SECTION TITLE

UBIQUITOUS SYMMETRIES IN THE ABSTRACT CALLIGRAPHIC PAINTINGS OF VISUAL ARTIST ILONA LÉNÁRD

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Abstract: Analysing the acrylic paintings of visual artist Ilona Lénárd there is a striking similarity with natural phenomena and mathematical constructs alike. As in the universe ubiquitous symmetries are found in the works of Lénárd. Although the artist is unaware of the hidden mathematics behind her gestures with the acrylic marker, there are strong signs of rotational and mirror symmetry in the strokes that she puts on the canvas with intuitive force. Other artists before her travelled a similar road in expressive abstract painting, notably Jackson Pollock and robotic artists Leonel Moura. In Lénárd's work the intricate symmetrical folding of molecules come to mind when observing her strokes, especially in the Flow series. Having lived and worked some years in Doha, Qatar, it shows in retrospect that Lénárd's work resonates with Arabic abstract calligraphy. What is shared between nature, mathematics, calligraphy and Lénárd's paintings is an intuitive and powerful grace of the constituent gestures, the notion of zero gravity, and hence a symmetrical balance of the overall image forming a ubiquitous symmetrical universe.

Keywords: ubiquitous, symmetry, universe, paintings, nature, robotic, mathematics, algorithms, intuitive, calligraphy, patterns

Rime

When we were on a hiking tour end of November 2020 in the Börzsöny mountains north of Budapest we found ourselves at the highest point near the Juliánusz viewing tower in a rain of frost particles falling from the trees [figure 1]. The ripe that had fallen onto the ground was organized in nice scattered patterns. It had this striking balance of symmetries at different scale levels. At the level of the single constituent component, and of the scale level of the overall image. The overall distribution of components represents a form of ubiquitous symmetry, while the individual local objects are built by the combination of frost and a laminar air flow causing the crystallization of the spikes, which are in themselves symmetrical in structure. In fall one finds similar patterns of small symmetrical objects, i.e. the leaves, in a scattered ubiquitous symmetrical arrangement under the bare trees.



Figure 1: stripes of ripe fallen onto the forest ground

A ubiquitous symmetrical world

I mention these natural phenomena while I was instantly struck by the similarities with Ilona Lénárd's acrylic paintings [figure 2]. They share similar properties of global and local symmetry, ubiquitously distributed on the canvases. The type of global symmetry we are referring to is an ubiquitous omnipresent type of symmetry, which is equally balanced from any viewing angle, from nearby or from further away. much in the same way as gas molecules are distributed in an enclosed space. The molecules, i.e. the constituent components, are strictly arranged according to their symmetrical logic, while the distribution is equally distributed, from any point of view. There is no such thing as a center in a ubiquitous symmetrical world, all properties remain the same wherever one goes, in what direction one looks. It is the kind of symmetry that builds a universe, the kind of symmetry that folds molecules, the kind of string symmetry that vibrates in the world of quantum. The center of the universe is where you are, and from where you look around, the center is both everywhere and nowhere. Each person may feel like the center of the universe, but so may any other person. The same logic applies to Ilona Lénárd's paintings. There is no center, there is no gravity, there are no boundaries. Yet there are strong rules of symmetry organizing the acrylic paint on the canvas. The paintings offer us a look into a personal universe, one out of numerous other personal universes.

Intuitive gestures

The paintings are built up from thousands of gestures, whereby the gestures are materialized by an acrylic marker that she holds firmly in her hand. The gestures go left and go right, go up and down. there is a local symmetry between the gestures that are traced quickly one after the other. Typically, each gesture is counterbalanced by the next gesture, thus building up local mirror symmetry. When one gesture turns right, the next most likely will turn left, but not as an exact copy, not deliberately drawn. A predefined character for the gestures of a particular painting defines the topology of the trace, not the exact geometry. Each painted gesture is unique, yet following the same instruction. There is no repetition, other than repeating the procedure. Like there is not a single leaf in a tree that is the same as any of the other leaves. They are similar but not the same.



