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new structure and the informal by Cecil balmond

summary

We make cages out of our structures. We want our buildings to have frameworks but out of a **Cartesian compulsion** we compartmentalise space into strict horizontals and verticals. Our designs reinvent the topographies of rigid skeleton. Locked in right angles, the assumption is of order as a rigorous delineation and within that the building as object. So the external boundary is set, and by grid and sub-grid a method of exact- subdivisions begins; a diminution into regular, repetitive fixings of space. Within the rigidity nothing moves. Like soldiers on the parade ground everything is at arm's length, the formation of regiment being taken as more important than the individual impulse. The formal is taken as read and a regimental concept of order accepted as the status quo. The imagination is immobilised. We trap movement.

In the static perfection of **the modernist cube**, with its minimalist palette of glass and transparency, we see right into the emptiness of the container. **Structure seems to have no response but to stand mute.** In hightech elaborations we see only the extension of a mechanistic tradition; steel mast and cable, structure as machine. In terms of space and configuration, inspiration seems to have given way to an overpowering technology. But is geometry this artificial wasteland or does it have some kind of animation, allowing the outcome of an intervention in its potential to be guesswork rather than a predestined plot? If there is life to this geometry perhaps we should go forward more cautiously, trading more on intuition, more on instinct than on the assumption of space being neutered, capable only of containerisation.

In the irregular rhythms and diversity we see all around us, **the real is highly complex**; It is rich in entanglements. So why not look for characteristics that 'seed' the complex and give starting points to an inner logic which could lead outwards to the idea of ensemble and coherence? Traditionally, A relates to B and then B to C in hierarchical connections of formal logic. But could the idea of A into B back into A back into B build on some kind of feedback loop? Why not structure as trace, as episode, as staccato or punctuation? Then as catalyst, the idea of local would arise; juxtaposition becomes rhythm; hybrid entities are taken as natural and positive and not as odd, freaky, or the exception. We enter a general domain of overlap where what is site specific, at a particular instant or viewpoint, may become order. Ambiguities arise, interpretation is the only way forward. There is no single reading of such a building.

:: The informal

The informal is not random or arbitrary, it relies on overlap to bring forward a series of shifting certainties - its logic is contingent upon initial conditions. Chaos is seen as a succession of several orders, quite different to the idea we have of trapping the arbitrary and calling it order.

The twisting in and out of a Moebius strip is informal. **A roof that turns to wall and floor, a floor that is skin, where boundary does not mean border, is also part of it.** Two columns out of step, side-by-side, of different shapes and material are part of it. Instead of regular formally controlled measures, varying rhythms and wayward impulses take root. Opportunity is seen to give chance, a chance!

The classical determinism of Newton pictured force as an arrow, straight and true. It bridged the void in unwavering linearity - the fixed link of a rigid chain of logic. **Now we see force differently, as a minimum path through a field of potential.** Dependent on local conditions that path may vary but the trajectory is based on moments of mutual cooperation, a simultaneous juxtaposition that charts a minimum path.

In the informal there are no distinct rules, no fixed patterns to be copied blindly. If there is a rhythm it is in the hidden connections that are inferred and implied but not noticed as obvious. The answers lie in the relationship between events.

Hybrid situations are taken as valid starting points and not unfortunate accidents. Two events close together are not seen as exceptional but as a dynamic that sends out particular vibrations.

Structural solutions that arise from the informal impart hidden energies to a building. The connectivity is improvising; the equilibrium put together in ad hoc instants. The informal acts as an agent of release and architecture is free from the traditional notions of fixed grid and locked in cage - the topography of such buildings is different. What is new is the intuitive rational and a new kind of structure.

:: Recent projects

Several recent projects with **Rem Koolhaas** incorporate structure as informal response to space. In the case of the library for the Jussieu University of Paris, the release of the vertical bracing from its traditional lines of concentration in a building,

to distribute throughout the cross section as a scatter, allowed floors to lift and spiral. Stability was given by a series of local interventions, coupling various discontinuities back to nodes, incorporating the slanting floor elements themselves as bracing elements.

