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The Membrane and the Fold

Art and Harmony

To start, a reminder: the radical Indo-European *ar-*, which means order, arrangement, setting up (opposite with chaos), gives the concept of *armonia* in Greek (harmony) and refers to the precise harmonization of things in the world (stars, seasons, gods). By recalling the theories of the followers of Pythagoras and Plato, the musical vibrations and the harmony of the spheres will be evoked *(Spitzer L. 1963; Sloterdijk P. 2003, 2006, 2010)*. Such a radical (*ar-*) refers to a series of terms expressing the arrangement and the accord of things (in Greek, *ararisco*, to join and adjust a part in carpentry). Amongst the derived meanings, one can mention in Greek, arthmos, member of the body, as a part proportional to the whole; in Lat., *ars, artis*, talent, know-how, art, adjustment, agreement of the parts to the whole, but also, *artus*, members of the body; and, *articulus*, articulation, joint of the bones.

Plexus of Differences

The term of plexus (in Greek, *pléxo*; in Lat., *plexus*, interlacing, derived from the participle of the verb *plecto*, to braid), the definitions of simple (Lat., *sim-plex*, folded once) and of complex (Lat., *cum-plex*, folded with) will be investigated. In semiotics, if one focuses specifically on the articulation present in the sign, the fold can also be seen as the plexus of differences: for example, this difference is concretized by the bond between phone / *gramma* in Greek, or by the seam linking *signans* and *signatum* in Latin. This differential play is to be found again in the linguistics of Ferdinand de Saussure, which would reduced the sign to a simple algorithm, S/s, in order to distinguish between the Signifier (S capital, the acoustic image or the material aspect, conveyed either by vocal sounds or by the writing's characters), and the signified (s lower-case, the referent, the meaning). This theory implied that in language there are only differences, and no positive terms, and such an assumption will give rise to structuralism. Following the publication by his students of the *Course in General Linguistics (de Saussure F. 1916)*, some of Saussure's followers thought that the connection between the signifier and the signified was arbitrary, but this hypothesis was not actually part of Saussure's thinking, since he died before publishing his main opus. Instead, Signifier and signified contracts a bond as to convey the signification. However, in the algorithm of sign (S/s), the line of the graph does not constitute an impenetrable barrier between words and things. Moreover, this line is not a rectilinear feature, but an inflected curve. This occurs because the original core of meaning is constituted through the fold of the presence, as that clearly appears in poetic writing. Actually, in the algorithm of the sign, the line of the graph is not a straight line, but a curve, folded upon itself, for the reason that the sign is a topological play of articulations. At the dawn of Greek thought, such a joint takes the name of *armonia*. In its original significance, this term is presented in the form of an articulation, an accord, a joint *(Agamben G. 1993)*. The crease is an articulation.

The Membrane's Folds

For Locke, the spirit is conceived like the purely visual device of a camera obscura, while for Leibniz, the individual, or the individual substance, bears the name of the "monad." Union of body and soul, it consists of a folded membrane, an elastic skin, able to record things (simple and complex), making them vibrate like with a musical instrument. This singular individuality carries within itself all the actions and the thoughts, which will unfold in time. Each multiple monad perceives the whole of the world of which it is the mirror *(Cauquelin A. 2010)*. For Leibniz, in their comprehensiveness, the monads do not have windows, although Horst Bredekamp has disputed this assertion in his book on "The Monad's Window" *(Bredekamp H. 2008)*. Michel Serres in his thesis on Leibniz, as well as, more recently, Bernard Cache, have discussed the conjecture according to which Girard Desargues' mathematics offers a model to Leibniz's monad *(Serres M. 1968)*. It will be argued that the "Catoptricum Conclave," conceived and designed by Johannes Zahn, a Canon of the town of Erfurt, offers a good representation of the monad *(Zahn J. 1702)*. At all events, with or without windows, the monad is an autonomous entity. An individual substance, it obeys the principle of the universal harmony. The monad is a folded membrane, an organ acting as a receptor of the world, but, to some extent, it is also an enveloping substance, such as a skin *(Deleuze G. 1993*).

