

## RENATURING OF THE BUILT ENVIRONMENT

### *Ode to the Petrusse Valley*

*Luxembourg is claimed to be one of the greenest cities in Europe. Its layout is complex, as the city is set on several levels, straddling hills and plateaus that are separated by the valleys. One of those valleys is the Petrusse valley, a natural oasis that contrasts with the bustling life of the peripheral districts located on the heights. It separates the two most dense districts of the city. The abundance of green and other natural elements in the center of the city is something unique, nothing like your ordinary city park where you can still sense the hectic atmosphere of the city life. The characteristic topography of the valley is also home of complex systems and natural ecological processes.*

*Due to its location between the two main emission zones, the Pétrusse valley plays a decisive role for the climatic conditions in the city. One of the many positive effects on the climate is that the valley brings cold and fresh air into the city while evacuating the polluted air. In addition, the Pétrusse valley plays a role in the regulation of the temperature, it offers shade under its trees, retains surface water, increases the humidity of the air through the*

*evaporation and improves air quality by filtering dust and producing oxygen. The valley of the Pétrusse is also characterized by enormous contrasts. The arid cliffs contrast with the rich soils of the bottom of the valley. Some parts are exposed to the sun all day, others remain in the shade permanently, which explains the great diversity of fauna and flora. More than 150 different types of trees can be found. One of the most prominent man-made systems you can find there, is the Petrusse canal. The canal originates in the hills at 12 kilometres west of the city. Until 1933, the Petrusse was a free flowing stream. Today it flows in a concrete duct, framed by high walls. One of the remarkable characteristics of the Petrusse is the enormous variation of its flow. Due to the high degree of waterproofing of its watershed, the peaceful brook can turn into a violent torrent in a few hours. These enormous differences in flow have proved to be the main obstacle in renaturing studies carried out since the early 1990s, but right now it is about time that nature takes over the canal once again.*

## *Renaturing landscapes*

The first thing you might ask yourself is: why would it be important to renature a canal, does it not function well the way it is now or is it not elegant enough in its current state? To answer this question we can better question why the process of renaturing landscapes in general can be important.

To start of, we have to realize that landscapes are cultural artefacts. Systems that are result of shaping the terrain and the making of a places.<sup>1</sup> It does not have anything to do with the untouched wilderness. Bruno Latour shows in his *Paris Invisible* that the city consists of all kinds of systems. Some systems are very much preset like the infrastructure of vehicles, but most of the systems are not that clearly visible. What is interesting is that all the systems seem to be built or influenced by men. This also counts for the ecological systems, where wilderness has been making place for landscapes ever since the rise of the modern men. It is easy to understand that this influence on the ecological system generally has a huge impact in the city. Due to its scale and the complete make-over of the landscape the ecological system has changed. According to the balance of nature theory, a small interruption of the equilibrial balance can cause a chain reaction of changing or disappearing flora and fauna.<sup>2</sup> Conserving ecosystems guarantees the very existence of every animal and plant species on Earth.

Right now the question that raises my mind is asking if architects are not approaching their designs and interventions too often in a too technical manner? We are more and more try-

ing to integrate nature into our designs which seems like a good thing, but it often feels forced with all the technical solutions. Are we not creating a fake nature that might not even be integrated in the natural ecological systems? Should we not look at what nature would do, or even better, try to give nature some more space and decide for itself what will happen in order to create a natural environment that truly adapts to the existing environment? We will elaborate on this concept by looking at the renaturation of the Aire river in Geneva.

The Aire was canalised in the late 19th century but the state of Geneva wanted to return the canal to its original and natural state. Instead of completely destroying the canal they decided to dedicate a much wider space than and next to the existing canal for the river to flow through. The exact position of the stream and how the river should flow was not defined. Instead, they made a grid of diamond shaped channels where the water could flow through. That is all they did, the whole area completely surrendered to the mercy of natural forces. Over time, the river started to take on its own form. The result is spectacular and effecting a clearly artificial intervention into a natural situation. One year after the opening of the new river space, the results are beyond expectations: the river flows, displacing diverse materials, gravels, sand and the diamond-shaped matrix is significantly modified. Vegetation also started to grow around the water and has become a true ecological corridor that promotes the networking of biotopes and the movement of small wildlife. In the end we could say that the river was free to design itself. The

process is shown in the images below. You might have been asking yourself what much of an impact it would make if we renature something like a canal once again if there has already been established a new equilibrium that in might still be rich in flora and fauna. To answer this question we have to look at renaturing from a different perspective. Besides the ecological side of the story we can also look at sustainability. Although ecology and sustainability are obviously very closely related, there are more aspects of sustainability that especially in the city could have an impact. What I want to

discuss is a more psychological approach to understanding why renaturing is important. We will take a closer look at how architecture can have an influence on the mind of people in order to become more sustainable



