SHIFTING BORDERS AND DISTINCTIONS ARE CONDITIONS FOR DESIGN

The first condition for our imagination is discernment, the ability to distinguish objects in a state of dispersion (form). For design that ability must be more mobile than for just using its result. You should not only be able to recognize familiar objects that already have a name. You must also be able to imagine objects with different contours (shifting borders) that have no name yet.

52

Constellations of stars have got a name. So you can remember and recognize them easily. The starry sky, however, has infinite possibilities to capture a collection of stars in a constellation. You can add or omit elements in your thoughts. If you add a third dimension to the image, then suddenly quite different groupings are possible. This has already caused the Copernican revolution in the current representation of the impression of a sky dome into the conception of an infinite universe.

The context layers in ***Fig. 46*** raise the question whether technology and economics should not be counted as 'culture'. The ABC model of ***Fig. 47*** is a simplification that avoids this question. It is a representation in which the order of cause and effect reverses without losing a causal basis.

The causal thinking that is anchored in our language (subject-verb-object), loses its direction from cause into effect in biology (chicken and egg). Through feedback, consequences interact with the causes (adaptation). That mechanism is followed in the technique ('cybernetics'). In the conceptual world of representations that direction can even turn completely around. We can first anticipate consequences and then cause them to be so.

The ideas of the ecologist Van Leeuwen shifts some crucial boundaries in conventional distinctions. My shortest summary of those ideas would be the following.

The only premise that no longer has any suppositions is the concept of 'difference'. Every other concept supposes a difference with other concepts. Everything differs. 'Equality' is only a special case of difference, an imaginary 'zero value', a limit that can only be approached.[a]

Also 'change' supposes difference (with 'now') and keeping it the same is also such an imaginary special case. Everything changes (panta rhei[b]), albeit to varying degrees.

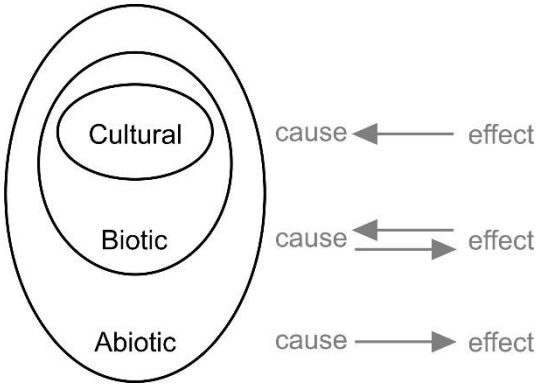

Fig. 47 ABC model

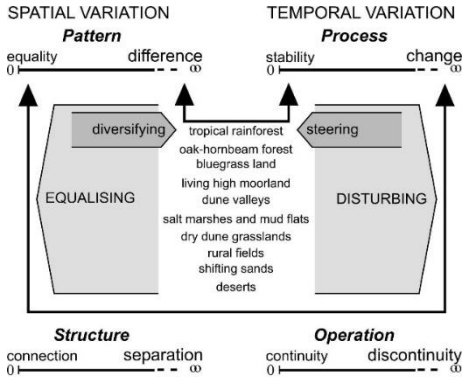

Fig. 48 Spatial and temporal variation according to Van Leeuwen

a You can already find this view at Cusanus(1440)De Docta Ignorantia II, 1 p92 and Leibniz (1663-1716) Kleine philosophische Schriften (Leipzig1879) Koschny p127 "... dass es niemals eine völlige Gleichheit geben wird." (Was zu einem meiner wichtigste Axiome gehört.) ". This is remarkable for a great mathematician. With regard to change, he also states on p221: "Streng genommen ist es richtig, dass kein Körper vollkommen und gänzlich in Ruhe ist, aber man sieht bei einer mathematischen Betrachtung der Sache davon ab.". In this way he puts the reality content of mathematics into perspective: nothing is really the same or the remaining equal, everything differs and changes. With him, just as with Van Leeuwen, time is no more than an "order of change" (p111): "…der Zeit, welche dem Geiste nur eine Ordnung in den Veränderungen darstellt, …".

b Attributed to Heraclites, among others by Plato.

According to Van Leeuwen, between this 'spatial variation' and 'temporal variation' there is a predominantly negative relationship (***Fig. 48***). Most likely is a relationship between increasing change and decreasing difference (equality). The reverse process is itself a change and is therefore implicitly opposed by that change ('disturbing') and process to equality ('homogenisation'). Making a difference is more difficult than making a difference equal.[a]

The concepts of 'difference' and 'change' are therefore more fundamental here than the abstractions of 'space' and 'time' derived from this. These abstractions are sometimes used as adjectives ('spatial' and 'temporal'), but only to distinguish between the two 'variations'. 'Variation' can be interpreted as 'difference in difference' and the difference between the two variations as a third degree difference: 'difference in difference in difference'.

The assumed negative relationship between the two variations is reminiscent of the second law of thermodynamics, the entropy law that states that every system inside or outside its borders always leads to more disorder (a higher entropy or probability). However, Van Leeuwen associates this disorder with more equality and change and the process towards more disorder with homogenisation and disruption (***Fig. 48***).