The structure of **the Kunst-hal in Rotterdam** is full of staccato and off beat rhythms. Columns move out of regular sequence in a **shameless opportunism**, to accept conflicts that arise from not ironing out and 'planning' evenness in the roof structures. As a result, the entrance area to the art gallery gains three columns, of different materials and section, whose juxtaposition introduces and defines 'threshold' in a fresh, new way. The horizontal bracing of the roof in the main upper gallery of the museum is a sweeping arc that punctuates the roof beams and begs the question as to what the curving red line in space is for; is it decoration or structure? But does it matter, why should structure be comprehensible and explicit? Structure need not advertise to itself. In fact, **deep structure will never be seen**. The algorithm, or secret pattern of its generators, is the impetus that stays hidden. I prefer structure as trace rather than skeleton, with pathways that attempt to interpret space. If the trace is continuous and explicit, well and good, the continuum is celebrated; if fragmentary and intermittent, then the discrete is allowed a say. Borders vanish and boundaries travel in this new paradigm, they become lines of passage and phase points of transition. Limits become thresholds. These are the dynamics of potential latent in position, where even a humble point is empowered as the first leap of concretisation out of a supercharged void. To achieve the great sweep of concave roof in the Lille exhibition and conference centre, I proposed to Koolhaas a hybrid solution of timber and steel using, unusually, timber as tension chord and steel angle tees for compression booms. A simple reinforcement bar bent into a waveform provided the shear bracing connecting top angle tee to bottom timber chord. What could have been a pragmatic industrial roof now became a lively surface of striations; the gigantic underbelly of a great boat. Timber lent warmth to the interior, making the huge space more intimate, more approachable - a mark of the informal. In the most recent project completed with Koolhaas for a **villa in Bordeaux**, equilibrium takes a flip from its usual stable configurations. Beam lines 'slip' and stagger, both in plan and vertical elevation, giving release to the solid form so that the idea of enclosure is 'airborne'. The traditional solution of evenly distributed bottom support would have given the configuration of 'table' and a static response. But the Bordeaux villa 'flies', the skewed nature of top hung right support juxtaposed with bottom left cradle support, setting up a precise danger point.

Balance is precarious. It is a knife edge. In the sharp juxtaposition of equilibrium there is shock, a polarising excitement of safety and risk; of uncertainty and unpredictability. The Bordeaux villa seizes the moment -extemporising space in a show of 'look no hands' structure. Though the main form is dark and strong and concrete, even fortress and bunker like, the villa seems to launch itself into space, the exaggeration of structure and its 'slips' making structure itself vanish. The response is typically part of the informal.

:: The Victoria & Albert Museum

For the V&A Museum extension, the new entrance building, **Daniel Libeskind proposed a 'spiral of history'**. Far removed from the 'de-con' labels hurled at it, the form was developed as an evolving trajectory, crisscrossing space, continuous and open ended, spiralling upwards. The approach was entirely holistic, Classical spiral forms revolve around fixed centring; both logarithmic and Archimedean spirals turn in ever widening orbits fixed by a continuous unwrapping of space. **There are no discontinuities, no jerks and no jumps, but the spiral of history is different, it is chaotic - its centre moves, the orbits jump. The resulting trace is one of interlock and overlap.**

A radius that moves around a circle, stopping in certain instants, will give an irregular polygon trace if the points at which it stops are connected to each other sequentially. If this radius should increase or decrease during rotation the notion of a spiral is introduced. If the centre begins to shift as well during the revolutions then the trace is of a new kind of spiral, a chaotic spiral.

When such a trace is taken as a centre line plan of wall elements, and the zigzag on plan is elevated by a series of height offsets, one in relation to the other; and tilts introduced about these centre lines, then a form such as the V&A takes hold. The overlap of the lines become cross-over points giving necessary bearing to the walls, which take their strength from the interlock. The structure as it were 'builds' on itself, standing free; needing no internal core or extra brace. Floors act as diaphragms and columns do not penetrate the volumes, giving to the interior spaces a meditative and serene quality. The walls are of concrete, weaving a seamlessness into the twisting structure and at the top, to gain light, the spiral turns into glass.

