



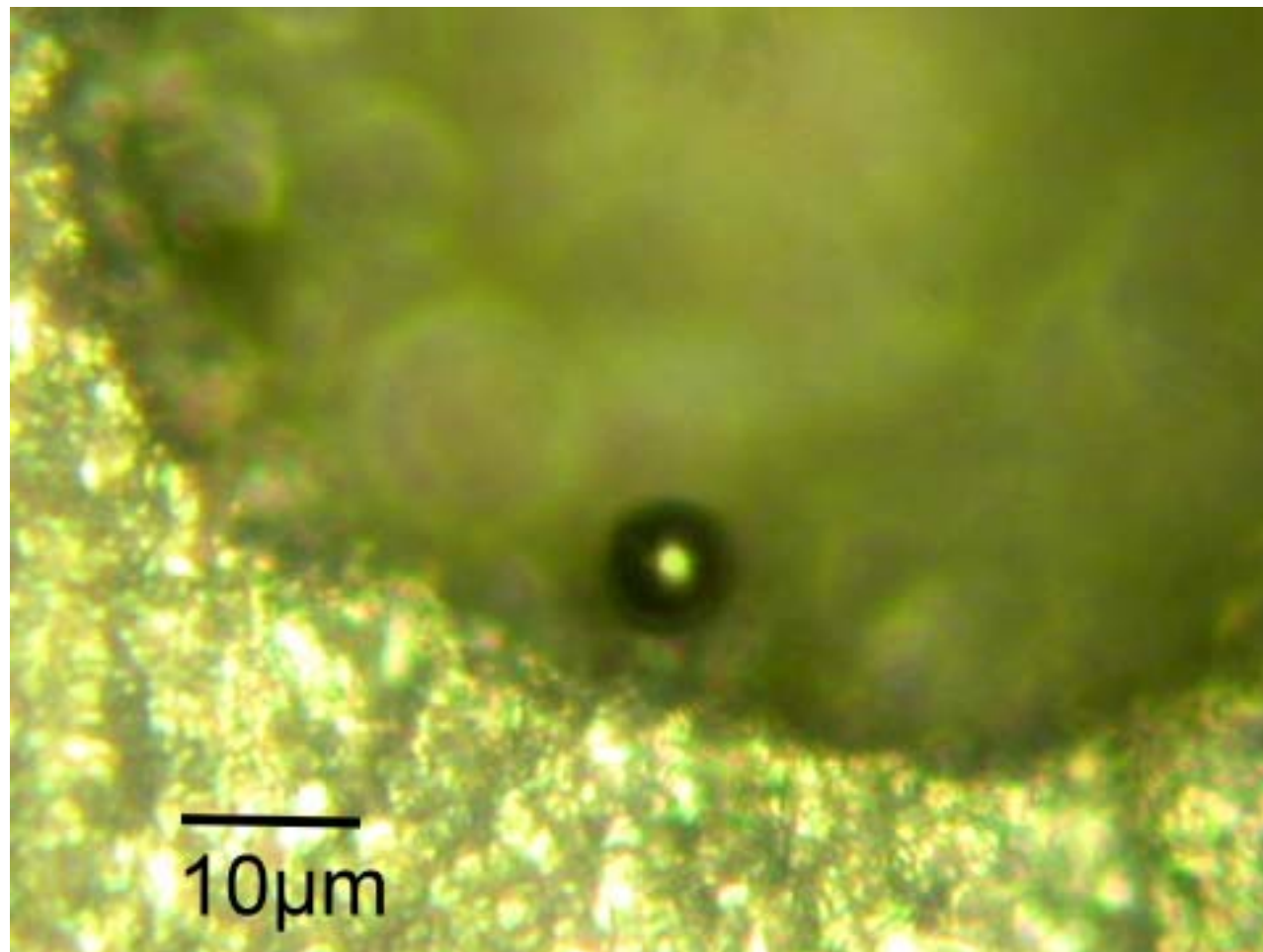
micro & nano - graph

Title:

## Black pearl

### Description:

A micro molten ball  
produced while micro  
EDM drilling is applied.  
It is round and smooth,  
just like a black pearl in  
the hole bottom.