Actual and Virtual

To carry on with the argument, one will attempt to tackle the determination of multiplicities in the thesis of the philosopher Gilbert Simondon, who updated the theory of the membrane according to the biology of his time. The theory of the membrane led Simondon to draw a topology of living beings and enabled him to better identify the concepts of the actual and the virtual, as inherited by Bergson. Influenced by the cybernetics of Norbert Wiener, Simondon will introduce the concepts of potentiality and "metastability" into systems *(Barthélémy J.-H. 2008)*. In her major opus on Deleuze, Anne Sauvagnargues shows that the philosopher adopted Simondon's theory of the membrane, in order to develop his thesis on the impersonal and pre-individual singularities, formulated in his volume on The Logic of Sense *(Sauvagnargues A. 2009; Deleuze G. 1969)*. Lastly, the text of Deleuze on Michel Foucault's notion of "folding" offers a topology of the insides and outside. The investigation on the topological singularities will continue by evoking the text of Gilles Deleuze on Leibniz *(Deleuze G. 1993)*.

Figure 1.Metropol Parasol, by Jürgen Mayer H. (November 2009)

Folded

In the United States, during the 1990s, whereas many architects were reading the translation of Deleuze's study on Leibniz *(Deleuze G. 1993)*, an issue of the review Architectural Design *(Lynn G. 2004)*, published under the direction of Greg Lynn, a collaborator of Peter Eisenman, was devoted to the topic of Folding in Architecture. In an introduction entitled "The Folded, the Pliant, and the Supple," Lynn will write a plea calling for curvilinear forms. Such invocation will lead to the provisional assertion of a "blob" architecture, whose official date of birth seems to be marked by a posterior article of Lynn, arguing in a manifesto-like article that tectonics was out and obsolete, while topology was in and sexy: "(Blobs) or Why Tectonics is Square and Topology is Groovy" *(Lynn G. 1996)*. Incidentally, and this is not to say that Semper's ideas should be trashed, Lynn was thumbing his nose at a series of personalities, who were fighting rearguard battles, defending what remained of the idea of tectonics. Moreover, as an apparent coincidence (but was it so?), new tools for 3D modeling offered by many computer applications during the 1990s (Maya, FormZ, Rhino) will make it possible for architects to literally multiply the folds in their projects.

Unfolded

The use of mathematical notions by architects will be discussed, including those of the inflection point in differential calculus, in which the curvature changes signs (creating in some cases a saddle point), and those defined in geometry by the Singularity theory, which is the study of the failure of manifold structure. In Singularity theory, the general phenomenon of points and sets of singularities is studied, as part of the concept that manifolds (spaces without singularities) may acquire special, singular points by a number of routes. In looking at classical statuary the folds of drapery are amongst the most obvious features. Other ways in which singularities occur is by degeneration of manifold structure. The presence of symmetry leads to consider orbifolds, which are manifolds that have acquired "corners" in a process of folding up resembling the creasing of a table napkin. The catastrophe theory of René Thom is another branch of Singularity theory, which listed seven generic structures for these bifurcation geometries: catastrophes with potential functions of one active variable (fold, cusp, swallowtail, and butterfly); and catastrophes with potential functions of two active variables (hyperbolic umbilic, elliptic umbilic, and parabolic umbilic). Deleuze will be guided in these concepts by the architect Bernard Cache, who will defend a Master's thesis in Science, titled *Movable Ground. Furnishing the Territory*, defended at the University of Paris-VIII (Vincennes) in 1983. In the thesis' published version *(Cache B. 1995)*, Cache argues that what surrounds us (i.e. the environment, or milieu) has to be perceived from the point of view of the "visible," beyond any function or purpose. He will then define three different, interlocking axes, describing various scales: "territories" which give rise to inflection; "objects" which are vector images; and, between the two, "buildings" that are the product of the frame (Fr., *cadre*).