This coherence of pattern and process is repeated in structures and operations: connection makes discontinuity more likely than separation; separation gives a greater chance of continuity. However, connecting and separating are themselves operations that cause discontinuity. Separation is therefore more difficult than connecting.[b] This is an appealing elaboration for designers, because 'structure' is then a 'set of separations and connections'.

In different directions, for example 6 'degrees of freedom' for movement (two opposite per dimension), you can imagine separation in 6 directions as a box or cell from which you can not escape, in 5 directions as a bowl, in 4 directions as a tube (or as armchair), in three directions as a gutter or slide, in two directions as a wall, in one direction as a deck and in no direction as a void (***Fig. 49***).

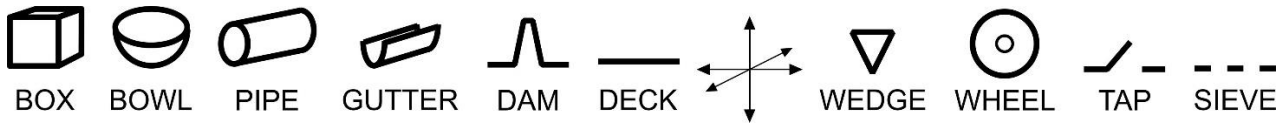

Fig. 49 Selectors

Van Leeuwen called these elementary structure components 'selectors'.[c] If you involve the temporal variation (sometimes separation, then connection) then a wedge (to make a separation), a wheel (rotation about one direction), or valve (door, tap, switch,

a Every child knows that if once it has built a sand castle on the sea front. That is always leveled by indifferent vandals or the sea.
b Jong(2007)Connecting is easy, separating is difficult In: Jong; Dekker; Posthoorn eds. Landscape ecology in the Dutch Context (Zeist) KNNV-uitgeverij p208. http://www.taekemdejong.nl/Publications/2006/Landschapsecologie/Onderdelen2/Connecting is easy.doc
c Leeuwen(1973)Ekologie(Delft)TUD Sektie Landschap p35

transistor) are also selectors. If a separation is selective with respect to size (or other differences in nature), then you have a sieve (filter, membrane).

The membrane is a foundation of living organisms. A cell is a selective enclosing membrane (box) that sifts input and output. This makes possible an internal arrangement, which can hold up against the ubiquitous, ever increasing external disorder ('entropy'). An organism nourishes its cells with tubes and also drains the superfluous substances outwards (with a higher entropy than previously admitted).

The terms 'organ', 'organism' and 'organization' already suggest that structures at different levels of scale (bounded by frame and grain) deserve their own interpretation. The structural concept is also crucial in technology. Each device is a set of selectors that work together or separate from each other.[a] I give some background to the ecological origin of these ideas that are important for the following chapters.

Boundaries suppose stabilized differences

A vague border is a sequence of consecutive differences that take up space ('gradient', ***Fig. 5*** p13). Van Leeuwen found more different and rare plant species in gradients than elsewhere.[b] After all, on a broad gradient, for example from high to low, more different species with different moisture requirements can find their own optimum (the widely accepted concept of 'ecological tolerance' ***Fig. 50***).

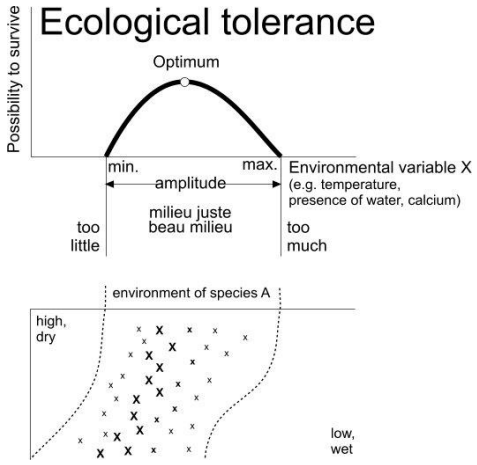

Fig. 50 Ecological tolerance

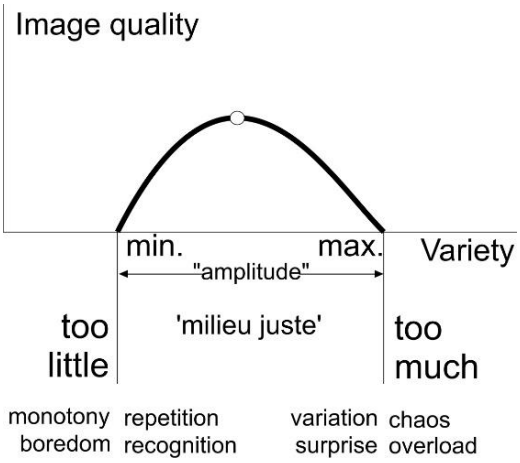

Fig. 51 Aesthetic quality perception

That difference has a stabilizing effect with external fluctuations. A species X flourishes at its optimal height, but is surrounded by languishing specimens x at slightly too dry or too wet locations. If, for example, it stays dry for a long time or starts to rain, these marginal specimens will flourish again: a risk coverage for the species. On the analogy with aesthetic quality experience (***Fig. 51***) I return to p57 and in § 43 p259.

