deleuze's) seems to be fundamentally temporal. For example, Sloterdijk presents his concept of bubbles as an alternative to the "anorectic" notion of a network: contrary to the nodes of a network, bubbles are "incompressible" occupations of space (Sloterdijk, 2005: 391–406). Deleuze and Guattari's rhizomatic network philosophy, on the contrary, stresses the nomadic aspect of *Umwelt*, its constant metamorphosis. They are interested in how bubbles will morph into other bubbles and generate new functional relations and immune systems. They are interested in the expressive qualities of bubbles, rather than in their possessive ones. However, they speculate, on a closer examination of both positions, the difference is not binding but lies in the nature of their approaches: whereas Deleuze and Guattari's interest in opening up interiorities is ontologically motivated, Sloterdijk's focus on shielding them off is existential.



Fractilians (Source: <https://www.widewalls.ch/analytic-cubism/>)

Departing from the idea that the human world was a shared stage for all living creatures - or as Sloterdijk suggests, 'taking the step from monologic physics, which interprets the world as a monococontext and projects it onto a single eye, to a pluralistic ontology that estimates as many worlds as there are eye types and other sensors to see and feel them' - Uexküll reached the conclusion that there are as many worlds as there are subjects and that the universe consisted 'not of a single soap-bubble that we have blown up beyond our horizon into the infinite, but of countless millions of narrowly bounded soap bubbles that overlap and intersect everywhere' (Von Uexküll, quoted in Sloterdijk, 2016).

To substantiate his claim, Uexküll frequently appealed to examples drawn from his experimental field research, such as a seemingly "objective" description of a meadow or a tree, only to break down the landscape into a multitude of different worlds according to each individual organism. Within this seemingly innocuous scene, Uexküll proposed to look through the eyes of the organisms themselves: 'how do they see the world? What part of the world is meaningful to them? What does this tell us about the organism itself?' As Judith Wambacq and Sjoerd Van Tuinen write, 'what counted for Uexküll was less what organisms are, but more where they are and how they are; that is, how they interact with the environment in which they are living. According to Uexküll, organisms do not merely occupy an environment, they create it. Their relation to the environment is not a given, but is in constant development (Wambacq and Van Tuinen, 2015).

Uexküll thus exchanged the static and passive view of classical taxonomic biology for one that was dynamic and creative, constantly shifting, banking. For Uexküll, the development of forms of life furthermore, did not occur solely 'on account of the animal but in a contrapuntal relationship of reciprocal determination in which the animal is an effect of something it has produced itself. Animal and environment therein make up an indivisible biological unity: an Umwelt or milieu.' For this umwelt or milieu, one of Uexküll's favourite metaphors was the soap bubble, Uexküll writes, 'the

² Only as long as "societies" hypnotise themselves as homogenous units, for example as genetically or theologically substantial national peoples can they view themselves as monospheres united through their origins (or by an exceptional constitution). They present themselves as enchanted spaces that profit from an imaginary immunity and a magically comprehensive commonality of essence and election - this is the sense in which Slavoj Žižek recently adopted my concept of the 'sphere' and applied it critically to the mental state of the USA before the attacks on the World Trade Center. When I speak in the following of 'society', the term refers not (as in rampant nationalism) to a monospheric container that encloses a countable population of individuals and families under an essential political name or a constitutive phantasm, nor (as for some systems theorists) to a non-spatial communication process that 'progressively differentiates' itself into subsystems.

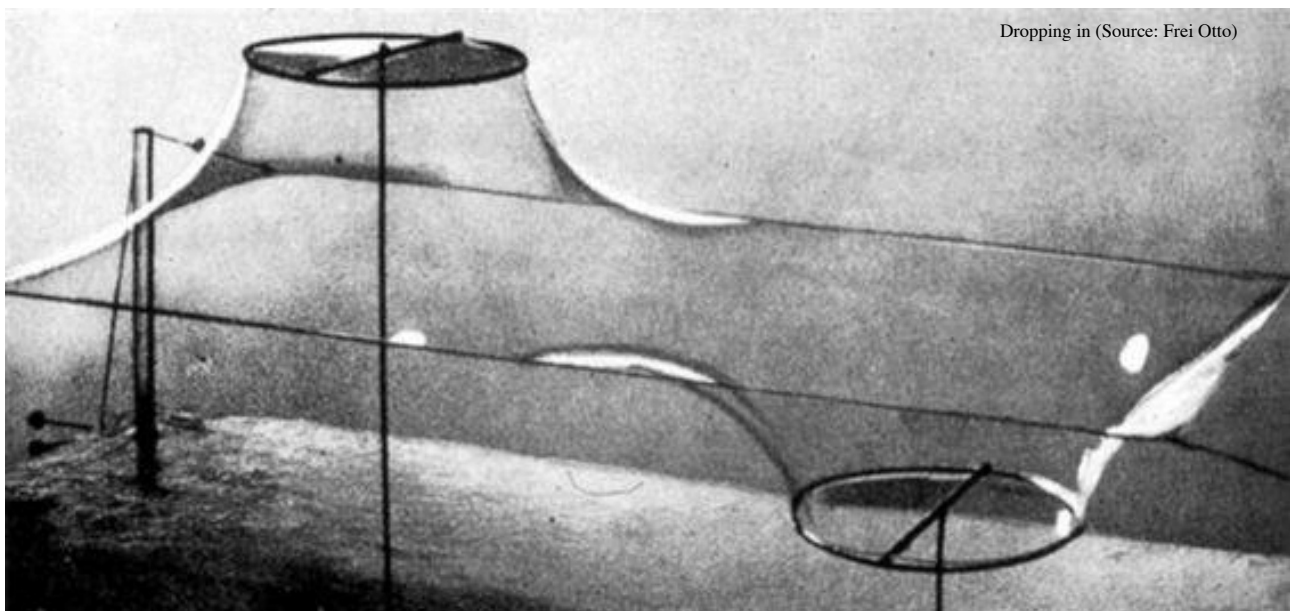
space peculiar to each animal, wherever that animal may be, can be compared to a soap bubble which completely surrounds the creature at a greater or lesser distance. The extended soap bubble constitutes the limit of what is finite for the animal, and therewith the limits of its world; what lies behind that is hidden in infinity' (Buchanan, 2009). Uexküll would describe the forms of life of the female tick (*Ixodes rhipicephalus*) thus:

Ixodes Rhipicephalus

'out of the vast world which surrounds the tick, three stimuli shine forth from the dark like beacons, and serve as guides to lead her unerringly to her goal. Nearly everything in the external world that surrounds the tick has no significance to it. The moon, weather, birds, noises, leaves, shadows and so forth do not matter to the tick. They may belong to the Umwelt of other organisms that live in the midst of the tick, but they do not carry any meaning for the tick itself. What does matter to the tick, however, is the sensory perception of heat and sweat from a warm-blooded animal, on which the female tick feeds, lays its eggs, and dies' (Buchanan, 2009).

Uexküll recounts how ticks will 'position themselves in a hanging position on the tip of a tree branch in the anticipation of a mammal passing beneath the branch. After mating, the blind and deaf tick is first drawn upward by the photoreceptivity of her skin. While the tick hangs on a branch, very little affects it. The tick does not feed itself, shelter itself, or engage in any other activities. It simply waits. And remarkably, ticks have been noted to hang motionless for up to eighteen years at a time until a precise environmental cue triggers it from its rest. This span of time encompasses nearly the entire life span of the tick, and it does so until the tick senses a specific odor emanating from the butyric acid (sweat) of a mammal. The sensation triggers a second response; the tick releases itself from the branch in order to fall onto the hair of the moving mammal. At this point, the tick's third response is to turn toward the source of the head and bore itself into the mammal's skin. These three cues (what Deleuze will call "affects") constitute the Umwelt of the tick: (1) drawn by the sun, it climbs to the tip of a branch, (2) sensing the heat of the mammal, the tick drops onto it, and (3) finding a hairless spot, the tick feeds on the mammal's blood. Once the tick has bored itself in, it sucks the mammal's blood until the warm blood reaches the tick's stomach, at which time a biological response is activated, and the sperm cells that a male has already deposited and are waiting in the female are released to fertilize the awaiting eggs. This reproductive action will not occur if the foregoing sequence of events first takes place. At this point, the tick has accomplished its plan, and dies soon after' (Buchanan, 2009)

Buchanan goes on: 'to be sure, many, if not most, ticks do not make it through this full cycle, but this does not diminish the significance of the tick's Umwelt. Above all else, these few environmental signs interest Uexküll the most. These signs alone constitute the Umwelt of a tick, such that everything else does not factor as meaningful in any way; indeed, there is nothing else for the tick, even if there may be for other organisms. It is on this point that we can see a parallel with other organisms. In the way that a tick can sense the precise odor of mammalian sweat, the same odor may have no



significance for other living beings. This sign does not figure into my Umwelt; it has no significance for me. However, I may perceive and be affected by the same mammal in another way. Perhaps the mammal is a dog out for a walk in the woods. Just as the mammal belongs within the Umwelt of a tick, the mammal may equally belong to my own Umwelt, albeit with a different significance. And while the dog may not notice the tick, it may notice a squirrel to chase or a twig to play with. With this understanding it becomes clear how it can be said that these signs form the “soap bubble” in which this tick lives, in effect limiting the significance available to it. As Uexküll notes, ‘each Umwelt forms a closed unit in itself, which is governed, in all its parts, by the meaning it has for the subject’. Yet what Uexküll’s experiment also demonstrated was how the Umwelten of different organisms may overlap with one another; the relations between forms of life expanding and meshing with one another in an intricate web of life’ (Buchanan, 2009).

