G

THE GAME OF LIFE

IN CONVERSATION

WESTERN EUROPE

TIME ZONE
UTC+1

ESTIMATED NUMBER OF SPECIES
One trillion

DISCOVERED SPECIES
0,001%

ORIGIN
The oldest found evidence of micro-organisms traces back 3.45 billion years

The conversation between Leonardo Dellanoce[LD], Ana María Gómez López[AMGL] and Femke Herregraven[FH] evolves around *Durational Monochrome* (2017), a site-specific and collaborative installation permanently installed at Rijksakademie in Amsterdam. The dialogue traces the artistic-led investigation into the unrecognised circularity of growth and migration and thus takes a closer look at the simultaneity between microbial, economic and cultural exchange.

LD: How did your collaboration come into being, and why around this specific investigation on microorganisms?

AMGL: I was looking into cyanobacteria and I remember telling Femke about the hypothesis that cyanobacteria (Synechocystis) developed the "original eye", one that cannot be compared to a human or animal eye, but one that could trace light and focus, almost acting like a camera. But what really connected us was an interest in astrobiology in relation to microorganisms.

FH: It was also the notion of extremity when talking about extremophiles. Being extreme is a human construct, but what does extreme actually mean? Most organisms on Earth are probably too extreme for us. This uneasiness with this anthropocentric standard brought us to create *Durational Monochrome* and install it at the Rijksakademie.

AMGL: We decided to start experimenting with the other "residents" of the building—cyanobacteria that could be found in large quantities on the roof and other parts of the building, for instance.

FH: On the one hand, there was this interesting tension between the very practical approach of sourcing and discussing biological materials drawn from the building where we are residents, like cyanobacteria, and on the other hand, the massive speculative leap of astrobiology and the conversation around it. The collaboration operated on these two axes, the material one and the speculative one.

AMGL: Actually, the speculative conversation was also dealing with early Earth and ancient biology, beyond speaking about astrobiology in outer space. One of the topics discussed has been the oxygenation event about 2.45 billion years ago when cyanobacteria produced the first photosynthesis that allowed them to create oxygen.

FH: But astrobiology definitely framed the conversation on extremophiles. There was, for instance, a research project by NASA and ESA in the Danakil Depression[1] that aimed to predict how life beyond Earth might look like.

LD: I'd like to go back to the artwork and to its title, *Durational Monochrome* to dive deeper into its form and conceptualisation.

AMGL: The title is a creation of Mihnea Mircan, a curator who came to visit my studio. When I was trying to make cyanobacteria behave in a photographic manner (using these organisms to imprint an image was quite successful in terms of process), Mihnea challenged me to not use cyanobacteria only as material but as the very

subject of the artwork. Why not densify them and let them act as cyanobacteria? That's where durational monochrome originated from. And this monochromatic character is evident only in certain moments in time. If you look at it now, it is all but monochromatic, but if you don't use a human perceptual time frame, then everything changes.

FH: The word monochrome also places it in an art historical tradition, which is very important to open the possibility of a non-scientific approach. What I find especially interesting in the durational element, is the fact that there is a degree of unpredictability in it. The monochrome seems to be a deliberate choice, for example to colour a painting in Yves Klein Blue or any other colour, while the durational element makes that idea collapse as it changes over time.

LD: Going deeper into this formal discussion: the decision of using specifically the Winogradsky column as culturing device is a deliberate one.[2] What does it relate to?

AMGL: Working with microorganisms in Amsterdam, and especially with cyanobacteria, is tied to history of science and how Antonie van Leeuwenhoek from Delft was the first to observe these microbes.[3] For doing so, van Leeuwenhoek created an optical tool that we call the microscope to allow humans to move beyond the scale of human vision.

FH: To a certain extent, the Winogradsky column is a viewing device too, as it allows for humans to see the composite development of a specific microbiological culture.

AMGL: Winogradsky was working in pre-Soviet conditions, trying to understand how soil was functioning for agriculture purposes. At this time, no one had an idea of how nitrogen was circulating through different strata. So, he came up with the column, an artisanal object to study such mechanisms. By making the yet invisible visible to the human eye he introduced a life cycle beyond the human-focussed.

LD: The difficulty in perceiving this microworld shapes also how the notion of migration operates in this context. This brings us to the notion of time and movement and their relation at different scales.

FH: Perhaps the point we should start to reason from is where human and microbial scale intertwine: the environment. As a matter of fact, one of the migrations occurring in this piece is the environmental one. We collected all these different samples from different locations. For instance, Ana María collected samples from the roof of the Rijksakademie, and together we sourced samples from rain water (so it's everyone's guess where those samples come from), and also from the neighbouring canals. Interestingly enough, you can see the microorganisms already in the form of green algae, visible to the human eye. After it is collected and put into the Winogradsky column, it takes months for it to reorganise with its fellow species and become visible again. Once disconnected from its "root" and forcefully migrated somewhere else, it takes much time to reconfigure. This is especially interesting in relation to different time scales—the movement we created by disconnecting the microorganisms could be related to a much bigger picture of migration that the one taking place in the column.

