‘Nucleus, an integrated public art work’

Realisation art work: Chantal Pollier
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Description of content:

The VIPA (Flemish Infrastructure Fund for Personal Affairs) is subsidizing renovation projects and new constructions, on the condition that a certain percentage must be spent on an integrated work of art. The board of directors of Sint-Lievenspoort, a health care center in the city of Ghent (Belgium) has withheld the artistic project "Nucleus" to be carried out on their site.

Location:
Two new buildings will be built on the street side: on the left the child care center (KDV), on the right the Ambulatory Rehabilitation Center (CAR). Both buildings will be connected by a footbridge located at a height of 7 m (the second floor). You enter the Sint-Lievenspoort site under the footbridge.

Both sides of the footbridge are largely made of glass; the integrated work of art is situated on the street side of the passerelle, visible to all passers-by and inviting to enter the site.

Work:

a. Techniques

* A detailed Scanning Electron Microscopy photo of a neuron cluster or of some neurons interconnecting, is lasered into the glass, with dendrites and axons fanning out in all directions, seeking the connection between the two buildings and their residents. This almost ten-meter-long, and 2.6-meter-high glass panel consists of three parts, each part being highlighted in a special way so that the lasered photo "lights up" and thus produces a strong spatial effect.
* The SEM photo is lasered in 3D. The technique used for this is to laser the image inside the middle glass plate. A two-dimensional tiff photo is supplied in stack format (several layers on top of and next to each other), this photo is then converted into a 3D file and converted into the point cloud program that the lasering machine can read. This then yields a three-dimensional image in the glass, in itself colorless, but glowing on direct exposure.
* LED lighting is placed perpendicular to the glass, due to the height of the work this must be done both at the bottom and at the top. The LED light deflects on every point that has been lasered, so that this point lights up and one sees the photo. This lighting is essential and is part of the artwork. Without the right exposure one gets a kind of "shadow" in the glass, a "ghost" of the work.
* The 'normal' lighting of the corridor must have sufficient contrast in terms of color to make the work stand out well. You can opt for softer and warm "earth colors" but, for example, a bright green orange or red would elevate the footbridge itself to a "connecting vein”.

b. Motivation

The functioning of the brain, neurons and neuronal networks has always fascinated me (partly because of my training as a psychologist). The complexity of the multilayer neural circuits can lead to phenomenal experiences, dreams, fantasies and achievements. But it is precisely because it is so complicated that it is also vulnerable to distortions, degeneration, diseases and disruptions. We have hardly begun to explore what our brain's capacities are.

This assignment, with much importance to communication, interaction and collaboration immediately reminded me of "the rosehip neuron" recently came out in the news. The rosehip neuron would be unique to humans and would have the function of "filtering" the innumerable interactions between different neurons. Looking for more images of neurons, I saw them as metaphors of communication, networking and connecting in all their complexity, but also uniqueness. The cells do not merge. It was the beginning of the "nucleus" project.

I searched for earlier visualizations of neurons and found Santiago Ramon Y Cajal (1852-1934). He was a Spanish anatomist and artist, he drew what he saw through the microscope after he had placed thin slices of brain tissue in silver nitrate. He was the first to recognize the importance of neurons as anatomical and physiological units of the nervous system and in 1906 he received the Nobel Prize for it.
I investigated the latest techniques to come to more detailed photos. Because the work is about interaction and communication, I also want to be able to display the synapses (contact points) and the dendrites as detailed as possible.
I learned that dendrites have a surface that is full of mushroom-like bulges (filopodia) on which the synapses take place. (see photo, from the internet). These detailed structures are beautiful and I really want to see them in the final photos. It appears to be very difficult to achieve this, but it would be wonderful to see this represented in the final art work. The lasered SEM photo will be very large and interesting details will make all the difference, leading to an interesting organic structure.