Figure 2: Q 04 | Ilona Lénárd | acrylic on canvas | dimensions 180 x 180 cm | 2018

The uniqueness of each constituent component is precisely what Ilona's autonomous work and the architecture of ONL¹) have in common. In architecture we name it parametric design, whereby each building component is [potentially] unique in its shape and dimensions, yet following the same simple rule. Lénárd refers to her strokes as intuitive gestures, based on one single base characteristic for the spatial hand movements. The procedure leads her hand intuitively, without deliberate thinking. The simple rules of the procedure are like the genes informing the strokes and the arrangement of the strokes in the fields of the canvas, thus assembling the body of the painting. The personal universe of the artist has similarities with the universe, where the billions of galaxies, each of them unique in their strength, shape and dimensions, are magnetically interlaced to constitute the ubiquitous endless whole, an omniverse without a center of gravity. The large canvas lies on the ground and the artist works around the canvas, securing that there is nothing like up and down, left or right. From each angle the painted personal universe, which is captured in the painting by adding layer after layer of strokes with the acrylic markers, offers a similar view into the depth of it. Slowly approaching the paintings is like traveling in space, at warp speed. One moves deeper and deeper into the entangled fabric, an assembly of interwoven individual strokes. The graphic strokes are put on the canvas with power, with speed, with focused intention. The speed of the hand movement surpasses logical thinking, thus avoiding deliberately moving from one inflection point the other. When observing the work in progress, it looks out of control, yet in fact very disciplined in the execution. By and large not in a conscious act, a dynamic balance is found between the components that build Lénárd's polynuclear personal universe. Layer upon layer is added to the canvas until the density is high enough to reach the intended depth in the painting. Then, typically, when there is just enough open space left to enable the viewer to dive deep into the painting, the painting can be declared finished.



Figure 3: brain cells | source.universal-sci.com

Hidden mathematics

There are some relevant references that come to mind when further exploring the topology and geometry of the paintings. Recently I stumbled upon an article at www.universal-sci.com about the hidden mathematics of the human brain ²). It is stated by the author that natural systems use symmetry for survival, adaptation and reproduction, using a different kind of logic than the binary logic of computers. The symmetries that are discussed operate like rotations that can be combined. What we can learn from that is Lénárd's gestures are born from a kind of logic that is not binary, but one that is based on how subsystems in brains are constructed [figure 3], and, following a similar logic, how proteins fold, live, adapt [figure 4] and reproduce in their interaction with neighbouring subsystems.¹

^{1&}lt;sup>2</sup> Chrystopher Nehaniv | Symmetry structure in discrete models of biochemical systems: natural subsystems and the weak control hierarchy in a new model of computation driven by interactions | www.royalsocietypublishing.org/doi/pdf/10.1098/rsta.2014.0223

³ www.nasa.gov/feature/the-universe-s-first-type-of-molecule-is-found-at-last

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Figure 4: process of self-assembly of molecules by folding | source: and rescolubri.net

The folding of proteins into tangled packages of basic pairs of molecules gives us another interesting reference. Proteins are the basic building blocks of life, ubiquitously present in the universe. Recent studies have shown that the simplest combinations of atoms into molecules, notably helium hydride, are evenly spread over the entire cosmos ³). Molecules seem to form spontaneously in the vast space between the celestial bodies feeding on the intense radiation that is emitted from nearby stars. From the simplest molecule to the folding of large molecules to form protein is a big step, it is the process of folding that is of interest for the analysis of the paintings.



Figure 5: Flow | Ilona Lénárd | acrylic on canvas | dimensions 140 x 140 cm | 2014



Figure 6: 3d sketch with 3d digitizer | Ilona Lénárd | Open North-Holland Pavilion | 2001

Alternating centrifugal and centripetal forces

Starting with the early Flow series in 1995 [figure 5], Lénárd intuitively made ultraquick sketches that are folding into itself, like superfast gestures that move away from the body and come back to the core in a series of rotations. Like alternating centripetal and centrifugal forces while sketching [figure 6]. The execution of the multiple sketches follows a strict procedure, repeated over and over again to assemble the paintings, following some simple rules, embodying rotational symmetry at the global level, and mirror symmetry at the local level. Symmetrical not in the sense that each sketched loop is the same, but as a topological movement using different intuitive emotional parameters for each loop. The similarities to the folding of larger molecules are striking ⁴). As if the basic forces of nature like intramolecular self-assembly are intuitively reinvented in the design concept of the paintings, by eliminating deliberate thinking in the execution phase.²

^{2 &}lt;sup>4</sup> See also Open Noord-Holland Pavilion at www.lenard.nl



Figure 7: Free Arabic Calligraphy | source freeislamiccalligraphy.com



Figure 8: Tangle 01 | Ilona Lénárd | acrylic on canvas | dimensions 12 x 180 cm | 2014

