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Movement and Flow at the Boundary

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Aristotle's Principle of the Excluded Middle, which posits that "there cannot be an intermediate between contradictories, but of one subject we must either affirm or deny any one predicate"[1], has left an indelible mark on our ways of thinking, containing principles within tight delineations which cannot be united at the boundary as nature might have intended. Nature has no aversion to keeping things apart. Indeed mammals and birds have two brain hemispheres which are designed to process cognition in different ways which are then exchanged and negotiated at the boundary which unites them – the corpsus callosum (McGilchrist, 2009[2]). Without this boundary, the two parts function independently of each other and their separate interpretations of the world are much impoverished. This 'middle' is essential to coherence of parts and wholes; its theoretical exclusion erodes the epistemology of the boundary – and boundaries in the built environment seem to have followed suit by becoming increasingly hermetic while attempting to become disembodied through devices such as glass or 'continuity' of surfaces on either side of construction walls.

The cellular world is made up of permeable, semi-permeable and degenerating boundaries (Rayner, 2010[3]), and mankind's earliest shelters were once made up of lightweight and relatively porous membranes of skin and fabric over equally lightweight and mobile structures (Semper, 2004[4]). The boundaries between the interiority of shelter and the exteriority of the wider world were fragile and flexible. The Greeks themselves symbolised this relationship through the myth of Hermes and Hestia, in which "Hestia symbolizes the circular hearth placed in the centre of the house, the closed space of the group withdrawn into itself (and thus in a sense of its relations with itself); while Hermes, god of the threshold and the door, but also of crossroads and town gates, represents movement and relations with others" (Augé, 1992[5]).

Vincent Scully[6] indeed asserts that Greek philosophy marked a turning point in architecture, before which buildings reflected a close association with nature and after which they moved away from this relationship. However, although Greek (or even Egyptian) temples might have been considerably more stable and permanent than their predecessors, if structures became solidified, their

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1 *Metaphysics, Book IV*, CH 7; source http://classics.mit.edu/Aristotle/metaphysics.4.iv.html

2 Iain McGilchrist, *The Master and his Emissary – The Divided Brain and the Making of the Western World*, 2009

3 Alan D.M. Rayner, *Inclusionality and Sustainability – attuning with the currency of natural energy flow and how this contrasts with abstract economic rationality*, 2010

4 Gottfried Semper, *Style in the Technical and Tectonic Arts or Practical Aesthetics*', 2004

5 Quoted by Marc Augé in *Non-Places – An Introduction to Supermodernity*, 1992

6 Vincent Scully*, Architecture: the Natural and the Manmade*, 1991


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boundaries remained permeable. Apart from tombs which would uncompromisingly seal death away from life, places of the everyday, of congregation and/or worship were spatially defined but only relatively sheltered from the elements. Defensive and nearly solid masonry walls are features of later Western architectural history.

Simon Schama[7] argues that the division of spaces into self-contained units (rooms) took a new turn with the advent of the corridor in the seventeenth-century, prior to which rooms would be accessed through their adjacency at the threshold. This statement is symptomatic, in itself, in that it highlights a new and important progressive stage in the development of 'compartmented' space. Although this is more specific to interior layouts, I would argue that the same principle applies with the much older institution of streets (see Hermes above), which would distribute separate units of habitation along an axis of circulation. Just as a river can cut through a landscape, streets and corridors can divide territories and become rigid boundaries. It is the debit of flow which dictates the permeability between sides, or the availability of bridges to provide thresholds across this flow. In very simplistic terms, permeability between entities enables transversal movement at the boundary while lateral flow potentially impedes it.

In urban convention, flow has gradually taken precedence over territory and this is particularly noticeable in maps, which would have given prominence to buildings or sites of importance in medieval times and are now often reduced to a grid of roads which are literally represented as boundaries marking out pockets of undefined space[8]. Flow and movement are increasingly treated as linear directional qualities, to the detriment of all other flows and movements which can occur transversally and in relative absence of physical motion. The assessment of a boundary's ability to conduct porosity between sides is incumbent not only on its material nature but also its function.