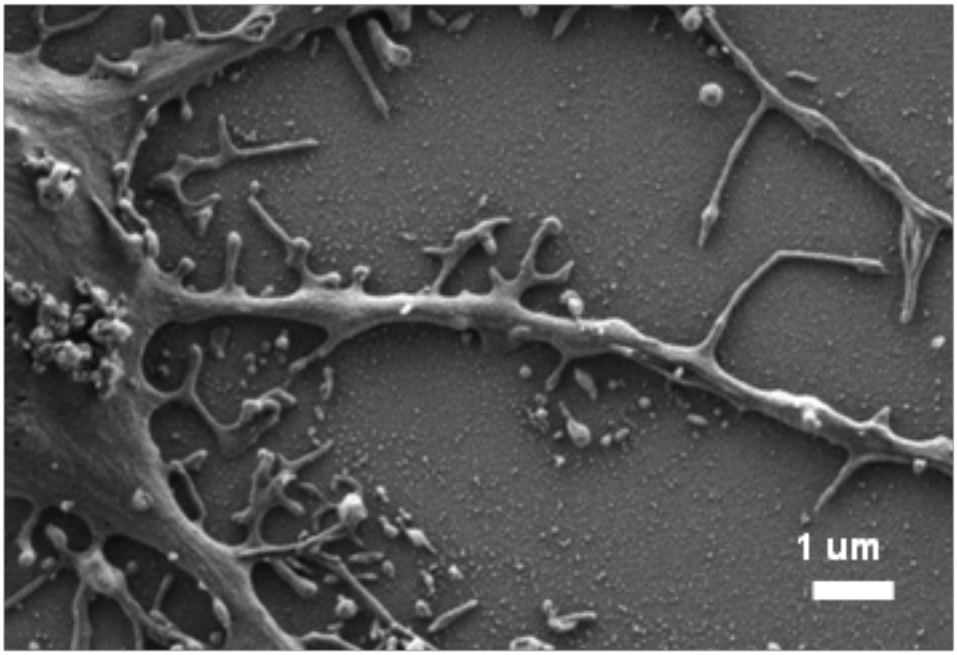


Fig. 2. SEM image of 6 DIV cultured mice cortical neurons over **AlN film** showing neuron filopodia and immature spines.