The materiality of the spiral can be further questioned by the sub-pattern tracing [when is structure seamless or buried network?]. If there is tiling on the walls, and the **pattern of the tiling is such that its configuration could transfer at some point into structure, then decoration turns into substance**. This exciting shift is being investigated with the V&A but to look at this fruitfully, a new kind of tiling was needed, a fractile.

The **'structure' of the tiling** chosen for the V&A is a generic pattern, a network that grows without scale and absolutes. The growth sets in place regulating self-similarities. In an ever breaking network of rivers and tributaries, rhythms of descent

and ascent grow. It is a constant replication that looks similar at every step but never quite repeats in pattern. Only three tiles describe the starting point for this adventure but each is derived from the other, setting up an interdependency and intimacy from the outset. The great surprise is that this delicate labyrinth builds on a hidden ancient geometry, that of the golden section!

It is quite astonishing how at the heart of something seemingly open-ended with simultaneous bifurcations at all levels, untamed and wholly modern in concept, there should be this classical mark of perfect ratio. However, there was nothing static about the early classical paradigms: the Greek spirit thrived on relative ideas such as 'interval' and 'proportion', and like Zeno delighted in paradox -not for those early masters the absolute fix of dimension. Classical perfection was taken as a march of several orders, interdependent and bound, one within the other. Algorithm governed; a symphonic geometry went to work to promote and proportion space.

:: Chemnitz

Stadia designs follow concentric thinking Typically, a slice is first solved with a cantilever roof coupled to seating stands, and then the cross section is spun round; faithfully following the running track in the idea of extrusion. **Architects Peter Kulka and Ulrich König** wanted to break this mould in their design for Chemnitz, near Leipzig They proposed a roof that was uncoupled instead from the stands; one that would not just follow the running track but would cover the whole site. It was a conceptual breakthrough. The uncoupling gave unlimited freedom with the roof acting as some sort of cloud floating over the seating The randomness of nature, as forest, was to be brought into the idea of the supporting columns, and the roof, main tier seating, and running track were to be given different orbits, spinning with different outlines and energies - as unpredictable as the games themselves with the outcome of win or lose.

A model was built out of paper to explore the free contours of such open thinking. The result was an extraordinary, longitudinal strip waveform. However, it seemed impossible to impose the logic of transverse, fixed radial cantilevers on such a proposal, and the question was how to respond with 'structure'? Something new was needed, an inner logic with which one could construct an argument.

The answer arose from three local conditions. On plan, at three places, the back of the seating coincided with the site boundary. **There was no available backs pan for a traditional cantilever. Instead, three torsion rings were proposed, launching into space.** In support of these rings, further rings vaulted into space and an assembly grew, **each ring interacting with the other.** A steel net formed. To create a rippled form for the roof, the rings were pushed up by a negative gravity on one side and allowed to sag naturally on the other providing a longitudinal waveform. From the rings, sub-assemblies of structure could be supported to fix the roof cladding in a variety of ways. The openness of the rings offered many possibilities to generate this secondary layer and propose different contours and materials for the external skin.

In relation to the columns, the question was how to gain a notion of the random from pragmatic buildability concerns? In the event the answer was simple; a grid, on the ground, was duplicated and rotated. From the intersection point of the rings on the roof, support lines could now be dropped to the nearest available nodes on the ground. The final pattern of connection would seemingly be random. Thus the columns took root, inclined in different- directions, giving density in certain areas or standing alone and isolated as single punctuations elsewhere. What was a fantasy to start with -the free-form paper model - found an interior logic that built outwards, **with rings and rotations of grids, to articulate the many freedoms of the solution. The strategies were wholly part of the informal.**

At the competition stage the location of the structural rings was guided by the eye. I was intrigued, though, to see if intuition had any rationale to it; could the patterns of the roof net itself be derived by other means? Did chaos, in the mathematical sense of deterministic algorithm, have anything to do with it; could different outcomes arise from different start points? In other words, could the roof pattern be self-generated by a chaotic rule? The answer lay in a rotating disc.

