

This is a Ion beam image of the root of a human hair taken with Scanning Electron Microscope SEM. Part of the scalp can be seen hanging from the tip of the root.

A Note on Nano (Form- Giving)

NanoFormGiving

Radical means to start from the root, which is exactly what we did – the root of a human hair was the landing site for our NanoFormGiving project. In the project we set out on a three year journey across a human hair that involved 15 members from the creative industry, fine arts, teachers and university-based researchers from the aesthetic disciplines and learning sciences, as well as life and natural sciences.¹ We chose a hair because it is one of the smallest tangible parts of our anatomy that we could conceptualize and literally hold on to as we performed experiments on it. In April 2009 we began to plan our travel route starting at the portal of the Nano Fabrication Lab at Albanova Univeristy Center, but before we could enter this highly specialize lab we prepared ways that

sensitized us to the scale of nano and learnt key concepts from quantum physics. The expedition was supported by an artistic research grant from the Swedish Research Councils to develop artistic methods for exploring the field of haptics in relation to the world of nano.

Setting up

Since things behave differently at nano-scale, due to quantum mechanics, it was crucial that we developed some sort of strategy for comparing the *intangible* activities in the nano world with our *tangible* experiences in the macro world. We were prepared to use a prior exploratory method called A-Labs (aesthetic laborations) to stimulate tactile and haptic perception that related either to developing knowledge in the field of haptics and/or the world at nano-scale. A *Scale interlacing method* emerged that wove together A-Labs with the events we performed in the Nano Fab lab as well as evoked emotive qualities for nano phenomena that could help drive our formgiving process.

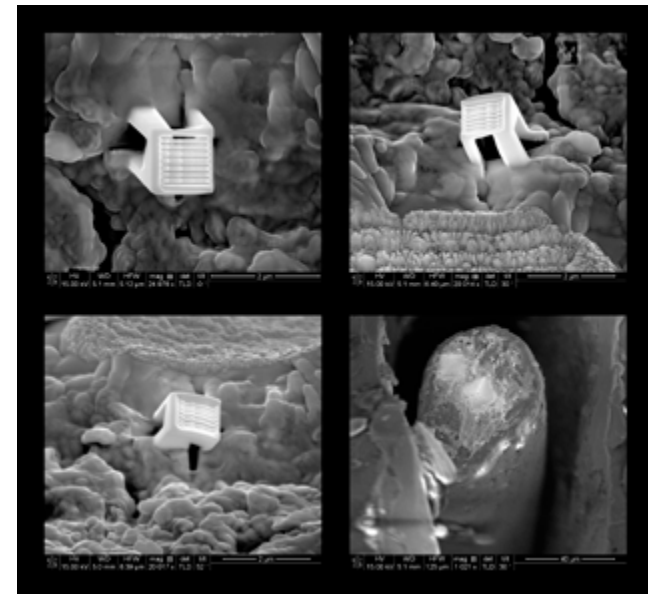
Innovative acts

The projects' formal name was *NanoFormGiving Through Haptic Aesthetic Laborations*. It was managed by a small core group that organised the activities and acted as artistic and scientific leaders and navigators, however, all the 15 members had the possibility of leading a haptic A-Lab in the macro world. The creation of these A-Labs were based on how the members interpreted the two-fold theme: nano and haptic and the project was therefore open-ended and supported innovative acts that were shaped by the members.

Subculture at Nano

To enter the Nano Fabrication Lab one of our members, a particle physicist, trained for four months to learn the protocol for working in the lab and the operational set up for most of the instruments. A nano-expedition team of three to four people, myself included, meet regularly to learn about the lab and conceptually prepared for entering and creatively interact in the nano territory of human hair. Once we began our journey we found that we were one of the few subcultures with our own creative agenda that could freely explore the nano

landscape and operate nano technology, and as our intentions were not framed by business or economy they were truly explorative. Our first encounter as a team failed because the generate that runs the Nano Fabrication Lab shut down before we even had entered the lab. The next day, however, we rescheduled and managed to shape an iconic platinum table through deposition and etching operations. The table measured just 1 x 1 x 1 micrometers with the table legs measuring 400–100 nanometer, a construction on a scale that is smaller than the thickness of a single photon light wave/particle. The images are therefore not photographs because a photon light wave is too big, instead the images are *haptic* which means they are produced by ejecting ions onto the platinum surface of the table or hair which causes particles to be released and collected for re-assembly on another surface as a mirrored image. These haptic images provide insight into the depth and detail that can be attained at this scale.



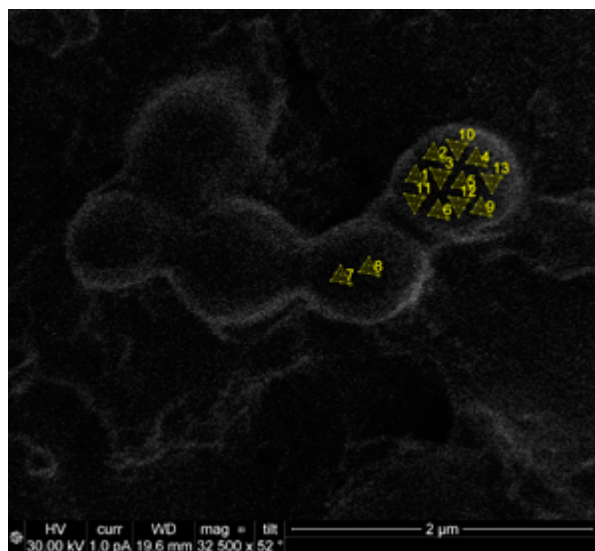
The diameter of this human hair is around 65 micrometers or 65000 nanometers. The hair was covered with a 10 nanometers of platinum gold to induce electrical conductivity making it possible to perform experiments. The table measurements are: 1000 nano x 1000 nano x 1000 nano and the legs range from 400 to 100 nanometers thick.

Infectious Formgiving

A new alternative method emerged from our intention to drive a co-creative formgiving process at nano-scale. We called this method *infectious formgiving*, a process that combined a biological growth process, that is autopoiesis or self-creation, with the nano-fabrication of triangular patterns. One of our members smeared human saliva on the golden hair and placed it in an incubator for a week with the hope to cultivate microorganism such as bacteria and virus. Before we could explore the results another layer of 10 nanometer gold was placed on the infected hair to enable operations and the creation of ion images. We then explored the hair and found clusters of spherical *Staphylococcus aureus* bacteria bound to the golden surface. This bacteria measures around 500 nanometer in diameter and are the most common microorganisms in saliva. Our humble creative response was to etch concentric pattern of triangles around the spherical shapes.

Exhibition

During the Nano Exhibition in 2012 at Norrköping Visualisering Center we exhibited our results and organized a nano workshop for the public. At the opening of this event I



Each yellow triangle has 60 nanometer legs that are etched in a concentric pattern on the bacteria spheres.



All four bacteria are marked with this triangular pattern testing different time intervals which determine the quality of the pattern. The two bacteria to the left had the best time intervals.

presented the following radical proposal: 1% for art / design for every project that receives state funding for nano research! My argument concerned the danger of a gated nano community:

- Only experts
- No subcultures
- Very little public awareness
- Business & economic issues monopolize the nano field
- Polarized debate due to lack of knowledge
- Little creative input from cultural/social actor

Since nano technology changes our everyday practices of life there should be a more *inclusive* social-cultural community contributing to developing artifacts events and knowledge at nano.

- 1 Key Collaborators: Project leader & Co-artistic leader Cheryl Akner Koler, Co-artistic leader Arijana Kajfes, Nano-Scientific leader Narendra Yamdagni.