AMGL: You do point to an interesting aspect, which is that some microorganisms live in the water and others are in the soil. The ones in the water are just shooting through all of Amsterdam's canal system, but the ones in the soil (some of it is of course being saturated from that water) are underneath the water table that is located much deeper below ground. Those have presumably been there for a longer time. In the Winogradsky column you have these different communities. For humans, it is chromatically visible because some are red, while others are green. When you talk about migration you as well need to talk about the medium it takes place in, and in our case, it is earth and water. Not to mention that cyanobacteria has adapted to different forms of motility in water. By the way, we also sourced the water for one of the Winogradsky columns from the camel's quarter at the Artis Zoo here in Amsterdam.

FH: Perhaps some contextualisation might help here. When we both started at the Rijksakademie we were shown footage of the institution from previous decades. There was one particular photograph where Rijksakademie students, dressed up in fashion from the early 20th century, are posing with a camel. The camel was a loan from the Artis Zoo here in Amsterdam and was used as a live model for drawing. There is a deliberate parallel between Durational Monochrome and what an institutional loan for artists might look like in 21st century. In fact, the camel is not just some animal but a symbol for exoticisation and colonialism predominant during these times.

AMGL: It also exemplifies the scientific focus on vertebrate animals.

FH: Precisely, as well as the artistic focus on what can be seen with the human eye and therefore can be represented. Micro-organisms, on the contrary, do not have the aesthetic qualities that artists might be interested in following this traditional sense.

LD: This points to a second migration happening in your work—a more human-centric one based on the loan of the camel's skeleton from Artis Zoo and of a sample of cyanobacteria from Micropia.[4]

AMGL: When we went to collect the sample from Micropia we brought simple sanitised jerry cans as suggested by the microbiologists. So, there we were, with one can with the microorganisms and one for the nutrient solution. The process did not involve any art handling, just a simple going back and forth.

FH: We had to sign a simple contract which declared that we have to look after the sample, nurturing it, basically keeping it alive, for a specific amount of time after which we were legally bound to terminate it.

AMGL: On the other hand, the camel skeleton required much more preparation and art handling because it is considered more valuable, not only economically but also in cultural terms.

1 The Danakil Depression is the hottest and lowest place on Earth, situated in the north of Ethiopia. It lies at the triple junction of three tectonic plates and has a complex geological history. Especially Danakil's hot springs offer research opportunity to study extremophiles and understand how life might emerge on other planets.

2 The Winogradsky column is a simple device for culturing a large diversity of microorganisms. Invented in the 1880s by Sergei Winogradsky, the device is a column of pond mud and water mixed with a carbon source and a sulfur source. Incubating the column results in two gradients that promote the growth of different micro-organisms.

3 Antonie van Leeuwenhoek was a Dutch scientist and best known for his pioneering work in microscopy.

4 Micropia is a museum in Amsterdam focusing on microbes' existence in daily life.

FH: The camel skeleton was treated completely different because it was an object—tangible, visible, and therefore more valuable in terms of insurance.

LD: These are the first two migrations in *Durational Monochrome.* In the former, you sourced earth and water supplies to create a "coded" environment in the Winogradsky column for different micro-communities. In the latter, the loan from Artis and Micropia, highlights the cultural and economic relevance of both in the current value system. The third one seems to be a radically different migration.

FH: Indeed, the third migration is specific to the micro-scaled world. In fact, earlier we were talking about time and movement in relation to human-scaled migration. On a human scale, time and movement are distinct elements of migration. On the micro scale, the picture is rather different.

AMGL: While you are making this point, I visualised a growth chart in my mind. Growth basically equals saturation in space. Whenever you see migration or the taking over of a certain space, what you really see are individual growth cycles that are temporarily contained—this is one of the beautiful aspects of microbial culture. Since you have only one or two cells, you see growth happening in an instant. So yes, there is a significant difference between time and movement, but it is a difference for us in terms of organising those activities in that column, the same operation that would happen within the soil or the canal.

FH: To me, the process of creating this culture has similarities to digital coding. What you are looking at is not an animation of the organism but a generative system. And by coding, I mean the setting of conditions through which the generative system operates—which implies that there still is a strong human factor involved. Of course, the microorganisms do what they want at a certain point, but our intention is undoubtedly present in the set possibilities given within that specific system. Around this notion, a famous example comes to mind that reinforces our activity of modelling: the game of life by John Conway.

AMGL: *The Game of Life* is a mathematical simulation, through which Conway demonstrated that a limited set of rules can generate a high degree of complexity. The simulation happens on a grid with dots being either alive (lit) or dead (dark) and the relation between dots make them die, survive, or be born. In fact, through the simple rule of the game what seemed to be random interactions generate clear patterns and differentiations. The dots on the grid not only reproduce but they evolve into distinct species that move across the grid through growth. This "simple" simulation not only suggests that life and intelligence might emerge from a series of random interactions, but it can also be seen as a simulation of migration, where movement occurs through growth. We know growth as a cycle unfolding through time, therefore collapsing movement into time, and vice versa.

The installation is composed of six Winogradsky columns for culturing microorganisms, in addition to a strain of cyanobacteria from Micropia (Synechococcus spp.) and a camel skeleton from Artis Royal Zoo, one of the oldest zoos in Europe.