Swaziland Microspheres

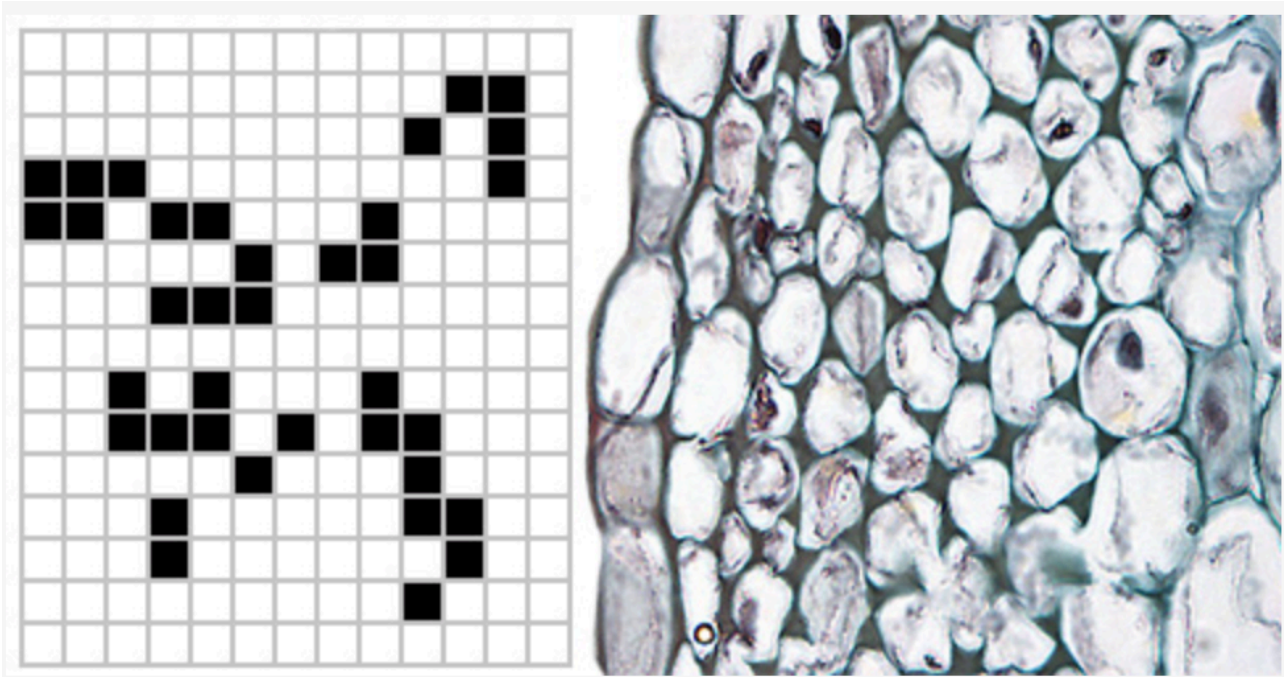
For Deleuze, this intricate web of life - a cosmos of countless millions of narrowly bounded soap bubbles that overlap and intersect everywhere forms an ‘origami universe that follows a systolic-diastolic unfolding and folding whereby explosions of difference are followed up by selection and accretion, only to expand again. Deleuze draws synonym to the movement of life, in particular organisms, which internalise small aspects of their milieu until they no longer need those aspects of the milieu to survive (such as in organisms that internalise water regulation so they can explore land), which can be described as ‘difference providing the becoming-unnecessary or becoming-independence of life’ (Deleuze, quoted in anarchistwithoutcontent, 2013). Indeed for Sloterdijk this potential to differ as the original and ongoing movement of life emerges in the view of some biologists where the birth of life can only be explained by the spontaneous formation of foam from the murky waters of the primordial ocean:

cell-like membranous enclosures form as naturally as bubbles when oil is shaken with water. In the earliest days of the still lifeless Earth, such bubble enclosures separated inside from outside [...] These lipidic bags grew and developed self-maintenance. [...] Probably solar energy at first moved through the droplets; controlled energy flow led to the selfhood that became cell life’ (Sloterdijk, 2016).

In Sloterdijk’s account of cellular genesis, the movement of life of the organism internalising water regulation so it can explore land is made more explicit. Internalising small aspects of the milieu, Sloterdijk writes, ‘the round form and energetic content supposedly affected each other in such a way that a first life form, the foam born monad, could rise from the sea, swimming in the water and free in it, yet also already separate from it, full of inner and own things. On this path of self-inclusion, small form-protected primal interiors viewed as the precursors to life separated off from the primordial molecular soup. In the parlance of systemic biology, they form ‘semi-open systems’ that process as self sensitive and environmentally sensitive reaction spaces. Sloterdijk re-counts how the oldest fossils found on earth thus far, over 3.5 billion years old, are interpreted by paleobiologists as ‘leftovers of primal bacteria; because of their shape and place of discovery, they are known as Swaziland microspheres.’ Their existence, Sloterdijk writes, ‘proves that the secret of life is inseparable from the secret of form, or more precisely from the formation of interiors according to spheric laws. Where unicellular organisms appear, the history of the organic begins as spheric compression and encapsulation: gathering under orb-shaped membranes is the *more* that will be called life’ (Sloterdijk, 2016).

III. LINGUISTIC GAMES

Indeed, for many key thinkers of the 20th Century, it was this relation between complex forms of life and their simpler, geometric rules, which would capture a tide of experimental architectural and computational practice levied at the multicellular tension sculptures of mathematical foam. One such model was introduced in the 1940s and 1950s by the Hungarian-born and Polish-born mathematicians John von Neumann and Stanislaw Ulam which came to be known as the cellular automaton.



Progeny-entropy endgames (Source: von Neumann)

As Perkowitz documents, ‘the geometric manifestation of a von Neumann-Ulam cellular automaton is simply a regular grid of cells, an idealised foam. The cells can be of any shape but are usually taken as identical squares in two dimensions, like a checkerboard. These right-angled shapes are easy to visualise or display on a computer screen, while supporting the key feature of cellular automata that gives them the power to generate intricate behaviour: ‘the condition of any given cell depends on the state of the surrounding cells’ (Perkowitz, 2002). Indeed for von Neumann and Ulam, as with Deleuze’s buoyant borrowers, Uexküll’s theory of the *umwelten*-laden infrastructural fold hovers. This seemingly basic rule - the condition of any given cell depends on the state of the surrounding cells - created for Von Neumann and Ulam unexpectedly rich outcomes. For Perkowitz, one such striking example comes in the computer amusement game, Game of Life, which plays itself out thus:

The game commences on a two-dimensional grid of square cells. Each cells is surrounded by eight others, like any checkerboard square. A given cell is either occupied or not by a living creature, which can be thought of as a unicellular organism, a cyberparamecium or cyberamoeba. These organisms are born, live, and die - in short, evolve - according to the following rules:

- If an occupied cell has no neighbours or just one neighbour, its organism dies of loneliness.
- With four through eight neighbours, the organism dies through overcrowding;
- With the happy medium of two or three neighbours, the organism survives.
- A new organism is born whenever an unoccupied cell is surrounded by exactly three occupied cells; that is, within the rules of the game, this is the sexual combination that produces offspring.

These simple regulations created astonishingly lifelike behaviour. As Perkowitz notes, ‘one real time Game of Life display on the Internet shows a busy, buzzing population occupying a flat universe of over 65000 cells, that is, 256 cells each in the vertical and horizontal directions. Starting with just a few organisms, and following them through generation after generation as the rules are applied, one sees multicell beings grow and die, coalesce and breakup, and move rapidly across their abstract universe, sometimes colliding and combining into new creatures’ (Perkowitz, 2002). This abstract universe is then in many senses the universe von Uexküll was appealing to composed ‘not of a single soap-



bubble that we have blown up beyond our horizon into the infinite, but of countless millions of narrowly bounded soap bubbles that overlap and intersect everywhere’ according to generic, geometric rules of progeny and loneliness entropy.

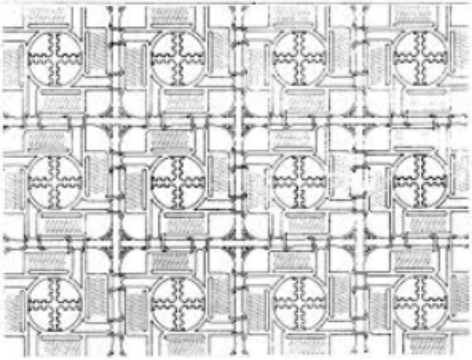
Cellular Architecture

This relation of how an abstract cellular geometry could create or simulate complex behaviour was one which was also taken up by a number of von Neumann and Ulam’s contemporaries in architecture and design. In 1951, the Growth and Form exhibition was held by the Independent Group (IG) (which included artists, architects and intellectuals such as Peter and Allison Smithson, Reynar Banham, Richard Hamilton and Eduardo Paolozzi) at the Institute of Contemporary Art in London. At the exhibition, which brought together the major figures of New Brutalism, British Pop Art and mid-century techno-utopianism, with Gestalt psychologists (Rudolph Arnheim), cyberneticists (Grey Walter), art historians (E.H. Gombrich), physicists (S.P.F. Humphrey-Owens) and biologists, the British developmental embryologist Conrad Waddington would attend, and propose that, ‘as opposed to the systems of modularity and standardisation promoted by early modernists, biological form follows principles of rhythmic variation and modulation, conditioned by the environmental factors that inform biological development and evolution³’ (Waddington, quoted in Sputnik Shuffle, 2012) The Growth and Form Exhibition in this sense pivoted on the 20th Century’s architectural and topological fixation on the formation of cells in multicellular ‘machines for living’ extended to a practical register.

Indeed, for Le Corbusier in his plans for Ville Radieuse, the concept of multicellular living extended beyond the vertical agglomeration of capsule units in the ‘social space-crystals and rigid foam-bodies’ of the city’s highrises to the city on a whole as a body, its districts would be planned multicellular, shifting from ‘the staid fixed town planning of early modernism to an open, process-orientated concept of construction⁴’ (Sloterdijk, 2016). (The image to the left is an

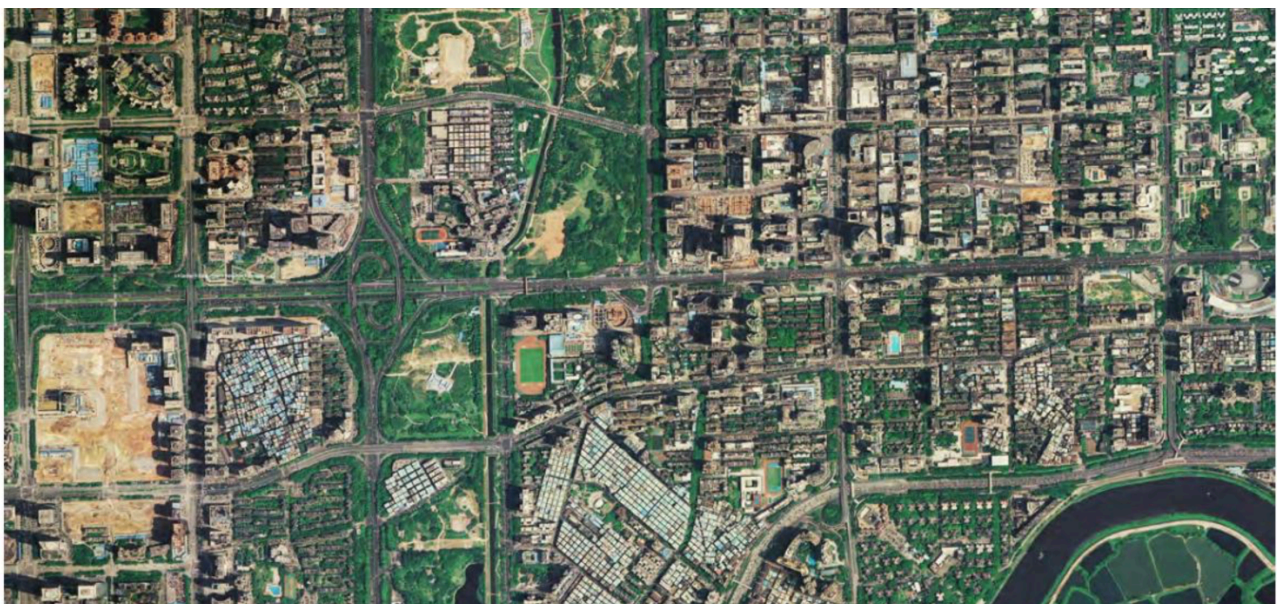
³ This view has been widely adopted in contemporary parametric design circles, and appears in the works of Michael Meredith, Greg Lynn and Reiser + Umemoto.