The photograph below, taken in the Lea Valley, north of the 2012 Olympics site, illustrates nature's response to directional flow.

7 Quoted by Jonathan Hill in *Immaterial Architecture*, 2006

8 Simon Foxell, *Mapping London: Making Sense of the City*, 2007

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Fig.1 – Lea Valley, view from water reservoir

While a variety of plants and shrubs intertwine along the canal banks and along a fence, nature becomes untypically bare on the borders of highway and railtrack. There is in fact a tendency for desolate waste to accumulate against uncompromising boundaries, strangely incarnated in the urban landscape by the presence of waste disposal units lining the very threshold between public and private space.

Fig.2 – Waste disposal in South London

This does not imply however that penetrability within an architectural boundary should necessitate penetrable construction materials. Relative permeability can be built into the design of flexible openings in the boundary (usually doors and windows, and their curtains, shutters, balconies and gates) and through the insertion of intermediate spaces in spatial layouts.

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Fig.3 – Stills from Jacques Tati's film Mon Oncle *(1958)*

However, building technologies have increasingly removed flexibility at the boundary while monitoring internal conditions through electronic devices, and many of the intermediate spaces of old times were written off the modernist drawing board, together with a long and complex list of human trades which informally connected individuals within a community. Snapshots of such intermediate spaces and human activities are captured in Jacques Tati's film *Mon Oncle* (1958), see Fig.3 above.

If the boundaries which manifest themselves in the physical fabric of the built environment are the more tangible human boundaries, most boundaries in the human world are actually invisible. They occur at all levels of human interaction, conceptual, social, cultural, cybernetic, psychological, political, administrative and scientific. They also occur at deep phenomenological levels of interaction between inner and outer realities, filtered through a human body which is increasingly given over to sight and intellect, and inhibited from the other processes of mediation and cognition necessary to a harmonious relationship with fellow


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humans and with nature (Pallasmaa[9]). However organic or abstract two entities may be, there will be a 'middle' between them, which is the notional boundary, capable of dividing or joining them – the point where sets of relationships can be activated or denied. The ignorance of this boundary excludes the potential of negotiation between entities, the very principle of life which enables mutability and adaptation within the greater flows of ecological cycles. Metaphorically therefore, rather than observing one side from the premise of another side, we would be best positioned at the boundary where the two sides meet, in order to assess their mutuality as well as their differences.

If boundaries of the built environment reflect and re(-)present our thinking structures, it can be speculated that the interface operates both ways; that the way we design physical boundaries affects not only our everyday habits but also the way we conceptualise boundaries in the first place. This proposition is particularly relevant if one bears in mind the fact that much of our learning and understanding of the world is effected through the agency of organic cognitive systems filtered by the human body. It can thus be proposed that our physical experience of inhabitation of urban space may also affect our conceptual understanding of the world in all its metaphoric dimensions, including those of time, emotion, context, etc. By association, sensory, emotional and intellectual cognition are indissociable (Lakoff & Johnson[10]) and the way we move through boundaries and thresholds and inhabit the two 'sides', may have considerable influence on our overall perception of the world.

There are some cases in contemporary architecture, where the principle of the boundary has become central to the design concept. Peter Zumthor's Serpentine pavillion, for instance, illustrates the principles of interiority and exteriory through the expression of the boundary as a corridor and point of porosity between inside and outside spaces which are both, in this case, dedicated to nature. The 'outside' is Kensington Gardens, relatively manicured to provide the visual and spatial ideals of Victorian public space in England. The 'inside' is an open air garden of wildflowers irrigated directly by the fall of a roof which also acts as a pergola and shelter, where visitors can sit and converse in relative intimacy while contemplating flowers and vegetation at the core of the cloister.