*Illustration 1: Different stages of the renaturation of the Aire river*

## *Affinity towards nature*

Almost for as long as the modern humans inhabit the world, architecture has played a roll in order to influence the mind and behaviour of people, whether it influenced them consciously or unconsciously. For example, this can be seen in the work of cathedrals or huge churches. They were designed with elevated ceilings, glasswork and light to such height that it will awe or inspire the people there for religious ambitions. Another example is that an increased visual connection to the outdoors, in addition to increased daylighting, has been found to improve well being.<sup>3</sup> It is no coincidence that almost all the hospitals and retirement homes in Luxembourg are located in very green and open areas. In order to create a truly sustainable environment, the environment should be able to inspire and affect environmentally friendly activity in those that are directly involved in its use, and possibly even those who experience it as a passer-by. One very interesting idea of how to do this is to look back at our roots and bring back nature in the design. This makes sense, because it is proven that humans have an emotional affinity towards nature.<sup>4</sup> This theory claims that humans possess a biologically based attraction to nature and that their well-being depends, to a great extent, on the relationships with the surrounding natural world.<sup>5</sup> As a result, humans need to affiliate with nature. Direct encounters with nature (for instance while playing or walking outdoors, experiencing nature) can also promote affinity toward nature and, subsequently, behaviour to protect its natural functioning. This knowledge may have strong implica-

tions for the design fields, especially if it is the goal of the designer to affect environmentally responsible activities and behaviours. I have to say that there is no guarantee that every person will be affected the same way because affinity depends on an emotional factor. In an attempt to inspire this sort of emotional connection between an individual and the natural environment, those in the design professions may create a built environment that, to the best of the designer's ability, emulates the qualities of nature. In attempting to foster an emotional affinity toward nature, it seems possible that a built environment that embodies elements of the natural environment will be able to affect sustainable behaviour, even in those that initially lack any basis of an emotional connection toward nature.<sup>6</sup> What makes it easier for the designer is the fact that it is not necessary to first establish an emotional connection to nature, since all human beings already contain such a connection. But in order to understand how we can incorporate this knowledge into our design, we first look at the genesis of these biological affinities and how they have evolved over time. We do this by looking at our genetic map. Neuroinformatics research has shown that humans (and every other species) have even stored the knowledge of millions of years of evolution in their brains. For instance, when a baby is born, there is already lots of information stored inside his brains that he obviously could not have acquired by experience. He knows that he can drink from a breast, while nobody has ever taught this to the baby. This information is implemented in everyone's brain and we call this our genetic map. We still

keep developing this genetic map because it has the ability to learn. What is very interesting about this genetic map, is that for the homo sapiens it originates from the time in their developmental history when they were still directly connected to the natural environment.<sup>7</sup> Nowadays the built environment often triggers our genetic map on an unconscious level. These unconscious and affective responses originate from fast, automatic and overall unconscious thought processes that immediately decide if we like or dislike a particular environment.<sup>8</sup> These quick and affective responses that are rooted in the human evolutionary history motivate us to quickly undertake actions as a means of survival and comfort. This is explained by Joye as follows:

When early humans came across settings containing important risks like turbulent water or a predator, this triggered a negatively toned affective reaction (dislike), thus ultimately leading to avoidance behaviour. On the other hand, if a setting offered good opportunities for survival and reproduction, this would have caused liking reactions, leading to explorative behaviour.<sup>9</sup>

All these adaptive behavioural responses are still stored in our genetic map, even though they are mostly not needed anymore in our modern day society. Unconsciously, they still have an influence on our behaviour.<sup>10</sup> We will further explain this from where it all started, the beginning of the human species. According to research, the human evolutionary brain has been established on the savannah regions of Africa.<sup>11</sup> The hypothesis il-

lustrates that our brain has therefore developed certain preferences for open spaces, with scattered trees and grazing animals. Spaces with a low to intermediately complex setting. This evolutionary phenomenon is also being referred to as biophilia.<sup>12</sup>

### *Biophilia in built environment.*

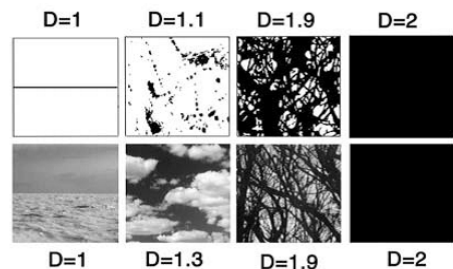
The built environment, especially the contemporary city, with its large rectangles and straight lines, seems not the least bit resemble the African savannah. Following the hypothesis the city causes an ongoing, unintentional and unconscious feeling of discomfort and stress. To test the impact of nature on stress, a famous study by Roger Ulrich shows the power of nature. In his experiment with people who had just undergone the same medical gall bladder surgery, he looked at their recovery process. Some people had rooms with a window view of nature, while others had the view of a brick wall. The conclusion tells us that the patient with views on nature generally had a shorter stay for recovering in the hospital than the people who had to look at a brick wall. They also took less painkillers and were less likely to complain to the nurses.<sup>13</sup> Another research tests this healing power of nature even more extensively. In this study, a somewhat artistic rendition of a landscape was shown to people who were recuperating from a stressful task. Their stress level was dropping considerably faster than the people who were not shown any image.

