

Grasping the Green Void

Reviewer: Dr Anuradha Chatterjee, Sydney based architectural writer, academic, and design research consultant.



Figure 1: Green Void, Customs House, Photo: LAVA



Figure 2: Concept image, Photo: LAVA

The *Green Void*, an installation designed by Chris Bosse, Tobias Wallisser and Alexander Rieck of LAVA Architecture, is exhibited in the atrium of the Customs House, Sydney from 10 December 2008 to 10 June 2009. It consists of a luminescent green lightweight membrane structure that is suspended from different points along the atrium. The installation has an organic branch-like form, composed of a seamless flow of narrow and hollow tubes, each of which culminates in a funnel like form. These 'funnels' reach out and touch five out of the six sides of the void, connecting the library, offices, cafe, skylight and floor in a sweeping continuum and making it a multidirectional installation (Figure 1). The structure hovers above ground, forming a canopy over people who stand in the middle of the atrium looking down through the glass floor at model of the city of Sydney. The installation is complemented by the media wall, which consists of twelve video screens that feature continually changing images showing the conceptualization, design, fabrication, and other projects by LAVA. The structure is twenty meters in length. Even though its surface area is three hundred square metres, it encloses three thousand cubic metres of space. In addition, it weighs a mere forty kilograms. The implication of these facts is that the tall and narrow void of the Customs House atrium is linked and adorned by using less material. This is achieved by using the concept of minimal surface theory.

According to Frei Otto,

Single minimal surfaces can be formed between any number of frames of varying edge forms or types which do not touch each other. The only condition is that the individual frames must be closed in themselves. Depending on the direction of immersion, individual soap lamellae can form between the edges apart from the continuous minimal surfaces linking the frames.¹

The definition of minimal surface would make sense if the following experiment were imagined.² A hollow ring is dipped inside a film of soap and then pulled apart. The rings are joined by a thin film of soap. This is a minimal surface as the film of soap represents the minimum amount of material required to join the two hollow rings. The position of the ring is the boundary condition. This experiment can be repeated with additional rings, which will give rise to a complex geometry. This shows that nature consists of forms that are not designed and that are naturally evolving systems. Other examples of minimal surfaces can be found in plants and corals, which consist of a complex network of inflated cells and membranes. The theory of minimal surface also suggests that is that material is allowed to assume its natural form, and it is not forced into predestined shapes and forms. The soap bubble model was used by Frei Otto to develop the fabric tensile roof of the Munich Olympic Stadium (1972), which pioneered research into what is now termed as membrane structures. Membrane structures are made of thin pliable materials.³ They are shaped into minimal surfaces by the equilibrium of the tensile forces applied on them. These forces are generated by restraining the membrane along “specifically chosen control points.”⁴ LAVA translates this concept through digital technology to develop the *Green Void*.

Instead of applying the theory of minimal surface to span a horizontal space or composing three dimensional forms by using flat sections of membrane, LAVA puts this theory to work in a three dimensional space as a three dimensional phenomenon (Figure 2). They employ the soap bubble analogy with five boundary conditions (rings). The boundary conditions correspond to five points in the atrium of Customs House. As this is naturally evolving system, this is fed into a computer model that simulates the process. The resulting form is a complex version of the soap bubble experiment. This is then structurally engineered, and subjected subsequently to a computer controlled material (computer numerical controlled or CNC) cutting and mechanical re-seaming.⁵ The physical form of the sculpture consists of a “double stretch” or a “two-way woven fabric,” which is specially treated high-tech nylon (lycra). This is mechanically attached to aluminium track profiles, which are then suspended from above and attached to the sides of the atrium with stainless steel cables.⁶



Figure 3: Moët Marquee/Espace lumiere, Melbourne Cup, Australia (2005), Photo: Chris Bosse



Figure 4: Entry Paradise Pavilion, Zeche Zollverein, Essen, Germany (2006), Photo: Chris Bosse