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9 Juhani Pallasmaa, *The Eyes of the Skin – Architecture and the Senses*, 2005

10 George Lakoff and Mark Johnson, *Philosophy in the Flesh – The Embodied Mind and its Challenge to Western Thought*, 1999

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Fig.4 - Peter Zumthor, Serpentine pavillion 2011, London, UK

In Germany, Karo Architects designed an Open Air Library in Magdeburg, which enables residents and users to congregate at any time of day or night within the boundary separating the more formal library premises from its immediate surroundings. In this case, the boundary also provides a shelter and a host for small gatherings to sit and chat, or to exchange books.

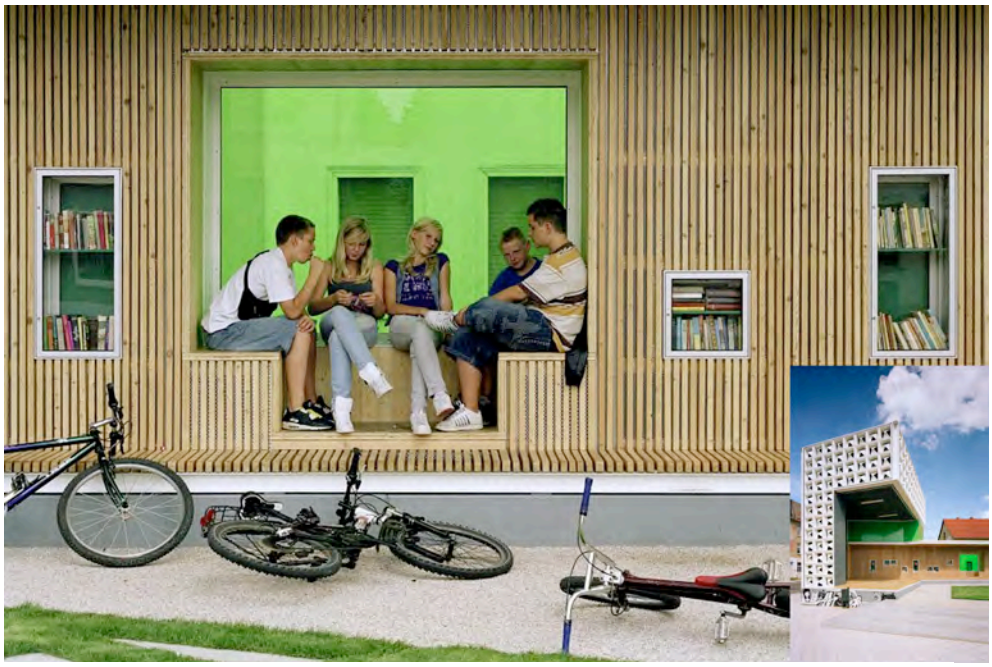

Fig.5 - KARO Architects, Open Air Library, 2007, Magdeburg, Germany

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In Merida (Spain), Selgascano Architects reinterpreted the concepts of public park, street and youth facilities by providing local children and teenagers with a string of semi-permeable shelters, some of which more enclosed than others, which can be freely accessed and occupied for games, physical exercise or congregation. In this instance, the structure cuts across the centre of the open space, defining a variety of different venues and locations on either of its sides but also within its own remit.

Fig.6 - Selgascano Architects, Youth Factory, 2011, Merida, Spain

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Fig.7 – Adjaye Associates, Idea Store, 2005, Whitechapel, UK

In the UK, David Adjaye's Idea Store locates the place of private study inside the structure of the boundary between the more public interior space of the library and the exterior space of the market street. Access to the library is also defined by two types of movement: lateral and vertical movement through an outdoor elevator protected by an overhead canopy, and transversal movement through several doorways along the high street and its perpendicular neighbour. Inspired largely by his upbringing in Africa, porosity is in fact a key concept in David Adjaye's work[11].