⁴ According to a further statement by Le Corbusier, a building is comparable to a soap bubble: ‘the bubble is perfectly harmonious if the breath is evenly applied, evenly regulated from the inside. The outside is the result of an inside.’

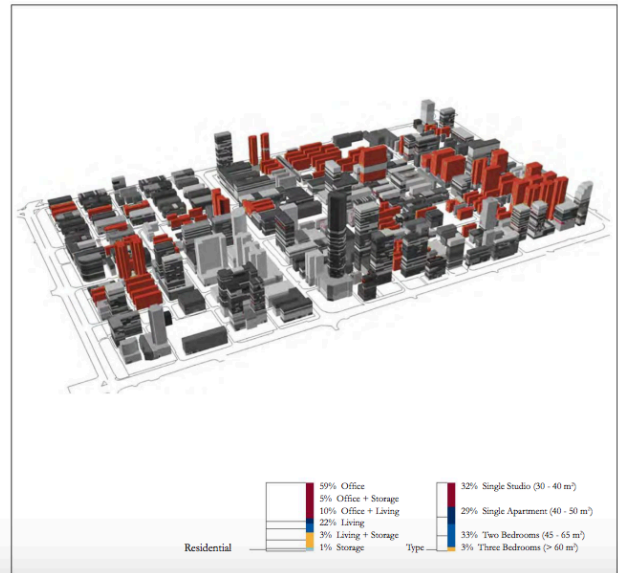
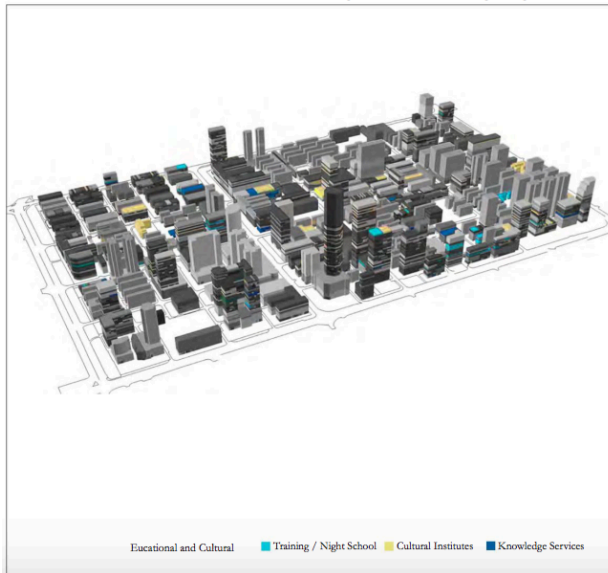


original top-down diagram of Ville Radieuse's cellular neighbourhood geometry.) Interestingly, where Western modernism sought in the myth of the apartment, the release of the individual into a devotion of cultivated self-relationships and thereby flexibilised in the capital stream, 'Soviet modernism condensed itself in the myth of the cellular commune as the matrix for the New Human Being who would be fit for the collective' (Sloterdijk, 2016).

For Sloterdijk, this 20th Century constructivist attempt to 'bring the microbiological concept of the cell closer to the architectural one in modernity did not however occur without a certain historical legitimacy: when the British physicist Robert Hooke introduced the biological concept of the cell in his work *Micrographica* (1665) in order to describe the dense arrangement of delimited cavities in a piece of cork, he had drawn inspiration from its parallels to the rows of monks' cells in a monastery.' Therein, 'with the arrival of modern architecture at the idea of the ideal-typically reduced housing unit', the concept of the cell returned to its point of departure after its 'productive exile in the realm of microbiology - with the added value of analytical precision and constructive mobility' (Sloterdijk, 2016). For Sloterdijk, this analytical precision and constructive mobility of the 20th Century was closely enthralled to the emergence of machines of seeing, the 'microscopes and telescopes', infernal machines for the eye, developed since Robert Hooke's 16th Century cork peering. 'Magnification', Sloterdijk writes, '(alongside cartography) was the first strike capacity of explication [making the implicit, explicit; bringing the background to the foreground] that coerced the previously invisible world to become pictorial [...] The phenomenon of nuclear mushrooms, cell nuclei and the interior view of humans, of X-ray images and CT scans, of galactic photographs - of a diffuse universe of complex, barely decipherable sights for whose emergence no human (more carefully put: ancient human) eye could have been prepared' (Sloterdijk, 2016).



Aphrograms (Source: https://issuu.com/projective/docs/rethinking_the_urban_block_ys)



Aphrographmetry

Sloterdijk stays for a distinct moment at this galactic height enabled by an infernal telescope, when he takes von Neumann's three dimensional Game of Life one further, to suggest 'that the best complete pictures of modern "society" are offered by aphrophagies, or foam photographs from a great height. Such images already convey at first glance the information that the whole cannot be more than an unstable moment-synthesis of a gleaming agglomeration. Foam photographs would provide external depictions of the psycho-thermic conditions in the agglomerations of human bubbles, comparable to nighttime satellite images of industrial nations, which in cloudless nights show the coexistence of humans and technical facilities in the electrified metropolitan areas as irregular spots of light [...] A high-resolution aphrogram of a 'society' would render visible the honeycomb and neighbourhood system of air-conditioned bubbles, thus making it clear that "societies" are polyspheric air conditioning systems in both the physical and the psychological sense. In the case of modernity, highly divergent temperature settings and great inequalities in the levels of animation, immunisation and pampering become evident - differences that are transformed into psychosemantic tensions and sociopolitical themes within their fields' (Sloterdijk, 2016). Here then we begin to see Sloterdijk's spherological account of co-habitational living in a multicellular urban fabric enter a space-theoretical kernel of political economy.

IV. A THEORY OF NEIGHBOURHOODS

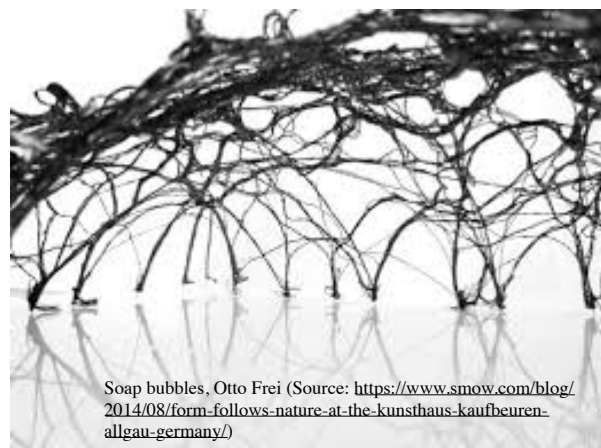
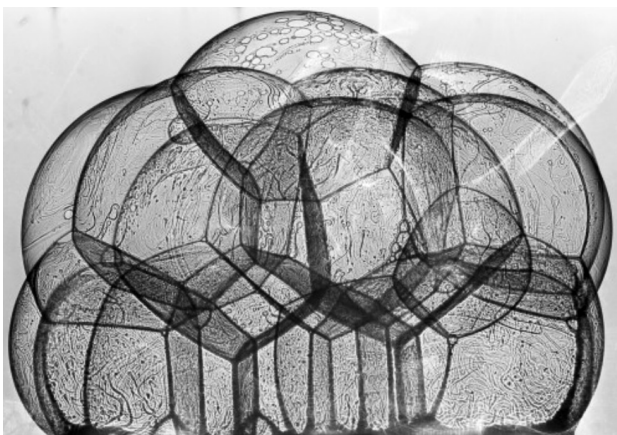
By such measure, Le Corbusier's high-rise could be precisely described as a tension sculpture of concrete, cellular life spheres. For Sloterdijk, the sphere is the 'interior, disclosed, shared realm inhabited by humans.' Living in spheres means creating the dimension in which humans can be contained. 'Spheres', he writes, are 'immune-systemically effective space creations for ecstatic beings that are operated on by the outside.' Continuing on this, Sloterdijk defines society 'not as a monospheric container [or a single soap bubble blown up beyond our horizon into the infinite] that encloses a countable population of individuals and families under an essential political name or a constitutive phantasm', but as an aggregate of microspheres (couples, households, businesses, associations) of different formats that, like the individual bubbles in a mountain of foam, border on one another and are layered over and under one another, yet without truly being accessible or effectively separable from one another' (Sloterdijk, 2016).

Sloterdijk's Spherology in many senses picks up from Deleuze in moving toward an anthropoeitic account of von Uexküll's universe of soap bubbles. This sensibility to the layering and density of human living conditions further prefigures in the accounts of broader spatial practitioners and thinkers. For the urban sociologist, AbdouMaliq Simone, in *Flickering in the Dark: The Compressed Tissue of the Urban*, he describes the urban tissue, from Andy Merrifield, as a 'fine-grained texturing, as a mosaic and fractal form that has some delicate content.' For Simone, whose interest has resided in districts of the working poor across Africa and Asia - 'sites of excessive energy, full of cascading surges and attenuations, speed-ups and slow-downs - the urban fabric takes on 'a contaminated tissue',

'full of the grounding of entities into a rush of particulates. Like both composts and superhighways, it constitutes a surface able to hold almost everything in their repetitive and improvised maneuvers, even if what it holds is increasingly indiscernible. But whatever care does take place increasingly does so in situations of compression and ambivalence. Taking a cue from Alexander Galloway, urban tissue is compressed, and something made up of many different realities and potentials [a universe of soap bubbles]. Compression is about asymmetric encounters, where things operate in the same space but which have no obviously discernible relationship with each other. The complex entanglements among household composition, entrepreneurial networks, financial reciprocities and dependencies, the dense fabric of everyday living arrangements, the profusion of tipping points, the multiplicity of risks and impulsive maneuvers, and the intensive scrutiny of individual behaviour coupled with the indifference largely shown to individualised needs all make for a thick social meshwork that is difficult to alter and reweave' (Simone, 2017).