The *Green Void* is an important part of an emerging trend in architectural design – membrane structures. Michael Hensel and Achim Menges note that some of the prominent and recent membrane structures are Herzog and de Meuron’s Allianz Arena, Munich (2006); Foster + Partner’s roof for Dresden Station (2006); Anish Kapoor’s *Marsyas*, Turbine Hall, Tate Modern (2003); and PTW’s Watercube Building, Beijing (2008).⁷ The *Green Void* is also a part of the well-established practice of installing membrane sails and screens inside atria to add visual interest; solve acoustical problems; and reduce heat and glare in galleries, schools, and offices. Some of the recent examples that come to mind are: 99 Queen Victoria Street, London; The Gateway, Leeds; Cocoon Atrium Structure, Heathrow, London; Worcester Art Gallery, UK; and Atrium escalator canopy, Travelex, Peterborough, UK. In fact, it is hard to

dismiss the striking similarity between LAVA's *Green Void* and Kapoor's *Marsyas*, in terms of the 'funnels' or the trumpet-like ends of its horizontal and vertical components. The field of membrane structures is emergent, and due to intersections in techniques, forms, and functions, it becomes desirable to establish the originality of new ventures.

The soap bubble analogy and the theory of minimal surface is fundamental to any membrane structure. This is complicated by the popularity of form-finding softwares that can simulate the behaviour of a soap film stretched between boundaries, which generate the 'funnels'. Arup used it for *Marsyas*, and no doubt, *Green Void* does too.⁸ Bosse notes perceptively that the similarity is due to factors inherent to the "material and the application."⁹ However, an important fact that is overlooked is that *Marsyas* is not a product of digital form finding alone. The red membrane was meant to represent flayed skin, and the funnels were a representation of the convex and concave forms that form a part of Kapoor's oeuvre. This is evidenced in installations like *Yellow* (1999), *Pillar* (2003), *Marsupial* (2006), *Inwendig Volle Figur* (2006), *I have places like these, you have places like these* (2007), Lisson Gallery; *Red Circle* (1996), Patrick Painter Editions Gallery; and *Spire* (2004), Gladstone Gallery. The convex and concave forms deal with dualities like "presence and absence, being and non-being, place and non-place and the solid and the intangible."¹⁰ LAVA's emphasis is different.



Figure 5: Section,
Green Void,
Image: LAVA

This becomes apparent in Bosse's earlier projects like the Moët Marquee/Espace lumiere, Melbourne Cup, Australia (2005), designed and constructed in collaboration with Gloss Creative; and the Entry Paradise Pavilion, Zeche Zollverein, Essen, Germany (2006) constructed by MakMax (Figure 3 and 4).¹¹ These projects are not external forms. They create interior spaces that are unusual, organic, and of an intimate scale. The Moët Marquee was inscribed within a ten-meter cube of space and the Entry Paradise Pavilion occupied a space of seven-meter cube.¹² The spaces created by these projects are unusual because the space is 'carved out' of a seamless material palate. The stretching of the membrane between various boundary conditions is manipulated, which enables enclosure as well as passage. The stretched membrane and continuous minimal surface gives rise to a spatial tectonic, because space, structure, and ornament are integrated. These projects are the precursors to the *Green Void*, which is similarly inscribed into the tight space of the atrium of Customs House, creating an inviting reception canopy that filters the light entering through the skylights. These projects and the *Green Void* are in stark contrast to the gigantic hundred and forty meter span and forty tonnes of PVC and steel of *Marsyas*.

The *Green Void* has layers of meaning. The installation is a response to sustainability because it makes an optimum use of material and because it is portable and reusable. There is another dimension to this argument. Bosse explains that the minimal surface theory can inform a sustainable design of high-rise buildings. The theory of minimal surface can be used as an "organizational principle" or a methodology for the arrangement of masses, because

of which minimal structure and surface can be obtained, which leads to the optimum use of materials. This approach underpins the design of the Michael Schumacher World Champion Tower in Dubai, which uses the geometrical order of snowflakes.¹³ The *Green Void* is a fitting contextual response. Customs House has an atrium with a clear glass floor. It also has a heritage status. As the installation is made of lightweight material, it can be suspended, leaving the floor unobstructed for passage, pause, and observation. In addition, it is attached to five locations within the atrium, and therefore, it can be installed and removed without much impact on the heritage fabric of the building. The installation also responds to the ambitions of the client. Jennifer Kwok, Manager of Customs House, intends to animate the atrium space by focussing on digital architecture and multimedia. Similar to Patrick Keane's installation titled *Stitching the Void* in the same space last year (March 2008), LAVA's *Green Void* showcases cutting edge experimental research in digital architecture.