:: Rotating disc

Imagine a black disc in a darkened room. Make a few holes in the disc; shine a light through the holes. Let the disc rotate, and track the light; and travelling waves in the geometry of overlapping cycloids emerge. As the holes vary in position the trace breaks down into a wild scatter or it comes out symmetrical and even. If a further complexity is added and the discs expand and contract, rolling tangential to set contours between a site boundary on one hand and a fixed running track edge on the other, then a net of rings forms. If the disc runs round and round, the 'weave' thickens and grows. An infinity of solutions is possible. Some weaves look like cane work, others give rainbow symmetries, some look like reef coral. Different traces suggest different objects. The results jump scale. **Pattern governs the interpretation.** Various properties can now be given to the strands and parameters stitched in to seed 'intelligence' into the overlapping interactions. What

looks so free is actually held together by **internal strategies**. There is a curious '**understructure**' to the ensemble and though we read 'free form' something else is felt: **a sense of 'nature' and of 'order'**.

Chemnitz incorporates all parts of the informal. It is a stadium far removed from traditional encirclings and the focus upon just one fixed revolution. Instead, in the Chemnitz project several revolutions take place and, not least, the one that embraces new structure as informal event.

:: New structure

New structure is a dynamic. Enquiring into form and configuration from first principles it admits into the solution the complex as a priori. New structure takes **overlap and ambiguity as a basis for design** and the stringent notion of order along Cartesian tramlines is discounted - a methodology that is taken as fixed, reductionist, and ultimately limiting in scope.

New structure animates geometry. It reawakens an original inspiration of form, enquiring of space itself as to its nature and interpretation. In this scenario buildings become rhythm and sequence and clash and confrontation; if symmetry is there it is in the active coming together of separate tendencies, in balance for only one moment. The traditional pursuit of external object cut by: dissecting and unthinking subdividing grid is rejected. Instead, an holistic approach is taken of inner logic informing the whole. The imperative is in-to-out.

In the name of modernism, a final stripping down and denuding of form has taken place and 'structure' relegated to mute submission. The result is a giving up of thought to blankness and transparency, glass and steel -evaporating substance and leftover cage; there is nowhere else left to go. Reductionism has reached its dead end. Design has deconstructed, and minimalism has become a reward label.

Twisted shameless multiplications of surface or texture of form are nowhere to be found. The desire is to conform and offer up constructions in orthodox containers, without the fun of elaborations - no syncopated rhythms, and none of the 'irrational' and spontaneous. Why not a new multiplicity, the idea of a new gothic or romantic?

:: New science

Surprisingly, new science offers a fresh start. Rejecting the linear and hand-me-down logic of a top-down hierarchical thinking, new science openly embraces the complex. The non-linear is adopted. What is new is the admittance of feedback as motive. There is overlap, and the simultaneous is empowered. Incredibly, such starting points of the chaotic are seen to lead towards stabilities and coherence, driven by internal self organising wills. The paradigm is one of emergence, a gathering together of disparate tendencies that move towards one expression of separate wills. **Flying in the face of conventional ideas of pre-arrangement, new science proposes the plan instead as the starting point, and the resulting boundary as surprise**. Order is only a transient part of the picture, on the edge of turbulence. Somehow able to come together by **internal improvisations, order in the sense of organisation and coherence is seen as a safe bet - arising out of the chaotic and unpredictable**. Such ideas fly in the face of entropy and the permanent run down holy-grailed into us by the second law of thermodynamics. But then creativity has always been a surprise!

The world is complex and it shifts gear and jumps. We shy away from this difficulty because the mind has to bend round corners and the mathematics is difficult. But the power of modern computing is unleashing what was never before thought possible; we do not have to think anymore along tramlines or be contained to derived notions of linearity. There is richness out there - we should delight in it. We should explore it.