Simone, Merrifield and Galloway are all in this sense Sloterdijkian in their sensibility to 'the multiplicities of neighbouring, interlocking, piled-up improvisations of habitat immunity.' A similar sensibility emerges in the work of Eyal Weizman, where he describes the Occupied Palestinian Territories as a 'frontier zone where settlers seem to inhabit the head of a pin' and where across a vertical column, a single territorial reality is multiplied to create two insular national geographies that occupy the same space, crashing, as Israeli historian Mere Benvenisti puts it, 'three dimensions into six: three Israeli and three Palestinian.' For Weizman, in this tension sculpture of volume occupation, the decolonisation of Palestinian life worlds 'will require not ever more 'creative' volumetric arrangements and complicated lines of three-dimensional partition, but rather, the fundamental 'delamination' of Israel's vertical apartheid. This 'political delamination', Weizman writes, 'would need to pry apart and flatten the inflated structure - the overlapping jurisdictions, separate legal systems, and modes of topographic and architectural separation - as well as acknowledge a common (not a singular or unified) history that includes the Nakba' (Weizman, 2012). In elevating the currency of foam to the level of political theory, the difficulty of such a delamination is however in some senses alluded to by free-associative means when Sloterdijk writes of the recorded spatial behaviours of aging foams thus:

- An aged foam embodies the ideals of a fragile system in which a maximum of interdependence has been achieved.



Soap bubbles, Otto Frei (Source: <https://www.smow.com/blog/2014/08/form-follows-nature-at-the-kunsthau-kaufbeuren-allgau-germany/>)

- In this framework of stable-unstable, large polyhedrons, it is potentially impossible for any one cell to burst without tearing the whole construct along with it into nothingness.
- These tragic geometries contain such a degree of internal tension, or tensegrity, between the remaining co-isolated spaces that their shared existential risk can be expressed in a co-fragility formula.
- The large cells of a mature foam act together to achieve an extension of their existence and they likewise disappear together at the final implosion. Let us note that there are no central cells in foams, and that the notion of a single capital would be inherently absurd (Sloterdijk, 2016).

The head of a pin

For Sloterdijk, the foam metaphor has the merit of ‘capturing the topological allocation of creative and self-securing creations of living space in an image.’ It not only reminds us of the ‘tight proximity between fragile units, but also of the necessary self-enclosure of each foam cell, even though they can only exist as users of shared separation installations (walls, doors, corridors, roads, fences, border installations, hatches and media). Thus the notion of foam evokes both the co-fragility and the co-isolation of these units stacked in dense lattices.’ In the foam, ‘every location means a relative intertwining of circumspection and blindness that is focused on that individual bubble’ (Sloterdijk, 2016).

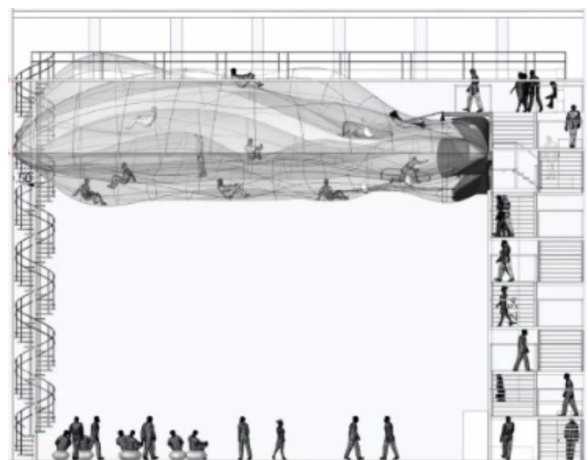
This neighbourly connection and separateness as two sides of the same situation can further be read in the modern living requirements of towerblocks where ‘the introversion of the individual households does not contradict its conglomeration in more close-knit associations.’ For Sloterdijk, the bubbles in this aggregate of human spatial multiplicities ‘must not only be stabilised by defensive means; their survival also depends on a primary extensibility that could be outlined with such concepts as creativity and capacity for relationships’ (Sloterdijk, 2016). Foam theory in this sense opens up the political claim to delaminate the infrastructural fold toward a differing creative ethics of situations and transactions, where the volume of the foam is accepted and the good is subsequently formulated as what is breathable in crowded, co-fragile living conditions.

Sloterdijk terms this bulbous onto-praxis a ‘soap bubble ethics’ in which the most fragile is taken as the ‘starting point of responsibility’ and in which ‘climate production is emphasised as a core civilisation process’ by which ‘persons and cultures are credited with the atmospheric effects of their actions’ on the lattice stack. In the Occupied Palestinian Territories where as Sharon Rotbard documents: ‘the most explosive ingredients of our time, all modern utopias and all ancient beliefs [are contained] simultaneously and instantaneously, bubbling side by side with no precautions, a soap bubble ethics attends to the ‘kissing points’ - ‘where distinctions between the ‘inside’ and ‘outside’ cannot be clearly marked. In a broader sense, Sloterdijk then elevates foam to a theory of media and communication whereby truth becomes complexifyingly multi-perspectival, whereby ‘in the foam, discrete and polyvalent games of reason must develop to learn to live with a shimmering diversity of perspectives, and dispense with the illusion of one lordly point of view’ (Sloterdijk, 2016).

As Sloterdijk suggests, ‘in media terms, foam cell “society” is a murky medium with a certain conductivity for information and a certain permeability for substances. It does not pass on outpourings of immediate truth; if Einstein lived next door, I would not know any more about the universe as a result. If the son of God and I have lived on the same floor for years, I would only learn afterwards - if at all - who my neighbour was. Every point in the foam offers glimpses of the bordering ones, but comprehensive views are not available - in the most advanced case, exaggerations

are formulated inside one bubble and can be used in many neighbouring ones. Messages are selectively transferable, and there are no exits into the whole' (Sloterdijk, 2016).

The subsequent question naturally enough however unfolds - in a pin-universe of countless millions of narrowly bounded soap bubbles - whose account of an event enters its kernel of accepted truth? With what weight, gravity and cross-perspectival examination? Indeed for Sloterdijk, the guiding morphological principle of the post-truth world we inhabit is no longer the orb, but rather foam, its 'individual spheres of influence are not absorbed into a single, integrative hyper-orb, as in the metaphysical conception of the world, but rather drawn together to form irregular hills.' In this configuration, globalisation is less a flattening than a tendential pulling together of inner contexts, where what is mistaken for the instantaneous and simultaneous, and 'confusedly proclaimed in all the media as the globalisation of the world is, in morphological terms, the universalised war of foams.'⁵ In this sense, the foam metaphor draws attention to the fact that there are no isolating means which are completely private property - one always shares at least one partition with an adjacent world-cell.

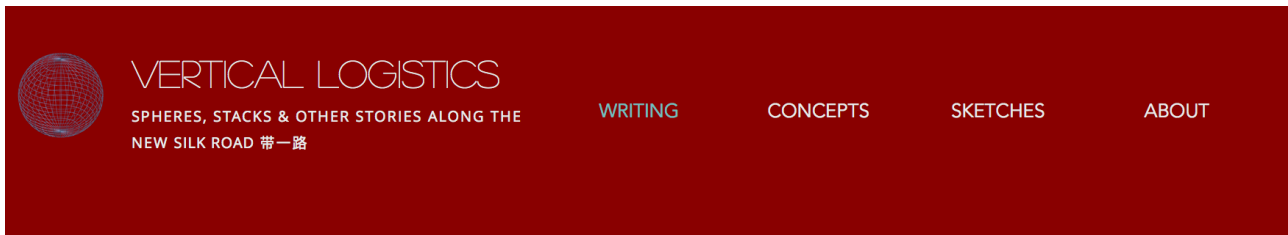


Adjacent world-cells, On Space Time Foam, Tomas Saraceno
(Source: <http://tomassaraceno.com/projects/on-space-time-foam/>)

⁵ Macaes draws an interesting case around Russia and its deliberate weaponizing of migration in an attempt to overwhelm European structures. A number of facts were coming together: the speed of communications producing a surge in refugee flows, the culture of universal human rights promoted by the European Union, and the ability Russia had rediscovered to project its military abroad. The increased level of interaction in a globalized world made it much easier and more effective to attempt to weaken an opponent from within. In this case, even if that goal was only a secondary one, Russia could use the mass bombing of civilian areas in Syria to increase refugee flows, sowing division between European countries and weakening German leadership. The point, of course, was to make it more difficult for the Europeans to resist growing Russian expansion along the borderlands, most immediately in Ukraine. Europeans were suddenly aware that systemic crises shaking the European Union could be fomented by other states.' (Macaes, 2018).

V. COSMICITY MACHINES

Elevating foam to the level of space-theoretical research praxis equates to what Sloterdijk terms the opening out of a 'sphere theory' that rescues sociology from the strained metaphor of the network and its overtly flat, reductive geometry - a universe for data fishers and anorexics. In contrast, speaking of foams highlights the individual volume of the communicating units in a spherical stack. When I first formulated a research project concerning the New Silk Road, I decided on the name Vertical Logistics, its subtitle more significantly read: *Spheres, Stacks and Other Stories along the New Silk Road 带一路*. What I was grasping for then was a theory of volume for the spheric neighbourhoods I sensed we would come to chase across the night skies of the Steppes, the spheric Umwelts eviscerating into Beijing's gravity machine and its cacophony of domed signals.



Spheres, stacks and other stories (Source: Author)

'I'm here', Caleb Scharf writes, in *The Copernicus Complex: The Quest for Our Cosmic (In)Significance*, 'to perform a comparatively mundane astronomical duty: to take calibrating snapshots of a few dozen distant cosmic islands - a set of otherwise nondescript galaxies strewn hither and thither across the visible universe'

'From inside this little cave I can control the dome's machinery and the telescope's sensitive digital camera, whose innermost pieces are chilled with regular infusions of liquid nitrogen foam. The images I hope to capture represent just one stage in a lengthy project of mapping and measuring these remote stellar townships, tracking their gentle evolution across cosmic time.' (Scharf, 2014).