The 'new' Gaia Theory proposed by James Lovelock & Lynn Margulis[12] in the 1960s presents an understanding of the whole earth as a unified living organism of interconnectedness. However, this description places emphasis on the element of interconnectedness (which holds the whole) and eclipses the element of difference (between the parts). Difference is the point at which boundaries occur and it is also at this point that interconnectedness occurs. This situation is as omnipresent in nature as it is in the human condition, and the notion of organic fluidity pertaining to all principles of life requires a morphologic understanding of the boundary and its subtle degrees of transversal and lateral movements. Movement and flow manifest themselves in the visible trajectory of entities across space. However, they also pertain to the less visible and more stationary qualities of all aspects of nature in space and in time.

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11 *Trying to look at architecture differently* - Mr. Adjaye speaks with Horst Rutsch of the UN Chronicle, June 2006, Victoria & Albert Museum

12 Lynn Margulis, *What is Life?*, 2000

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One of the key difficulties in defining porosity and boundaries lies in the fact that our conceptual understanding of the world is pervaded by references to the physical world which enable, more often than not, visualisations of the non-physical world through the inner and outer 'eye'. Abstract or tangible, images are a primary thinking tool for the human mind, but a tool which has its own limitations. Thus flow and interconnections are represented by lines and arrows while entities are represented as discrete parts, which are often bounded by lines also, conveying through the representation itself a profound ambiguity about the nature of the boundary.

Entities are only isolated parts if they are 'discrete', i.e. separate and autonomous in the way numbers are discrete. Lere Shakunle remarks: "both ancient and modern mathematics are based on the false dichotomy of point and line, that is on discreteness and a paradoxically divided representation of continuity (i.e. 'contiguity') that is intrinsically discrete"[13]. Continuity, "like absolute infinity, is effectively treated not as a receptive internal presence, but as an outsider of, or exception from Nature, which can only be approached, but can never be reached. The 'point' is regarded as a whole point, filled with concrete; not a hole point, dynamically embodying space - where space is understood inclusionally as a non-local presence that provides room for movement, instead of a passive background 'absence' or fixed framework"[14]. Shakunle thus speaks of "internal and external communion", enabled by a 'zeroid' which, like a boundary of nature, folds parts into each other in an infinity of connectedness.

Curiously, though not surprisingly, the cavity wall, most commonly used in the UK since the 1930s, resembles the *zeroid* in more ways than one. The argument for its widespread use is that it is more efficient at retaining heat and preventing damp.