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Abstract calligraphy

The main components in the paintings are vaguely similar to hand drawn Chinese characters, but even more like Arabic calligraphy [figure 7]. Chinese and Arabic script share the brush strokes, and share the varying width due the nature of the brush, the angle of the hand and the amount of black ink absorbed by the brush. Chinese characters are written from the top down and are more complex in one character than Arabic ones. Arabic letters are written from right to left, except for the numbers, they go from left to right. Western scripts are written from left to right and are by and large phonetical. Arabic calligraphy is more gracious and therefore closer to Lénárd's strokes. In the paintings these influences come together in a new personal script, whereby the intuitive gestures are sharing the building blocks of an imagined universe, the structural components of the assembly. Like the letters and the words are the structural components of writing, bound together by syntax rules and grammar. The space-filling ubiquitous symmetries in the paintings form the syntax and grammar, while the local symmetries form the equivalent of the letters and the words. The paintings are a form of abstract calligraphy, without the meaning of the character, but with the characteristics of the gesture. The first series of acrylic paintings to apply the method of abstract calligraphy are the Tangle series [figure 8], not unlikely inspired by the frequent visits we paid to the UAE and other Arabic countries like Jordan, Oman, Kuwait and Qatar from 2006 onwards until the day of today. We have lived for two full years in Qatar, where the Q series [figure 9] were made, whereby Q stands for Qatar and/ or Quantum.



Figure 9: Q03 | Ilona Lénárd | acrylic on canvas | dimensions 180 x 180 cm | 2018

Zero gravity

The analysis of the paintings with respect to the world of symmetry would not be complete without reference to other artists who preceded her, albeit in a different way, and with different intentions. The obvious artist that comes to mind is Jackson Pollock, not because Lénárd's paintings are the same or similar, but because both artists are forcing paint on a large canvas that is spread on the ground, allowing the artist to go around the painting. The decision to put the painting on the ground invites the artist to work on the painting from all sides, and thus, almost by itself, the anti-gravitational ubiquitous symmetry of the painting comes forward. Furthermore, what Lénárd and Pollock share is the systemic procedure of painting. While Pollock uses a drip painting technique [figure 10], Lénárd has a more direct contact to the canvas using wide-tipped acrylic markers. Both apply pre imagined gestures to put the paint on the canvas, and both of them move around while working. Both of them have music on when painting, Pollock listens to jazz classics, while Lénárd prefers the likes of Simeon ten Holt, Ryuichi Sakamoto and Philip Glass, modern classical music that can be considered as procedural as well, music that has a strong aspect of continuity. Both in jazz and in Glass there is a strong notion of the counterpoint, which is the musical equivalence of symmetry. By rounding the corners of the painting many times, in different directions, a ubiquitous form of rotational symmetry emerges spontaneously. So, the geometry is not thought of beforehand, but is a byproduct of how the artist moves about. Imagine the painter painting a stroke on one side, and then the next stroke from the opposite side. This act creates the rotational symmetry. And any of such rotational symmetrical strokes create a manifold multiverse.



Figure 10: Jackson Pollock | Autumn Rhythm | Jackson-Pollock.org | 1950

Robotic painting

Another artist that is relevant to mention here is her colleague artist Leonel Moura from Portugal. Moura has developed a special robotic technique called swarm robotics [figure 11]. Instead of himself tracing the lines on the canvas he puts a group of tiny robotic devices on the canvas and lets them run. These little robots are programmed with a simple set of rules: pen up, pen down, turn left, turn right, proceed until bumping into one another etc. The robots hold felt tip pens in various colors. The resulting paintings share many of the characteristics of both Pollock's and Lénárd's canvases. The local symmetry is embedded in the instructions given to the robot, the ubiquitous symmetry a result of the endurance of the process, whereas the thousands of strokes distributed over the canvas guarantee the universal character of the robotic painting.