In Sloterdijk's *Volume II Spherology, Globes*, he introduces us to the world fresco of 'the last cosmographer' Alexander Von Humboldt who - in keeping with the spirit of von Uexküll's and Nietzsche's 19th Century - dispensed with one lordly point of view and took up an 'arbitrary position in the external space from which to approach the earth like a visitor from a foreign planet'. 'I propose', Humboldt writes,

'to begin with the depths of space and the remotest nebulae, and thence gradually to descend through the starry region to which our solar system belongs, to the consideration of the terrestrial spheroid with its aerial and liquid coverings, its form, its temperature and magnetic tension, and the fullness of organic life expanding and moving over its surface under the vivifying influence of light (Von Humboldt, quoted in Sloterdijk, 2015).

In Chernobyl Prayer, the Belarusian writer, Svetlana Alexievich recalls how 'two disasters coincided: a social one, as the Soviet Union collapsed before our eyes, the giant Socialist continent sinking into the sea; and a cosmic one - Chernobyl. Two global eruptions. The first felt closer, more intelligible. People were wrapped up in their day-to-day worlds [umwelts] of what to buy and where to go. What to believe. Which banner to rally round next. Or whether we should now learn to live for ourselves, find our own lives. The idea was unfamiliar for us, we had never lived like that and did not know how to set about it. Each and every one of us was going through this dilemma. But we would have liked to forget Chernobyl, because our minds just wanted to capitulate. It was a cataclysm for our minds. The world of our beliefs and values had been blown apart' (Alexievich, 2014).

As I trace these separate umwelt givings, an email bores through for a workshop at Arts Catalyst on 74 Cromer Street, Molecular Violence. ‘What distinguishes environmental violence?’ - the blurb reads - ‘it is a process, often invisible, slow, remote and indirect (or, to make use of a term by philosopher Felix Guattari, “molecular”). Contaminants such as mercury and arsenic left behind by mining, or pesticides used in the maintenance of plantation monocultures, slowly transform environments.

Failed Levitation

This week (16.04) I began the onerous task of cataloguing the foams of the New Silk Road: greyish metal foams, black inert foams; fractal foams; social, guanxi foams. The molecular foams of a Caspian Sea at ‘the centre of the world’, this is how Bruno Macaes in his book *The Dawn of Eurasia* describes it thus: ‘I had a hard time falling asleep, so shortly before sunrise I left my refrigerated cabin and walked to the bridge [...] we were more or less in the middle of the Caspian Sea, near the disputed Kapaz oilfield. The weather, stormy when we had left from Alyat, promised a beautiful, clear day and the early light took on unusual colours as it reflected on the calm waters, so different from the rough waves I remembered from Derbent and Burzovna. The Caspian is a lake which was once a sea and it keeps in its many different colours the memory of this transformation. Imagine an open sea, with no sign of land on all sides, but where the water, not clean and colourless, like ocean water, breaks apart in patches of endlessly shifting colours depending on the light and the angle of the clouds on the horizon’ (Macaes, 2018).

Macaes is travelling on a cargo ship (‘there are no passenger ships crossing the Caspian’), which we have plotted to likewise at the beginning of July this year. ‘One or two hours after departing from Alyat’, Macaes ‘spot[s] the lights from Neft Dashlari. This is the first of the Caspian’s imaginary cities, places so implausible you have trouble believing they are real. Neft Dashlari, he explains, ‘is a full city on the sea, with hundreds of kilometres of roads built on piles of landfill connecting different oil platforms, partially submerged apartment buildings hosting thousands of oil workers, schools and cinemas, hotels and even a tree lined park. The first offshore oil platform, its central settlement was built on a foundation consisting of seven sunken ships, including the world’s first oil tanker, the Zoroaster, launched in Baku in 1878.

COMPLETIONS

Foamed cement successfully applied in shallow water environment in Caspian Sea

By Rufat Mammadbayli, Jon Greener,
BP Exploration; Dale Doherty, Jose Reyes,
Patricio Torres, BJ Services

THE GIANT Azeri-Chirag-Gunashli (ACG) field, located 100 km east of Baku, Azerbaijan, has potential reserves greater than 5 billion bbls of oil and is planned as a 30-year development project. Due to geohazards in top-hole sections and previous unsuccessful attempts to combat Shallow Water Flows post cementing, the Central Azeri Platform drilling team reviewed the feasibility of using foamed cement on the surface casing operations. This article describes the pre-planning, field trial and successful application of foamed cement in a shallow water environment and lessons learned.



The city and the city (Source: <http://www.iadc.org/dcp/dc-septoct06/Sept06-rufat.pdf>)

As the ship leaves Neft Dashlari behind, 'new lights from more recent platforms, entrepôts of Azerbaijan's oil empire', shine around Macaess: Chirag, East Azeri, Deepwater Guneshli, Shah Deniz. 'The straight line we were taking from Baku to Turkmenbashi may one day become the energy route bringing oil and gas from Central Asia to Europe.'

black foam

Foam runs right the way down into the subterranean forest of the Caspian's belly, enabling the full city on the sea to gorge itself on the draining city beneath. The lubrication from liquid foam supports the rotating drillhead to cut deeply until it reaches its oil reservoir. In the Caspian basin, the depositional environment was formed with a sedimentation of 1,000 m / million years. 'This high rate combined with tectonic uplifts and mud volcanoes in the area contribute to the formation of high-pressure water zones.'

In such an environment, the drilling operation must utilise a method of underbalanced drilling whereby to reduce friction on the rotating equipment and to ensure the integrity of the sea floor adjacent to the platform, the drillhole is pumped with liquid and cement foam, extended with hollow chemically-inert nitrogen microspheres. The sense begins to emerge of the true scale of Neft Dashlari's honeycomb apartments across its kilometeric vertical column.

grey foam

'Through the addition of air, a liquid or solid loses its density [...] The light element evidently has a cunning ability to penetrate the heavier ones and combine with them. 'Earth', combined with air, results in stable and dry foam like volcanic rock or cellular glass - phenomena that only came to be termed foam in modern times, once the introduction of air chambers into materials of any hardness or elasticity had become industrial routine' (Sloterdijk, 2004, p28).

Metal foams are 'a new class of material, as yet imperfectly characterised but with alluring properties. They are light and stiff, they have good energy-absorbing characteristics (making them good for crash-protection and packaging) and they have attractive heat-transfer properties (used to cool electronic equipment and as heat exchangers in engines). Some have open cells, very much like polymer foams but with the characteristics of metals (ductility, electrical conductivity, weld ability, and so forth). Others have closed cells, like metallic cork. For mobility - applications for the automotive, railway or aerospace industry - being light weight plays an enormously important role, as in these cases, saving weight leads to a large savings of energy, e.g., due to the continuous acceleration and breaking cycles of the mass. The ship building industry is considering metal foam applications concerning weight reduction and distribution, i.e., upper structures should be as light as possible, to increase ship stability and, as a consequence, to increase ship load capacity.

In the industrial machines of Intelligent Manufacturing, foam-filled beams and columns which are stiff but light can be used. With reduced inertia, they can be moved quickly and positioned precisely. In September 2017, the following conference was held in Nanjing, at the heart of the Belt and Road's Intelligent Manufacturing Chinese export dreams.



MetFoam2017 14–17 September 2017 Nanjing • China
10th International Conference on Porous Metals and Metallic Foams

fractal foam

Having crossed the Caspian, and carved through the bellies of the Kazakh Steppe and Taklamakan Desert, Macaes reaches the compressed tissue of Yiwu Futian Market, a mosaic and fractal foam of a city on China's eastern coast. 'Walking in the city you come across tens of thousands of business visitors, a motley collection of colourful characters, groomed in the less glamorous underside of global capitalism. There is an Arab district and a Turkish district and an Indian district in Yiwu, a city, small by Chinese standards, yet so intimately connected to the rest of the world that every disturbance produced a continent away is immediately registered here, the central nervous system integrating information from endless locations everywhere' (Henneke, 2014).

For Laura Henneke, in her visual-anthropological account of Arab Migrants in the City of Yiwu, she describes the clear division and organisational structure of Yiwu's specialising zones thus:

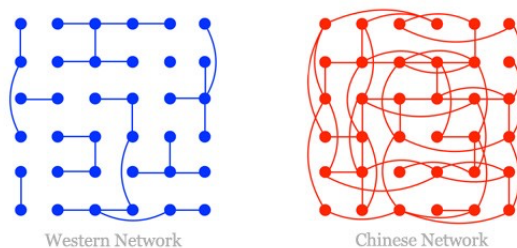


Yiwu foam Source: Henneke, 2014)

'Firstly it mimics a micro-scale reproduction of Zhejiang's local industrial clusters, where every producer of the province can be found in one of the booths in Yiwu Market, and which, presumably, are situated in proximity to merchants that have their factories close by.' The sense emerges that Henneke is grasping for an interscalar mental currency to give name for a precision nesting of shopfront spheres (micro) within productive-industrial spheres (meso) within their political-financial Chinese sphere of influence (macro). 'The second peculiarity', Henneke notes, 'is the parallel that can be drawn to the souks in Arab cities. Although they are usually not accommodated in multi-storey buildings, those bazaars follow an equally divided organisation, arranged into alleys that specialize on items or services. The inside of the buildings of Yiwu Market are a sequence of alleys with low ceilings and interruptions where the space gets wider and galleries with escalators open up. At these intersections, a higher amount of informal economy can be noticed. Shoe-blacks, food vendors, and smaller merchants – who do not rent booths but bring a very small amount of products to the market – use the open spaces for "unofficial" business dealings. For a number of China scholars, these

connections are often framed through the notion of *guanxi* which, in the Chinese language and culture, entails much richer meanings than the Western notion of ‘social connections’, and is bound to ideas such as obligation and loyalty to ascribed social groups’ (Henneke, 2014).

As Pu Yan and Taha Yasseri note, ‘early scholars studying *guanxi* culture traced its roots back to Chinese social structure. Chinese sociologist, Fei Xiaotong summarized the Chinese organisational principle into a “different mode of association” (*chaxugeju*, 差序格局) (Fei, 1992), which resembles ripples spreading from the center of a body of water when a stone has been thrown into it. Social connections in China are non-equivalent and rely strongly on family ethics and kinship positions.’⁶



Guanxi (Source: Pu, Yan, 2017)

In Henneke’s account, I am reminded of Doreen Massey’s gravitational sense of place as a constellation of social relations, of Lefebvre’s dialectical sense of the concentration of spheric *umwelts* (the implosion) and their hand in hand projection of myriad urban fragments across non-urban geographies (the explosion). For Sloterdijk likewise, under the relevant circumstances, a place like Yiwu ‘is a quantum of built-around and conditioned air, a locale of handed-down and updated atmosphere, a node of harboured relationships, a crossing in a network of data flows, an address for entrepreneurial initiatives, a niche for self-relationships, a base camp for expeditions into the world of work and experiences, a location for business dealings, a regenerative zone, a guarantee of the subjective night’ (Sloterdijk, 2016).