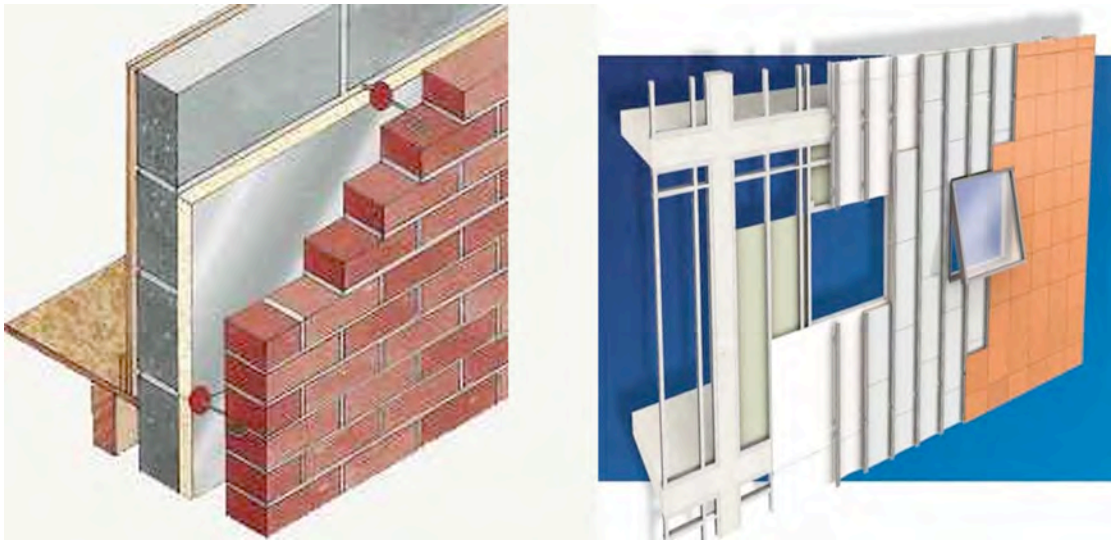

Fig.8 – Traditional Cavity Wall and Metzec System

13 P.9, *Transfigural Mathematics - Breathing-Point of Loving Influence*, by Lere O. Shakunle, 2010
14 P.14, *Transfigural Mathematics*, idem


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The principle behind this technology is that when temperatures between the inside and the outside differ (in winter usually), the inner wall absorbs some of the heat generated by heating systems while the outer wall shelters from the cold generated by the weather and the two are separated by the cavity. This enables internal warmth to be retained on the inner side of the wall through the application of an insulation layer, and the cold and damp of wet weather to be prevented from penetrating inwards. The cavity takes care of any discharge of condensation which might occur at the point where hot and cold air meet, and the air in the cavity also provides an extra layer of warmer air.

There are many debates about the actual merits of the cavity wall against other more traditional solid wall technologies, not least of which is the question of permeability, the balance between the 'breathing' properties of the wall against its ability to shelter from the weather. As the wall becomes more impermeable, the need to create controlled ventilation increases, and there are now sophisticated internal air circulation systems which recycle warm air from within the dwelling before its eventual (mechanically controlled) release into the atmosphere.

There are also issues about the flexibility of the walls, which lose contingent flexibility to cater for movement from the foundations upwards. This reduced flexibility does not affect the wall only; it also affects the points of penetration between the internal and external territories, usually the doors and windows. The design of openings in the wall becomes more complicated in a cavity wall, particularly at the point where the lintel supports both solid walls without causing 'cold-bridging' – the point at which cold and warm air would otherwise meet.

The flexibility of components is also more complex: the triple glazed window for instance, will sometimes require complete replacement in case of a minor fault because of the way it was also designed as an impermeable barrier between the inside and the outside. It thus becomes more expensive to repair and more demanding on the natural resources used for its production. This tendency is further compounded by more recent curtain walling systems which, although based on the same principle of internal structure and external skin as the cavity wall, become even more uncompromising where openings are created. In fact, recent decades have seen a proliferation of buildings comprised of walls and windows which can barely be told apart.

Compared with the boundaries discussed earlier, the boundary of the cavity wall is therefore made up of three boundaries alongside each other:- the boundary of the internal realm, the boundary of the external realm, and the boundary between the two which is a void enabling the meeting point of two specific sets of entities, internal air and external air. Strictly speaking therefore, the other entities of internal and external life are joined together by 'bridges' across the central cavity, the doors and windows which enable the formation of thresholds between interior and exterior.

The zeroid potential in this cavity wall is however rather slim, enabling the formation and discharge of condensation while keeping all other entities strictly separate.. a suitable re-presentation and symbol of contemporary attitudes to the boundary.

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Fig.4 - Peter Zumthor, Serpentine pavillion 2011, London, UK; photograph taken by author. More information on http://www.serpentinegallery.org/2011/04/serpentine_pavillion_zumthor.html

Fig.5 - KARO Architects, Open Air Library, 2007, Magdeburg, Germany; photograph from website http://www.dailytonic.com/open-air-library-in-magdeburg-germany-by-karo-architekten/

Fig.6 - Selgascano Architects, Youth Factory, 2011, Merida, Spain; photograph from Architectural Review October 2011; more photos available on http://www.thecoolhunter.co.uk/article/detail/1976

Fig.7 – Adjaye Associates, Idea Store, 2005, Whitechapel, UK; photos from Google images

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