Intuitively parametric

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Besides the similarities there are substantial differences in the execution of gestures between Lénárd and Pollock, and between Lénárd and Moura. Moura uses preprogrammed gestures executed by robots. The robotic traces are basically repetitive, always the same but traced with different orientations, locations and colors. Lénárd's gestures are different from one to the other, comparable with the principles of parametric design, that is, not predefined but driven by her own muscular pulses of the moment. Whereas Pollock splashes the enamel paint on his canvases, avoiding contact with the canvas, the direct physical contact is essential for Lénárd. Pollock uses selfpowered chance to arrange the splashes on the canvas, while Lénárd in a by and large emotive way varies the pressure on the canvas, varies the speed of the hand movements, and varies the alternating centrifugal and centripetal forces as parameters for her gestures. Her work is intuitively parametric. What Pollock, Lénárd and Moura share is the fascination with the procedure, the canvases spread out horizontally on the ground, the spatial zero-gravity of the figure, and the creation of omnidirectional personal universes.



Figure 11: RAP / Robotic Action Painter | Leonel Moura | leonelmoura.com | 2006

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Machining Emotion

Special attention needs to be given to a series of robotic paintings titled Machining Emotion executed in 2015 [figure 12]. Machining Emotion has been a collaboration between the artist Ilona Lénárd, the author of this essay, and two younger designerprogrammers Ana Maria Anton and Serban Bodea, former architecture students of the author. The procedural method of intuitive 3d sketching was enhanced with an advanced algorithmic script and executed by a large industrial robot arm. The originating 3d sketch was made by Lénárd using the 3d digitizer. The selected sketches are analysed in the script using the trajectory *[i.e.* the number of vertexes along the curve], the speed of the gesture, the angle of the marker that was fixed to the tip of the digitizer and the pressure of the marker on the tracing paper. These data were used as parameters to feed into the algorithm. Also we introduced fractal symmetry, which meant effectively replacing convex and concave segments of the original with the trajectory of the sketch as a whole, thus ascertaining the distributed multi-scalar symmetry in the finished painting. Again, the robot painted in a number of superimposed layers using slightly varying parameters to come to the final result. We could have made thousands of different paintings, all of them unique and all of them representative of the intention of the artist, just by varying initial sketches, parameters in the algorithm, choice of colour for the markers, speed of operation, and number of layers on the canvases.



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Figure 12: Machining Emotion RDM 06 | Ilona Lénárd, Kas Oosterhuis, Ana Maria Anton, Serban Bodea | dimensions 110 x 190 cm | 2015

In the same year 2015 we organized a second iteration of Machining Emotion in the Dubai Design District [D3] during the Dubai Design Week [figure 13], with the same team. We rented a medium sized robot arm and had it installed in one of the exhibition spaces at D3. We worked with another set of 3d sketches, but this time done through a small device called Leap Motion. Leap Motion recognizes one's hand and tracks the movements of the hand, leaving a 3d digital trace. The 3d sketches were used as input values for a slightly revised algorithm, and we started playing with the variables during the design week, in the setting of an open laboratory, for the public to watch and interact with. We used the properties of the robot to make an as large as possible painting. The symmetric end result is a direct effect of the reach of the robot and the dimensions of the available canvas. The painting is divided in three equal parts, symmetrical arranged along the axis from the blind spot, which is the point that the robot arm could not reach, to the opposite side. We run four iterations, changing the variables from painting to painting and sometimes even during a single run.

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Figure 13: Machining Emotion DDW 04 | Ilona Lénárd, Kas Oosterhuis, Ana Maria Anton, Serban Bodea | Dubai Design Week | dimensions 315 x 315 cm | 2015

Intuitive understanding

Back to the most recent analogue paintings, notably the Pattern series [figure 14]. While working in Lénárd's studio at Doha Fire Station in 2018-2019, where we were also invited to mentor the 2018-2019 batch of artists in residence, she replaced the acrylic marker with a pattern roller. Pattern rollers were commonly used in her homeland Hungary to decorate interior walls with floral patterns, or even with more abstract patterns. New pattern rollers are hard to find, only used half broken old ones. Fortunately, some good new ones were found in Germany. The rollers are used as the markers, strong short fierce curved and quirky left and right leaning curvilinear strokes are imposed on the rollers, creating layer by layer a mesmerizing universe of interlacing patterns. In one painting two different roller patterns are used to create more diversity in the overall image. Not surprisingly, the paintings are reminiscent of natural phenomena, but explicitly without imitating them. It may look like the ripe falling from the tree, but it is not inspired by it. The congruence comes from deeper emotions, from an intuitive understanding how natural forces work. From an intuitive understanding of finding a balance in ubiquitous symmetries.



Figure 14: Frost | Pattern series | Dimensions 200 x 200 cm | Collection Qatar museums | 2019