The bazaars of the Belt and Road are foam-functive structures in this way, tension sculptures of individual bubbles (often shipping containers) strung together through reciprocal isolation, separations and immunisations. Yiwu vibrates with millions of cells in sonorous foams; with countless competing listening collectives: Arabic, Mandarin, Pashtun, Farsi. Their introversion toward their delicately designed individualised agglomerates of foam elsewhere⁷, what we otherwise term ‘networks’, ‘links’ or ‘chains’ does not furthermore contradict their conglomeration in more close-knit associations. Yiwu’s social foam is a constellation of multiplicities of loosely touching lifeworldly cells, compressed. This delicate content of the bazaar’s pin-universe of soapbubbles further generates empirically observable characteristics, what in financial parlance are termed fractal market effects. In the Fractal Markets Hypothesis, the market is considered to consist of heterogenous agents who react to inflowing information with respect to their investment horizon. Hence, ‘what is considered negative information and thus a selling signal for an investor with a short horizon might be a buying opportunity for an investor with a long horizon, and vice versa.’ Deleuze’s buoyant

⁶ By contrast, Western social structures, in his opinion, have equivalent social connections and are constituted by autonomous groups and memberships. Recent scholars in key have considered *guanxi* culture from a micro and interpersonal perspective. Empirical researchers taking this perspective proved the importance of kinship systems in Chinese *guanxi* culture. Jacobs defined *guanxi* as “particularistic ties,” which consists of ascriptive ties, such as family members or people from the same native place. Family and extended family ties are also the foundation and starting point of establishing other types of *guanxi* connections. In China today, *guanxi* relations sometimes refer to an exclusive and yet politically influential social clique that shares similar *guanxi* ties. One recent example of the *guanxi* network in politics comes from China’s continuing struggle against corruption and conspiracy. A group of government officials were indicted for corruption earlier this year. According to reports on Chinese state media, this network was established among *tongxiang* (同乡), people from the same hometown, forming a “protective umbrella” to cover up bribery and embezzlement, leading to a “systematic corruption” (Yi, 2014)

⁷ For Sloterdijk, because each shopfront can be reached by telephone / Skype / whatsapp, each is deprived of the “unity of place” and instead connected to a network of virtual neighbourhoods. From an immunological perspective, the telephone is an ambivalent innovation, as it directs a canal for dangerous infections from the outside into the dwelling-cell, while conversely expanding the inhabitant’s radius - in the sense of larger alliances and opportunities for action - in an explosive fashion.

information-borrowing enterprise subject resurfaces - a protean node of decisional autonomy, on the move in environmental spaces that are themselves moving, autonomous, and self-deciding.'

In Yiwu Futian Market, 'if a sufficient number of buyers and sellers trade and are efficiently cleared in the market mechanism, a smooth functioning of this market is guaranteed. This brings economists to the crucial notion of FMH - liquidity. If investment horizons are uniformly represented in the market (i.e. there is a sufficient number of investors at a wide range of investment horizons), then supply and demand for assets are met, the market works efficiently and remains stable. However, if an investment horizon (or a group of horizons) becomes dominant, buying and selling orders are not efficiently cleared and extreme events are likely to occur' within the soapbubble agglomeration (Kristoufek, 2013). Alike Durian's shaving cream in this sense, the intensity of a torch light shone through Yiwu fluctuates as the bubbles both consolidate and rapidly shift position. As the social foam shifts, internal stresses might grow, until groups of tightly packed bubbles suddenly snap from one configuration to another like a slow-motion avalanche, the crisis of financial bubbles building, coarsening then bursting geometrically anew.

Subterranean home for 400 found in Beijing basement

🕒 20 June 2017

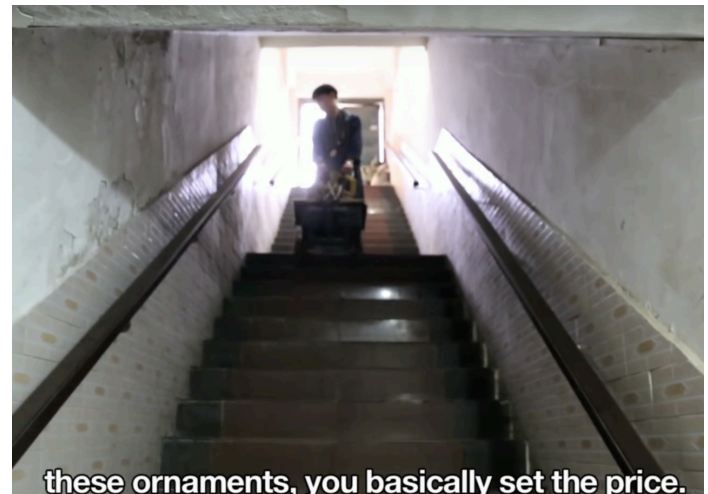


Source: <http://www.bbc.co.uk/news/world-asia-china-40325773>

A high-resolution aprogram of multicellular Yiwu might further render visible its divergent temperature settings. A BBC article comes to mind, documenting the psychosemantic tensions of one upscale apartment complex in Beijing, *Julong Gardens* - a modern day equivalent to J.G. Ballard's *High-Rise* - in which the apartment homeowners began to become increasingly 'suspicious when they began noticing more and more unfamiliar faces in their complex.' The homeowners 'eventually discovered a warren of hidden rooms behind a door in the basement of one of the complex's towers' which led to an underground space, subdivided into small windowless rooms in which around 400 people - migrant workers without adequate salaries or rights to the city - were living.

A high-resolution aprogram of a 'society' in its volume in this sense rendered visible the divergent temperature settings at the heart of China's Hukou system of governance. For Kam Wing Chan, under the hukou, or household registration system, codified in 1958, each individual is fixed within his/her own small hukou administrative unit (a neighbourhood in the city or a village) at a different position in the hierarchy. Permanent migration from one unit to another is generally not permitted without the approval of the hukou authorities rested in the police. An individual's hukou status relative to their location therein determines the level of benefits the individual can receive, for which rural-to-urban migrants (non-hukou migrants) are by in large not eligible for benefits once they have arrived in a city to which they were neither born nor assigned hukou status within.

Kam Wing Chan locates these divergent temperature settings or rights to a window, to a broader political economy of the state 'letting migrants from the countryside into the cities and export-processing zones to sell their labour at very low wages, but without giving them urban residence status and access to social services, thereby making their real wages much lower' and deferring the 'arrival of the critical Lewis turning point' (whereby surplus rural labour reaches a financial zero, causing a labour shortage which leads to rising agricultural and unskilled industrial real wages until a labour surplus is reached again) by enabling the state to draw labour from rural to urban areas at rural subsistence wage rates.' Chan therein locates the hukou system and its growing call within sociopolitical fields for extensive reform within a broader narrative of 'incomplete urbanisation' and 'under-agglomeration of cities' whereby hukou migration



Rat tribe (Source: <https://www.youtube.com/watch?v=cGbaRR3cM4M>)

restrictions 'have limited the ability of labour to move permanently from low-productivity locations to settle in high-productivity ones; and more generally, limited the ability of the population to agglomerate at different points in space whereby urban production - characterised by localised external economies of scale - might have been mobilised. Chan's language in this sense is illuminating for its sense of economic shape taking that of agglomerating bubbles, clusters and polyhedral foams.

katabatic foam

In AAA Cargo, Solveig Suess follows a group of 'paralogisticians', a new generation of precarious workers consigned to the construction of the Belt. As the government in Beijing presses on to accelerate the terraforming machine, a nomadology of minor resistances coagulate to speak of other possible worlds: unruly sands hacked up by katabatic currents off the Loess Plateau disrupt project schedules, downtime opens up for the paralogisticians to carve out different spheric *umwelts* of poeisis, transnational guanxi and friendship within the cargo-holds and passenger carry-ons of the logistical fleet.

'Sand', Suess writes, 'can find its entrance anywhere, its movements always in multiple, potent with the ability to irritate and agitate things as solid as infrastructure. Despite algorithmic oversight, a relentless material disruption frequents the New Silk Road. Every grain carries the potential for interfering into the machinic workings of infrastructure on various temporal levels. The intense sand-carrying wind requires trains to be cleaned every three days, or it would have the power to corrode the surface of trains and de-colourise its paint. Sand becomes an oxide after



Source: Suess, 2017

reacting with moisture on the ground, where it does not forget the industrial chemicals which meld into its chemical composition, nor the salt from its original bed. Over a longer duration, it gradually wears down the tracks and train wheels. Train tracks undulate on and above ground, the heights determined by the intensities of the landscape's sand composition. 463 kilometres of windproof walls were built along the Gobi Desert stretch of the line, as well as the 3600 metre-high Qilianshan tunnel in Gansu Province

The sands are close reminders of the expanding deserts from the nation's modern peripheries, Xinjiang and Inner Mongolia. Over the past few decades, utopian social-agricultural experiments of high Maoist socialism completely drained groundwater and many lakes across Xinjiang and Inner Mongolia, quickly receding its water tables. Lop Nur, a lake that disappeared forty years ago, is now one of the four sources of sandstorms in China. Twenty percent of the country currently exists as desert, whereas in 1975 desert lands were 21,000 square miles smaller. For anthropologist Jerry Zee, the mobile dunes of the deserts are "sites and material forms where we can trace emergent alignments of politics to the inorganic afterlives of the broken land." The state-led ecological construction slogan in these areas speak of "blocking wind, holding sand" (fangfeng gusha), where it is through the control of conditions of suspension which influences local environmental politics. These displaced sands have become products, manufactured as an accumulation of soil degradation, labour practices, atmospheric sways, political ideologies, and geological grinds. In a turbulent flow of agency, sandstorms irritate the calculated journey of the train.