The fallacy of a reductionist science has been to make us think that the whole can be cut into bits and then reduced down to one final bit, but something always gets lost on the surface of that cutting or splitting knife.

Physics has taken us into this atomic and monadic world and now we find that reality blurs, and certainty, chameleon like, transforms into doubt. Is a particle a wave or is it the other way round? Is matter itself a particular vibration of overlapping multidimensional 'strings' or a quantum jump out of the virtual?

The shadowy and the fantastic seem to be the new realities; virtual and nascent, rather than fixed and concrete. We want to understand, make linear relays and logical chains out of the complex, but in trying to remove uncertainty we remove the invisible glue that holds things together. Inevitably something gets lost.

Mathematics is racing forward with non-linear dynamics high on the agenda. Given a starting point or initial sequence, improvisation and internal rhythms are calculated to lead to coherence. Economic crashes and heart attacks are explained. Research into quasi-crystals and amorphous forms question our hard fixed notions of boundary and structure. Biology is in the vanguard of the new science; chemistry and the other disciplines follow. Where is architecture?

:: New science = new architecture?

The current investigations and research of the new sciences is based on dynamic living systems. How then does it relate to architecture, built out of fixed forms and static structures? One to one translation of the new science to a new architecture does not seem to be realistic - it only leads to mimicry. **Copying nature or chaos ends up looking forced. What is more interesting is to look into the basis of the paradigm that embraces 'risk', and the building up of internal processes that throw up conflict and clash.** Ambiguities will arise, such a building will give separate readings due to overlap. One has to interpret as opposed to assume a preconcept.

Does it matter? Why not go on planning containers and repeating equalities and subscribing to static, fixed, ideals of symmetry?

I propose that more than the eye sees the body senses. In response to new structure we may find in the configuration of such network a deeper resonance than the superficial visual. Out of chaos we came; within us is a derived sense of order, not linear and logical, but odd and complex. Responding with one's instinct to raise ancient spells is important -sharpening one's intuition to investigate the runes of form a necessary act. Gaining an insight is important.

:: Conclusion

There are no fixed rules for new structure, the informal takes care of that. If there is a set rhythm it is in the hidden connections that are implied and felt but not seen, **leading to the skewed and oblique or towards the regular and symmetric - it all depends on where one starts.**

There is no one reading of such designs - **ambiguity forces interpretation.** Juxtaposition and hybrid situations are valid and not unfortunate accidents; on a small and intimate scale local actions are trusted to spread outwards and inform the whole. At some point coherence is reached and an 'object' defined. Order, in this sense, is a travelling transient. The method is informal, the framework is new structure. The inspiration is new science.

43.20 concept of Chemnitz station



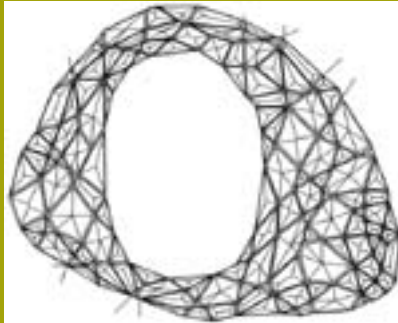
43.21 four elevations



43.22 "face" of the building



43.23 roofplan



43.24 entrance of the "kunsthal"



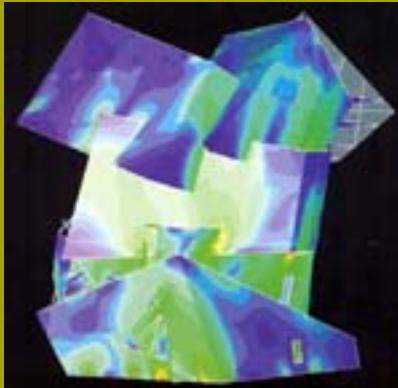
43.25 interior of the "kunsthall"



43.26 concept V&A museum,
floorplan



43.27 elevation V&A museum,
forces through the building.



43.28 elevation of the roof of
V&A museum