In order to explain this phenomenon we will take a look at the geometrical shapes. The French mathematician Mandelbrot has done research to the thus far immeasurable geometry related to fractals and came up with the level of roughness (D value).<sup>14</sup> This is a scale that reaches from D 1 to D 2. A D-value of 1 is a straight line. A D-value of 2 is a black plane. This model could not only be used to explain the complexity of geometrical shape, but Taylor found out that this model can also

be related to psychology. In Figure 2 you will find images with different D-values.

Most people seem to have a preference for a D-value of 1.3 to 1.4. The D-value of artistic people might be a little higher and closer to 1.5.<sup>15</sup> A sky with fluffy clouds has a D-value of around 1.3, so it could be possible that humans prefer that environmental setting. The painting with the artistically drawn tree had a D-value of around 1.4, while the photo of the landscape was had a value of 1.6. Now the question raises: what can the architect do with this knowledge. Just painting fluffy clouds on his façade probably won't work. Research has been done to the eye-movements of people while they were analysing a landscape. It seems that people are especially focussed on the edges of objects. A skyline, a transition between green, buildings and the sky, is often the dominant edge, as long as there is enough contrast. The shape of the buildings therefore plays a very important part in aesthetics as this is what we unconsciously focus at. Also in the façade itself you can work with different geometrical shapes and different materials to accentuate these edges.

Another theory that is worth mentioning is that people (especially the laymen) unconsciously have a preference for organic shapes in architecture. There are two theories that support this claim and can both be related to the human evolutionary history. As we grew



*Illustration 2: Levels of roughness. Humans have a preference to D-value close to 1.4.*

up in nature, all the things around us consisted of organic shape. There were no perfect straight lines and 90 degree angles. That's something that we ourselves have created later in time. The other theory suggests that sharp object were often relate to something dangerous. Think about sharp rocks that could potentially cut in your feet and thus hurt you. Over time we have created an avoidance behaviour for sharp angles because we unconsciously related this to danger.<sup>16</sup> Adding natural element thus can help to create a sense of tranquillity.

We can conclude that the mind, whether unconsciously or not, has a built-in preference for nature and natural objects, that humans affiliate with nature and that this can lead to sustainable behaviour. Besides the ecological and sustainable reasons, it seems that there also is an aesthetic and evolutionary will to renaturation.

### *Conclusion:*

Renaturing seems to be very much related to the field landscape architecture. For architecture and the design of buildings the process of renaturing becomes a much harder task since it deals with different materials and has other technical complications. Does this mean that the landscape eventually has more meaning, from a (less) technical point of view? Should architects stop designing with straight angles or should they accept their loss that it might be too technical and cannot be influenced and designed by nature as much? We probably should not. Instead we can try to see that the city is also some kind of nature, home of the human race creating their own habitat. When we are aware of this phenom-

on we can also try understand that the city as a whole is also an organic system. After all, aside from the fact that we have a preference for nature from an evolutionary perspective, most people still feel very much comfortable in the city. As for the architect, we should also not forget that luckily there is still the genetic map of our brain that we can rely on to be used as a tool to resemble features that originate from nature. And maybe in the near future, architecture can also find its own way to be naturalized and let the design create itself.

It is time for the Petrusse canal to be renatured as well. Beside the ecological and sustainable reasons to do so, it has also an impact on the human mind that wants to affiliate with nature and consequently can also lead to an increased sustainable behaviour. The example of the Aire river in Geneva is a perfect example of a technique to let an artificial intervention turn into a situation where nature decides for itself how it should be designed. On the level of the project this means that the whole valley will take a make-over on the ground level. Often renaturing pairs causes an exclusion of human activity. By this I mean that we should just leave nature alone and cannot enter those areas. This is the opposite of my goal for the Petrusse valley. More people should enjoy and maybe even learn from nature. The fact that the renaturing of the Petrusse will take up a lot of space in the valley and infrastructure will have to change, does not make it easier to design a valley where renaturing and an increased human activity comes together. This asks for intelligent design answer to come to a new valley, improved for both nature and humans.

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