Inflected Spaces

Cache proceeds to define territories as spaces subjected by the singularity of inflection: "(...) inflection is the true atom of form (...) Space is thus no longer a juxtaposition of [valleys and] basins, but a surface of variable curvature" *(Cache B. 1995, p. 41)*. In such curved, inflected spaces, no one should think "that time flows, but that time varies. No settling is possible in such a landscape: variable curvature turns us into nomads" *(Cache B. 1995, p. 41)*. Settlement is achieved only through an unsettling: "(...) [t]he reading of a landscape in relation to inflections leads us toward an experience of weightlessness" *(Cache B. 1995, p. 44)*. Form dissolves and "(...) little by little, the waves make their way to surface. Shaped like a wave, inflection introduces the form of the vague, (...) moving as a cluster of concavity" *(Cache B. 1995, p. 51)*. Today, far from the convexity of classical spaces, one has to learn to live on top of concave surfaces, at the tangent of a spline. Or, in a well tempered environment, a wholly conditioned sphere *(Sloterdijk P. 2003, 2006, 2010)*.

Framing and Deframing

At smaller scale, buildings are the product of a set of framing operators. "Frames" are what commonly architects call plans and sections; however, they are also a lot of other significant things, including not only the framing of the structure, but also the framing (Fr., *cadrage*) of the view onto the surrounding *(Cache B. 1995, pp. 56-65)*. Architecture is the art of interlocking differently oriented frames, such as the wall, the window, the floor, the roof that envelopes, and the slope section. In *What is Philosophy?*, Deleuze was fast in pointing out one of the core thesis of Cache: "Interlocking these frames or joining up all these planes (...) is a composite system rich in points and counterpoints *(Deleuze G. & Guattari F. 1994)*. The frames and their joins (Fr., *jonctions*) hold the compound of sensations, hold up figures, and intermingle with their upholding, with their posture. Frames as sections are not coordinates; they belong to compounds of sensations whose faces, whose interfaces, they constitute" *(Deleuze G. & Guattari F. 1994, p. 181)*. However, planes mustn't be kept forever as gigantic rational coordinates, but must be taken apart, in order to create new affects. The plane of composition needs to be also the place of vast line of flights, "that carries out a kind of deframing" *(Deleuze G. & Guattari F. 1994, p. 181)*. Deleuze borrows the French term of "décadrage" to cinema-theorist Pascal Bonitzer, and such an "un-framing" permits to set off from the house-territory to town-cosmos, in order to "dissolve the identity of the place through variation of the earth" (in French, *la Terre*, i.e. Earth with a capital E). Now the building is traversed by a deframing power that opens architecture onto a plane of composition, on which can be actualized an infinite field of force *(Deleuze G. & Guattari F. 1994, p. 188)*.

Earth Moves

Returning to Cache's volume, the line of flights that passes through the building is the geographic dimension, an absolute outside (Fr., *dehors*) that crosses the inside, exceeding any attempt to interiority. If one could talk of a cinematographic device in architecture, "that allows for the passage from the frame to the screen," this happens "because architecture comprises a register of out-of-field images *(Fr., images hors-champ)* that is specific to it," i.e. the geographic span *(Cache B. 1995, p. 71)*. In this manner, within the architectural framework, one has folded tour and detour, proximity and distance, finite and infinite, and outside onto the inside: "it is [an act of] furnishing (Fr., *a-meublement*) in the sense that furniture (Fr., *meuble*) is a property of earth *(Cache B. 1995, p. 71)*. In French, the term *"meuble"* (furniture) refers to mobile objects or gear, as

Figure 2. The Hylomorphic Project, by Open Source Architecture (O-S-A).

opposed to *"immeuble"* (building, construction) which has the meaning of an immobile piece of equipment. Thus, for Cache, not only earth (as turf) is in motion, but the planet Earth becomes mobile, and moves. As Galileo said of the Earth, "yet, it moves" (in Italian, "eppur si muove"). While folding mobility and immobility, weightlessness and gravity (Lat., *celeritas* and *gravitas*), outside and inside, architecture "functions as a topological operator" *(Cache B. 1995, p. 72)*. As Simondon had already demonstrated, this means also that organism and milieu are related in no obvious (or natural) way, in as much as they belong to the domain of multiplicities and complexity. There is no such thing as a subject in an environment; everything happens as if milieus were seeking one another, and folding themselves onto an outside *(Cache B. 1995, p. 81)*.

Complexity

This article will attempt to expound on a theory of explanation (Lat., ex-plicare, to unfold, to unroll), considered as an act of unfolding, so as to elucidate (and unfurl) selected domains of complexity and multiplicity *(Sloterdijk 2003)*.

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