a See Rodenacker(1976)Methodisches Konstruieren(Berlin)Springer.
b Leeuwen(1965)Over Grenzen en Grensmilieus(Amsterdam)Jaarboek 1964 van de Koninklijke Nederlandse Botanische Vereniging

A sharp border has fewer differences and less species in its environment, but as a front line also more competition and dynamics. Van Leeuwen therefore proposed to concentrate our nature policy on sustainable vague boundaries (gradients) and not on the categorization of ecosystems with 'target species' on either side of borders.[a]

Yet that *categorization* became the basis of Dutch nature policy. Ecological categorization is probably the most laborious and questionable form of scientific categorization[b]. She became outdated by accidental succession of environmental influences and climate change. The characteristic species composition must always be adjusted or further divided, but the landscape gradients still exist.

You could link a far-reaching consequence to this. Categories (sets) are primarily determined by external differences and boundaries and not primarily by internal generalization of equality.

Difference compensates change and the reverse

Van Leeuwen then assumed a compensatory relationship between spatial and temporal variation in the landscape (***Fig. 48***).[c] Where there is little change (with fully developed 'climax vegetation'), he found more diversity than where there is much change (with 'pioneer vegetation').[d] He left the causality direction in the middle (leads difference to stability or vice versa: does equality lead to change or the reverse?).

This 'relation theory' or perhaps better 'regulation theory' received a lot of criticism, for example from a mathematical point of view[e]. There are, however, mathematical indications that continuous repetition (a form of staying the same) of the same operation on the preceding outcome in time can yield spatial diversity (cellular automata[f] or iterations, see also § 24, p115).

Furthermore, this criticism is largely overcome by the scale paradox (***Fig. 6*** p14).[g] Van Leeuwen can be right on the odd scale levels, while equilibrium and stability are linked to the even scale levels without contradiction. The point is then, to determine the scale levels where the change of paradigms takes place by additional research.

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a This view was taken over in VROM (1966) Second Policy Document on Spatial Planning (The Hague) State publisher p109 and resulted in a 'gradient map'. For a short time this was the norm for nature policy in The Netherlands.

b This 'plant sociology' distinguishes vegetation in areas where the same composition of species is often found as 'societies' and gives it a Latin name. The distinction between very heterogeneous collections that have something in common yields complex methodological problems, see Schaminée (1996) The vegetation of the Netherlands (Leiden) Opuluspress. The plant-sociological vegetation categorization and mapping for the Netherlands, under the direction of Westhoff from 1942 with an admirable perseverance was established. A true monk's work. At least ten bulky folios filled with tables with field recordings saw the light. The system, generally known and accepted as the 'Westhoff-Den Held' system, was later regarded as unsustainable by Den Held in inventories in South Holland.

c Leeuwen(1970)Raumzeitliche Beziehungen in der Vegetation in: R. Tüxen Gesellschaftsmorphologie Strukturforschung(Den Haag)Junk 63-68 en Leeuwen(1971)Ekologie(Delft)THD 3404

d Change is a form of difference (fourth dimension). There is therefore some reason to propose the time dimension as perpendicular to space. In this case, between spatial and temporal variation, according to Van Leeuwen, a perpendicular paradox applies as a special case of the spatial paradox that equality appears perpendicular to difference. Thus, technical possibilities such as the selectors of ***Fig. 49*** p14 appear.

e Sloep (1983) Patronen in het denken over vegetaties: Een kritische beschouwing over de relatietheorie (Groningen) RUG. This dissertation appeared at the same university (Groningen) where Van Leeuwen had received an honorary doctorate for his relationship theory a few years earlier.

f Experiment with, for example https://mod-est.tbm.tudelft.nl/wiki/index.php/Bestand:GameOfLife.xlsx

g Jong(2003)Het belang van ecologie voor bouwkundig ontwerpen en omgekeerd (Zoetermeer) MESO http://www.taekemdejong.nl/Publications/2003/Het belang van de ecologie.htm

Here it is especially important that the abstract concepts of space and time can not be imagined without direct perceptible differences and changes. Vice versa they can. The intellectual constructions 'space and time' *suppose* 'difference' and 'change'.

Equality supposes difference

After this I accept Van Leeuwen's underlying insight of equality as a special case ('zero value' or limit) of difference, and stability as a special case of change. Differences can always be thought of more different, but not always less different. Less than the smallest observable or imaginable difference is called 'equality'.

With a microscope or telescope you can always see differences (even if it is only a place difference of details). The result is that 'equal' does not have to be in logical contradiction with 'different'. The idea that change itself is a special form of difference (with 'now') is for my account, as is the perpendicular paradox between spatial dimensions (**Fig. 5** p13) and between each spatial dimension with the time dimension