Figure 6: View through the library, Customs House,
Photo: LAVA



Figure 7: View from the first floor, Customs House,
Photo: LAVA

The *Green Void* also poses some interesting philosophical challenges. It reiterates a radical paradigm in architectural theory, one that emerged with the nineteenth century writings of John Ruskin – that architecture is everything that is *added* to a building, which is in excess of function and use. *Green Void* does not have a pragmatic or a performative function like other atrium installations, which scale down a vast and unfocussed space or provide acoustical and thermal comfort. It redefines the meaning of function and tries to provide an experience of space beyond the built fabric within which it is installed. In historical architecture, new spatial experiences were provided by fantasy and illusion. This was true for Gothic cathedrals in which the rising collonettes and the web of trceries on the ceiling would hark back to its origin in the tree canopy. The *Green Void* achieves this through its colour and organic form, which creates the illusion of an artificial forest and sky.

LAVA introduces a new architectural premise. It believes the task of architecture is to connect, bridge, and weave things (ideas, events, people, and spaces) that were previously disconnected. The *Green Void* treats the void of the atrium as a three-dimensional canvas and its five branches form an organic 'weave' through it (Figure 5). Furthermore, the *Green Void* is a sensate experience as it engages the whole human body – the mind, the body, and the eye. Its unusual form evokes curiosity, which compels one to look up, walk up, walk around, look across and down, to contemplate and appreciate its multiple visual effects (Figure 6 and 7). Like the form of the *Green Void*, the architects of LAVA believe that architecture is a many-pronged text that has numerous beginnings and ends. It has many uncontrolled meanings and the outcome (perception) depends on the beginning point. Architecture for them is not a 'serious' literary work but one that is focussed on pleasure emerging out of exploration and discovery. In my opinion, the *Green Void* is both playful as well as serious. On one hand, its form is direct and intriguing, and its meaning is fluid. On the other, its technical virtuosity is distinguished, as is

its attention to aesthetic, ethical, and philosophical issues. The installation is worth visiting as it is capable of satisfying a common person as well as a highly learned audience.

Project Team: Chris Bosse, Tobias Wallisser, Alexander Rieck (LAVA Architecture); Collaborators: Jarrod Lamshed, Esan Rahmani, Kim Ngoc Nguyen, Anh Dao Trinh, Erik Escalante Mendoza, Pascal Tures, Mi Jin Chun, Andrea Dorici

Fabricator: MakMax

Lighting: Pivod, Showtime

Graphic Design: Toko

3D Videos: Peter Murphy, Esan Rahmani

Soundscape: Wax

Photographs: LAVA

¹ Frei Otto, *IL Soap Bubbles*, 41 Vols (Stuttgart: Institute for Lightweight Structures, 1975-1995), 18: page number identified.

² As explained by Chris Bosse, LAVA Architecture, Interview, 22 December 2008.

³ Michael Hensel and Achim Menges, "Membrane Spaces," *Architectural Design* 78, no. 2 (2008): 75.

⁴ Ibid.

⁵ See <http://www.archdaily.com/10233/green-void-lava/>, viewed 21 December 2008. See also <http://www.dezeen.com/2008/12/16/green-void-by-lava/>, viewed 21 December 2008.

⁶ Ibid.

⁷ Hensel and Menges, "Membrane Spaces," 74.

⁸ For Arup's account of the process, see Cecil Balmond, Chris Carroll, Brian Forster, and Tristan Simmonds, "Engineering Marsyas at Tate Modern", *The Arup Journal* 1 (2003): 40.

⁹ Chris Bosse, LAVA Architecture, Personal Correspondence, 23 December 2008.

¹⁰ See <http://www.tate.org.uk/modern/exhibitions/kapoor/default.htm>, viewed 08 January 2009.

¹¹ See Michael Weinstock, "Can Architectural Design Be Research?," *Architectural Design* 78, no. 3 (2008): 112-115.

¹² Ibid, 114-115.

¹³ Chris Bosse, LAVA Architecture, Interview, 22 December 2008 and Personal Correspondence, 15 January 2009.