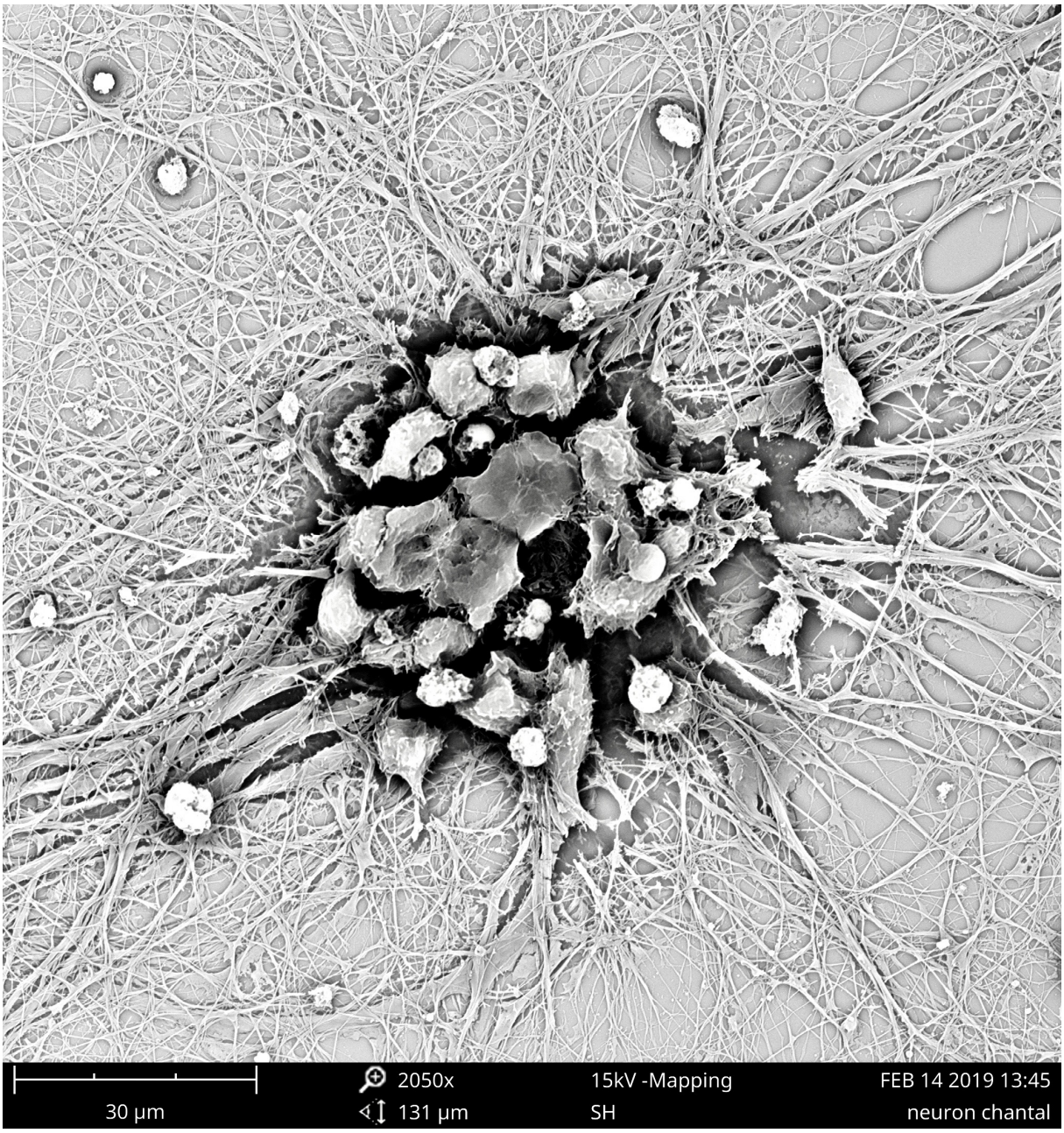
Technical description

Neurone Sample:
* It would be possible to send a sample of embryological mouse neurons, cultured by SCK.cen / Belgian Nuclear Research Centre. Contacts: Mieke Verslegers en prof. Sarah Batout

Stack file in TIFF
?

Ph**oto in 3D-formaat**: (if necessary …)
* Produced bij Digital arts and entertainment Howest Kortrijk or 'Materialise' (both in Belgium)

Glass:
* Produced bij: Isophon Glas Gmbh (www.isophonglas.de) (Gany)



This was a first testing of a SEM-photo of a neuron cluster, in collaboration with SCK-cen. Unfortunately and because the team doesn't need these detailed type of visualizations for their work, They could not help me any further with the production of the photo that I need for my art project.

They can make a culture of embryological neurons and send them over if necessary. On the photo above you see that dendrites are ripped of the nucleus, some of the nucleus are 'exploded' and there is pollution of silicium (from the glass plate) on the photo. Also there are too many dendrites to make a nice representation for the art work. And it was not possible with their SEM microscope to create a stack file.

Collaboration with Lichtman Lab.
ATUM automatic tissue collection on a film-like tape, of brain tissue sliced in small sections the size of 1/1000th of a human hair.
Like this, a kind of library of brain tissue is collected.
Followed by the making of a SEM photo of each section.
(the size of a rise grain is 55 birds equals 10300 sections.
1 section or frame = 10Gigapixels image (compared with photograph it is 1000 times more detailed ; 100 000 pixels on 100 000 pixels)
So together that makes 100 terabytes on data (1 terabyte is 1000 gigabite)

https://www.nationalgeographic.com/magazine/2014/02/brain/

https://www.cell.com/cell/fulltext/S0092-8674(15)00824-7?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0092867415008247%3Fshowall%3Dtrue