I quote Suess at length for the visual currency she is developing of sand - 'emergent alignments of politics', 'fangfeng gusha (blocking wind, holding sand)', 'conditions of suspension.' In Jane Bennett's formulation, sand is vibrant matter. Yet in another sense, the sand basins from which sand storms develop appeal as foam-functive structures of their own, tension sculptures of 'a mosaic and fractal form that have some delicate content.' Indeed to stretch, AbdouMalik Simone's descriptive of the urban fabric as 'sites of excessive energy, full of cascading surges and attenuations, speed-ups and slow-downs, a contaminated tissue 'full of the grounding of entities into a rush of particulates', this would fit as a descriptor of the more-than-human sand cities of Lake Lop Nur. Suess's essay film entrancedly traces the curving undulations of these city perimeters. I get the sense that in Suess's work she is grasping for a visual and mental currency in the affirmative: "this is not tabula rasa" (or in

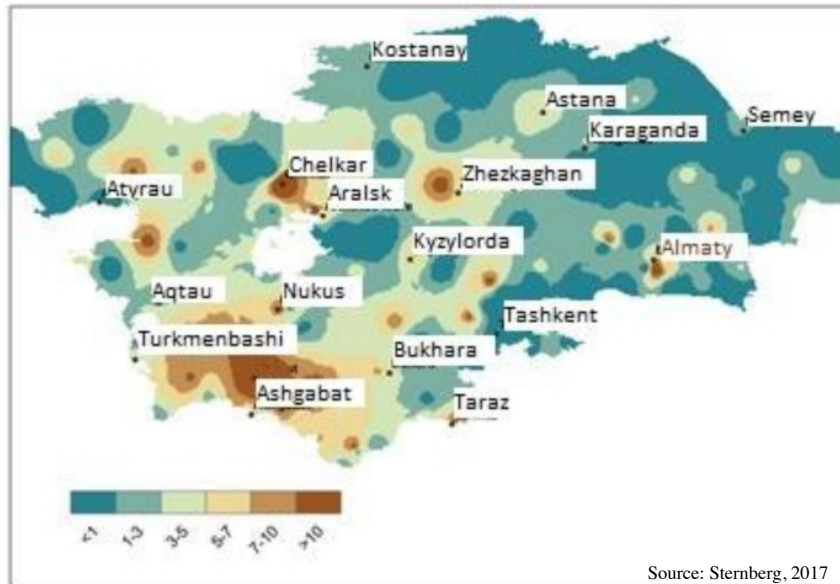
Snow falling and night falling fast, oh, fast
In a field I looked into going past,
And the ground almost covered smooth in snow,
But a few weeds and stubble showing last.

The woods around it have it--it is theirs.
All animals are smothered in their lairs.
I am too absent-spirited to count;
The loneliness includes me unawares.

And lonely as it is that loneliness
Will be more lonely ere it will be less--
A blanker whiteness of benighted snow
With no expression, nothing to express.

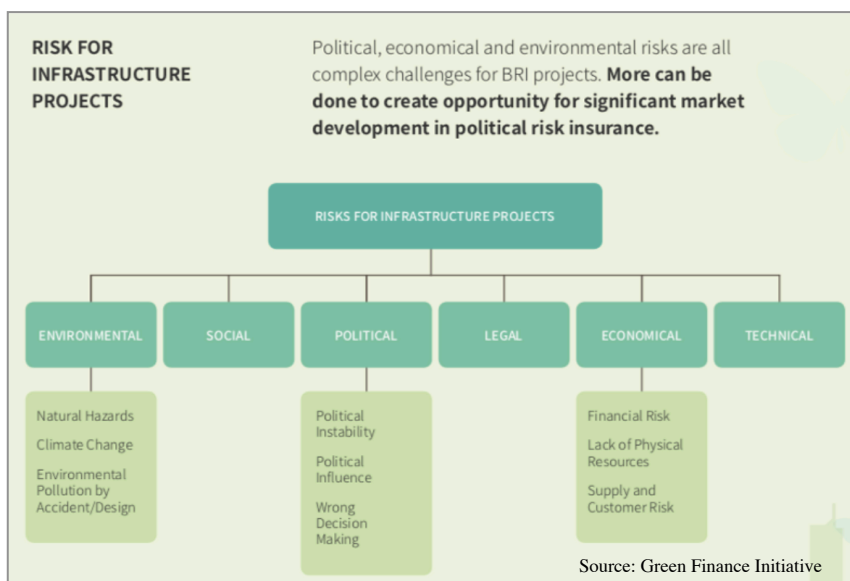
They cannot scare me with their empty spaces
Between stars--on stars where no human race is.
I have it in me so much nearer home
To scare myself with my own desert places.

Source: Robert Frost, Desert Places



Robert Frost’s memorable formulation, ‘empty space’) but *volume virtual occupied*, a dense ocean sky of kinetic neighbourhood spheres dormant, charging or re-charging.

The sense emerges that from the great height of Von Humboldt’s satellite, ‘consideration of the terrestrial spheroid with its aerial and liquid coverings, its form, its temperature and magnetic tension, and the fullness of organic life expanding and moving over its surface under the vivifying influence of light’ would animate forms of life between sands and humans that are not dissimilar in their mass exoduses, resettlings and reformattings to socio-economic and environmental pressure flows. In July this year, we will be pulled through these spheric desert worlds, bending their inner contexts to gravity, scattering light. We will be sucked into the dessicated vortices of the Aral Sea, whose cities were under no irony built in sand through Krushchev’s Frostian ‘Virgin lands’ agricultural expansion diktat in the macro-spherical brace of the Soviet 70s. As Troy Sternberg writes, ‘due to its overexploitation as a water resource for agriculture, the basin lost more than 70% of its volume in five decades, as a consequence [...] new dry areas became



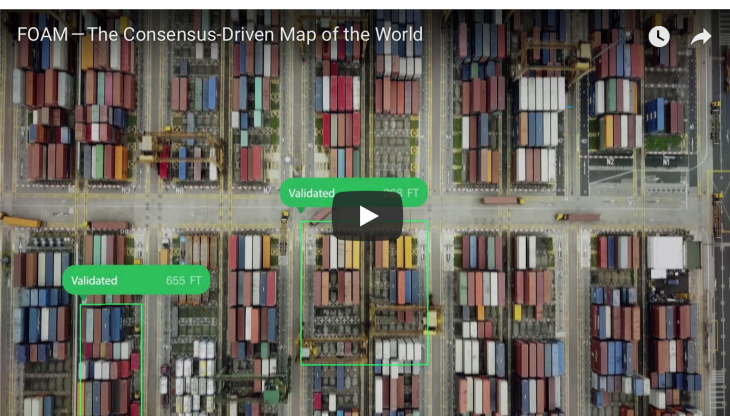
active hotspots of dust storms. The bottom of the sea salts, and then fertilisers, pesticides, herbicides, and other conditions that affect human health and hygiene (especially water and sewage), supplied the dust storms with particles that are chemically detrimental to human health’ (Sternberg, 2017).

Entrained when a strong wind (powered by the spin of the earthsphere and its parasitic differentials of solar receipt) exceeds a threshold value, these particulates suspend in airy tension sculptures of volume occupation and exodus, the dance of a million traders bending their inner contexts in rhythmic variation and modulation under the non-linear compression/decompression dynamics of the pack, the Silk Road's first collective. It is no surprise that Douglas Durian uses his method of diffusing wave spectroscopy and computer simulation today to examine how sand flows. The same computer program that simulates foam simulates sand by making individual spheres rigid like sand grains rather than soft like bubbles. Durian constructs his parametric designs of sand to illuminate how these enclaves of sand cities form and move.

Elevating tension sculptures of foam to the level of space-theoretical research praxis appeals in this sense to Bratton's formulation when he describes geopolitics as a flat discourse - much in the vein of Sloterdijk's sklerotic network - which obfuscates forms of life from their real occupation in 'aerial volumes, atmospheric envelopes and oceanic depths.' In this sense, elevated foam is a resolutely anthropocenic device for animating these tendential relations of quote on quote "cultural" and "natural" phenomena which does not fall back on an anthropomorphising or overtly embracive tendency toward the non-human but rather observes the relation under a vivifying light where organic and aorganic umwelts of spheric association curve and fold out of one another by their shared geometric rules of solar and air-breathing progeny. The sand cities of Lop Nur are not inert or exogenous to the economy of the New Silk Road in this sense but complexifyingly implicated in its associated 'investment climates' - hence the pressures to block wind, hold sand. Complexifyingly so: because the landscape is a simultaneity of exterior gaze and interior phenomenon. Interior: because the mythic formulation that the environment is external - and may be coded, quantified, and rationalised to serve economic growth, social development, or some other higher good - is dismantling and being re-formatted toward the reality of its anthropocenic soapbubbles where one can never reach the outside to dump or externalise waste, where one always shares at least one partition with an adjacent world-cell.

These relations are a key international political sticking point of the BRI - several western leaders including Theresa May and Emmanuel Macron have withheld from signing Memorandums of Understanding with Beijing due to a concern for the lack of environmental concern evidenced thus far. Framing the foam-forms of life between sands and humans thus, solarially progenised into mountains of blinding foam, is not a sole poetic-imaginative endeavour but opens a visual currency on a real politik of the infrastructural fold and its dissensual lines between the environmental interiorists and the externalisers.

blockFOAMs



FOAM's protocols will enable an ecosystem of independent applications in an array of verticals. In this post we explore potential use-cases in what we currently see as the biggest verticals for FOAM; Mobility, Geospatial Data, Gaming, Supply Chain, IoT & Location Intelligence. We encourage you to think about alternative applications enabled by our core protocols, as the use-cases we are most excited about, are the ones we can't even envision yet.

All applications discussed are fictional examples for illustrative purposes.

Source: foam.space

VI. A THEORY OF CO-FRAGILE SYSTEMS

Density

Toward the end of *Spheres III - Foams* - Sloterdijk suggests modernity forms an ‘experiment with highly compacted conglomerations.’ Modernity is ‘the era of increasing co-fragility; it could, *à la longue*, constitute the transition to post-bellicism.’ In co-fragile systems, Sloterdijk continues,

‘one can no longer achieve much with such concepts as independence and autonomy. Where high density becomes stable, the whole of sovereignist reason to date could descend into folklore along with its strategic concepts. One cannot rule out the possibility that an age of cooperation lies ahead, one that will replace imperial logic and disenchant the conventional political collectives, the stirred-up peoples. Because these are phenomena that develop over long periods, we will have to await the judgement of later generations. Then one will see how the nation-state and the fiction of peoples will fare in the next two hundred years. Whether one is justified in posulating a macrohistorical law of growing density, extending to a super-context that embodies a stable final foam, is a question I shall leave open [...] One thinks from a distance of Newton’s definition, which states that bodies are denser when their inertia is more intense. World civilisation would then be a state of highly integrated, hyperactive inertia. Perhaps people will one day assert that density is destiny’ (Sloterdijk, 2016).

When reading accounts of the Silk Roads, there is often a sense of these Newtonian inertial spheres of light-scattering contexts.⁸

‘Returning from his last mission, Marco Polo found the Khan awaiting him, seated at a chessboard. With a gesture he invited the Venetian to sit opposite him and describe, with the help only of the chessmen, the cities he had visited. Marco did not lose heart. The Great Khan’s chessmen were huge pieces of polished ivory: arranging on the board looming rooks and sulky knights, assembling swarms of pawns, drawing straight or oblique avenues like a queen’s progress, Marco recreated the perspectives and the spaces of black and white cities on moonlit nights’ (Calvino, 1997).

‘Do not ask me about the coordinates of these planets. Those numbers are the oldest mystical proverbs of the universe. They are the air between your fingers. You reach out to grab them, but when you open your hands, there’s nothing. You and I and they meet for a moment, and we are fated to again separate. We’re only travellers, singing songs whose meanings are obscure, wandering through the dark sky. That is all. You know they are singing in the wind, singing in the wind of a distant homeland’ (Hao Jingfang, 2017).

Perhaps it is the vast distances and what Bachelard calls ‘cosmicity’ on the side of the dreamer. Cosmicity, Bachelard writes, ‘is performed by the sleepless philosopher who trains his mind to hear the ebb and flow of a vast ocean in the hubbub of the chaotic, nighttime city’ (Bachelard, 1958). In the microcosmic cell of an apartment block in the nestled oasis city of Bishkek, new forms of cosmicity are emerging, a farmer and his farm *umwelt* is pulled into the orbit of a Sino-Krygyz agri-logistic consortium, which is pulling into the orbit of a Sino-industrial spheric world OBOR to its east; another trader and his bazaarshop *umwelt* loses his business to a consortium’s growing presence. To hear the ebb

⁸ Indeed in Peter Nolan’s account of the ancient silk roads, ‘from the ninth century through to the fifteenth century, an astronomic Silk Road flourished, producing ‘towering intellectual figures who made fundamental advances in mathematics, astronomy, geography, medicine and philosophy, including al-Khwarizmi (783-847), al-Farghani (798-865), al-Khwarajandi (eleventh century), al-Biruni (973 - 1048), Ibn Sina (980-1037) and Al-Quschi (1402-1474). The most famous figure in Central Asian astronomy was Ulag Beg (1394-1449), who was the virtual ruler of Transoxiana. Among numerous achievements in the arts and sciences, Ulag Beg is renowned for his remarkable *madrassa* in the Registan square in Samarkand and for the observatory he build just outside Samarkand. The first Ming Emperor, Tai Zi, would establish a Muslim Astronomical Bureau in 1368, headed by Jamal al-Din from Bukhara. The Bureau operated alongside the traditional Chinese astronomical bureau. Central Asian studies of astronomy were translated into Chinese and Muslim astronomers built an astrolabe which was installed in Nanjing in 1385, in order to observe the stars’ (Nolan, 2016).

and flow of a vast ocean in the hubbub of the chaotic, nighttime city gives as many worlds as there are eye types and other sensors to see and feel them. The infrastructural fold of the Silk Roads emerges as the expansion of horizons - life chances and life risks multiply.⁹ Anthropology gives up its ghost and enters the realm of an *Umweltology*, pulled across a universe of soap bubbles avalanching in and out of shape. Countless forms of life in turbulent foams doppler in progeny-entropy endgames.

Perhaps it is less the distance than the sense of density growing out.

In the seventh and eighth centuries, the Chinese capital, Chang'An (modern Xi'an) was the greatest city in the world: 'the streets were filled with the cosmopolitan populace befitting the capital of such an extensive empire. There were priests from India, officials and merchants from Persia and the kingdoms of Central Asia, Turks, Arabs and traders from Mesopotamia...There grew up side-by-side the Buddhist and Taoist temples, Muhammedan mosques, Manichean and Nestorean churches' (Nolan, 2015).

In 2013, President Xi visited Central Asia, including Uzbekistan, Turkmenistan, Kyrgyzstan and Kazakhstan. In spring 2014 he visited Europe. In a sequence of speeches during these visits, he clarified China's conception of the bridge between China and Europe along the New Silk Road by Land and Sea. He paid close attention to the importance of infrastructure development, including ports, airports, roads, rail, water, electricity and telecommunications. These are vital in order to stimulate commercial relations, which are the foundation of enhanced mutual understanding. Xi spoke: 'History tells us that only by interacting with and learning from others can a civilisation enjoy full vitality. If all civilisations can uphold inclusiveness, the so-called "clash of civilisations" will be out of the question and the harmony of civilisations will become reality' (Nolan, 2015)

Pull

The New Silk Road is a cosmic machine, scattering a neighbourhood of aqualine spheres across the spine of three continents, weaving polyhedral oases in black, grey and fractal foams. And of the countless millions of narrowly bounded soap bubbles that overlap and intersect everywhere, the aprogrammetrists can only capture a few remarkable polyhedrons by their unimaginative Westphalian referents, often the largest, orbiting larger neighbours still.¹⁰ These large polyhedrons enter the frames of political economy / international relations / economic geography as real abstract neighbours whose positions in the world hothouse with many rooms are drawn into the linguistic games of mutual understanding, clash and harmony. Three such, polyhedral sovereignist spheres - Georgia, Kyrgyzstan, Kazakhstan - spin their inner contexts to the pull of densifying expansionary polyhedrons elsewhere, a Russifying Eurasian Economic Union sphere to the north, a Sino-industrial spheric world, OBOR, to the east. In foam, the hothouse sciences depart their flat, monochrome gazes toward a soap bubble ethics where place, position and perspective are foregrounding first dialogic steps.

Perhaps this elevation of foam comes at a price of clarity - like the New Babylonianists tracing the aghropolises of cities spreading across the earth as proliferating nomadic artists' colonies on stilts - the Silk Road of Spheres enters the equation *in absurdia*: 'how can a construct after all that cannot even guarantee it will stay in shape be considered as a possible enabler of life sequences and creative long-distance effects?' (Sloterdijk, 2016). Yet, in elevating foam to the level of space-theoretical research praxis, this real-surreal unbalancing lays broader ontological claims on the

⁹ In Bratton's formulation, the infrastructural fold 'smooths space by striating it with heavy physical grids of cables and server farms, and striates space by smoothing it out with ubiquitous access, sensing, relay, and processing micropoints.

¹⁰ For Pierre Levy, the semiotic productivity of large polyhedrons develops thus: 'in the knowledge space active exhalations work together, not to bring about some hypothetical fusion of individual beings, but to collectively inflate the same bubble, thousands of rainbow-tinged bubbles, provisional universes, shared worlds of signification.'

infrastructural fold than might be first apparent, that i) in the foam, ‘discrete and polyvalent games of reason must develop’. Foam in this sense, from a semantics-critical point of view, offers a mental and visual paper currency with which to re-approach questions of co-fragility, co-isolation and expansionary interest in the descriptive-normative linguistic games of their long-exhausted kernels of international relations.

That ii) density is a measure of human *and* material living arrangements, a material human anthropology¹¹, which re-affirms the reality that the human is a bounded sphere not a self - a sphere-selfing *umwelt* - forever chasing a lightness of being in grave spaces.

‘It is in no sense “bare life” that determines the subject’s form in the luxury hothouse, but rather the possession of spending power in combination with mobilised appetites. One part of the image of the new is a strong upward social mobility, carried by a considerable multiplication of chances in the earning histories of individuals. Multifocal “society” offers a thousand milieus to lean on, ten thousand stages to come out on, and a hundred thousand stairways to ascend. Every milieu, every stage and every staircase forms a micro-universe of uplift’ (Sloterdijk, 2016).

When Bourdieu wrote of the weight of the world, his reference was a heavy ‘bureaucratic field’, re-constituting itself by a process of concentration of the various species of capital operative in a given social formation. Yet like Simone’s compressed tissue, the hope of uplift in Bourdieu’s grave bureaucratic spaces is not lost, ‘there is something in how the solidity of small attainments, the thickness of socio-economic fabric, and the weight of an overused physical base intertwine that provides a surface of protection by keeping things the way they are. This intertwining of thickness, solidity, and weight embodies the conditions of precluded transformation, but also a motility that constantly heads somewhere inch by inch without specific destination, creating a sense for residents that things are moving. Complex recalibrations do take place’ (Simone, 2017). That *things are moving* is the secret of the infrastructural fold, its expansion of horizons: life chances and life risk multiplication, uplift and weigh-down, a hundred thousand stairways.

Elevating foam captures in an image infrastructural life in its boundlessly space-forming effects, foam in this sense opens the possibility for a media and material theory of the world hothouse with many rooms. Elevating foam to the level of space-theoretical research praxis opens out toward a theory of media, communication and matter which does not dispose of position, place and perspective but rather takes as its first image-step the occupation of the problem in volume. The New Silk Road is a hypercubist, multiperspectival tension sculpture par excellence in this way, a litmus to the poly-plural pin-universe of co-fragile influence spheres we now live in east-west convergence times. In this sense, where light scatters, the foamologists and *aphrogrammetrists* enter, recording a fractal of opinions, hopes, losses, dreams, optimisms, closures, drifting the foam chamber of a world hothouse with many rooms, capturing edges, staring at a foam chamber, pumping a dazzling neighbourhood of aqualine spheres, bending their inner contexts to gravity, scattering light.

¹¹ As Peter Nolan notes, this material human anthropology is also a material human history: ‘In the two millennia after China was united under the Qin Dynasty, China was mostly peaceful and it formed a gigantic free trade area in which commerce and ‘capitalist sprouts’ (*zibenzhuoyi mengya*) flourished and expanded over time. The state performed critical functions in areas in which the market failed. Infrastructure was the most important of these. Under this structure, China advanced far beyond Europe in terms of its level of national output, mass living standards, urban prosperity, enlightened culture and level of technical innovation. In numerous areas of technology, before and during the Renaissance, China’s sophisticated market economy stimulated path breaking innovation long before the West: silk textiles, paper, printing, gunpowder, porcelain, steel-making, the wheelbarrow, the compass, the sternpost rudder, the segmental arch bridge, watertight compartments on ships, the crank and the double-acting piston bellows, which together constituted ‘the complete morphology of the steam engine’, the foot stirrup and the efficient equine harness. The spread of these and other technologies to Europe took place mainly through merchants, both Chinese and foreign, by land and sea along the Silk Road (Nolan, 2016).

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