Magnification: 1500 X (3"x4" image)

Submitted by: Y.S. Liao & C.S. Lin

Instrument: Nikon MM40 with customized lens and E5000 camera

Affiliation: National Taiwan University, Taiwan





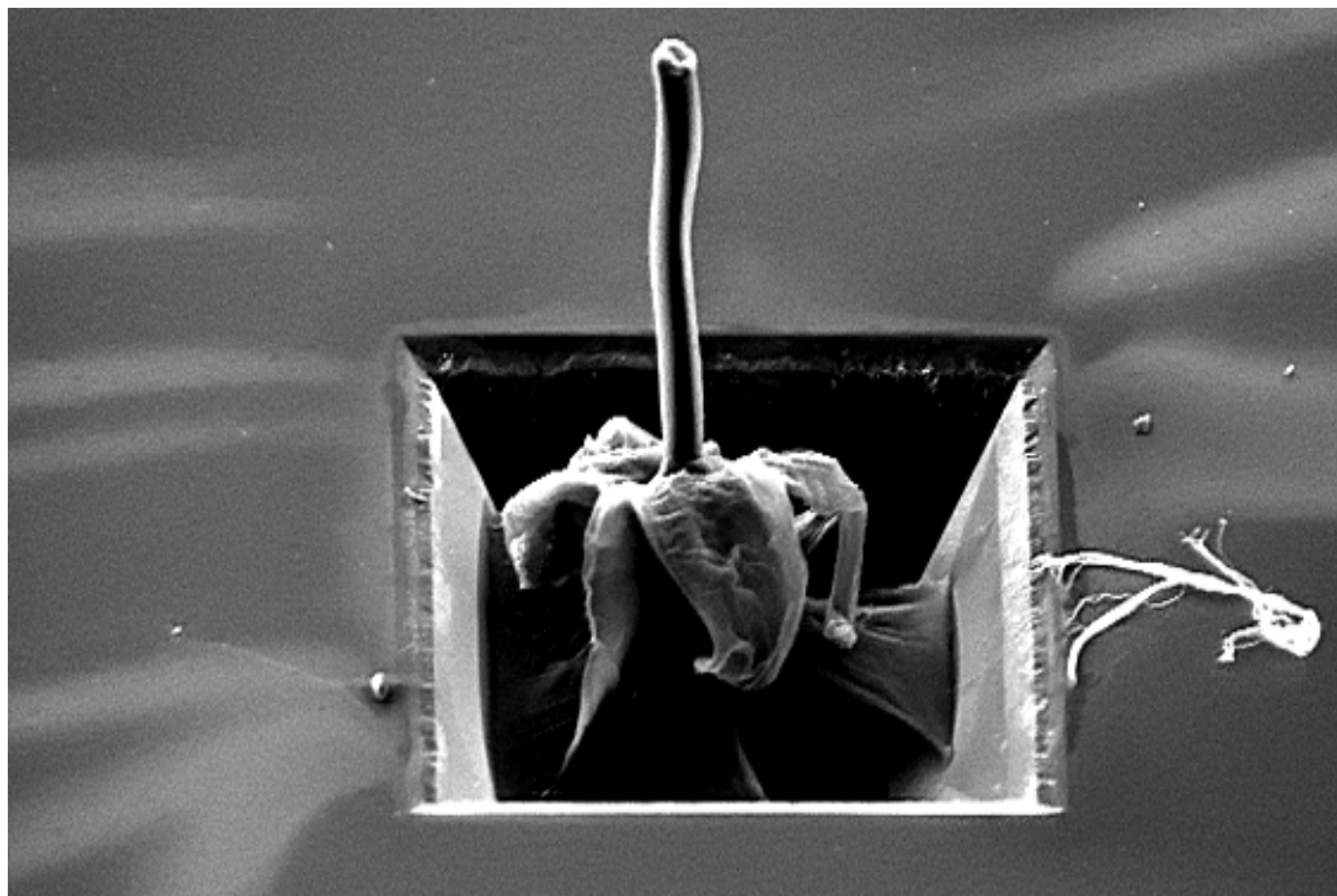
micro & nano - graph

Title:

## Nano- Ikebana2

### Description:

Carbon Nanotube  
Microflower



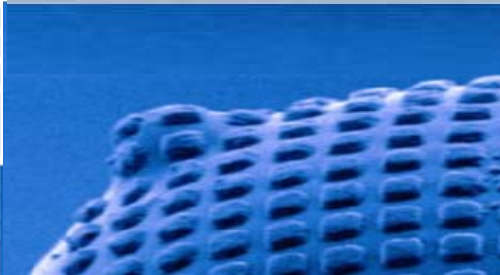
Magnification: 200 X

Submitted by: Michael De Volder

Instrument: XL 30 FEG SEM

Affiliation: UMICH-IMEC-KULEUVEN



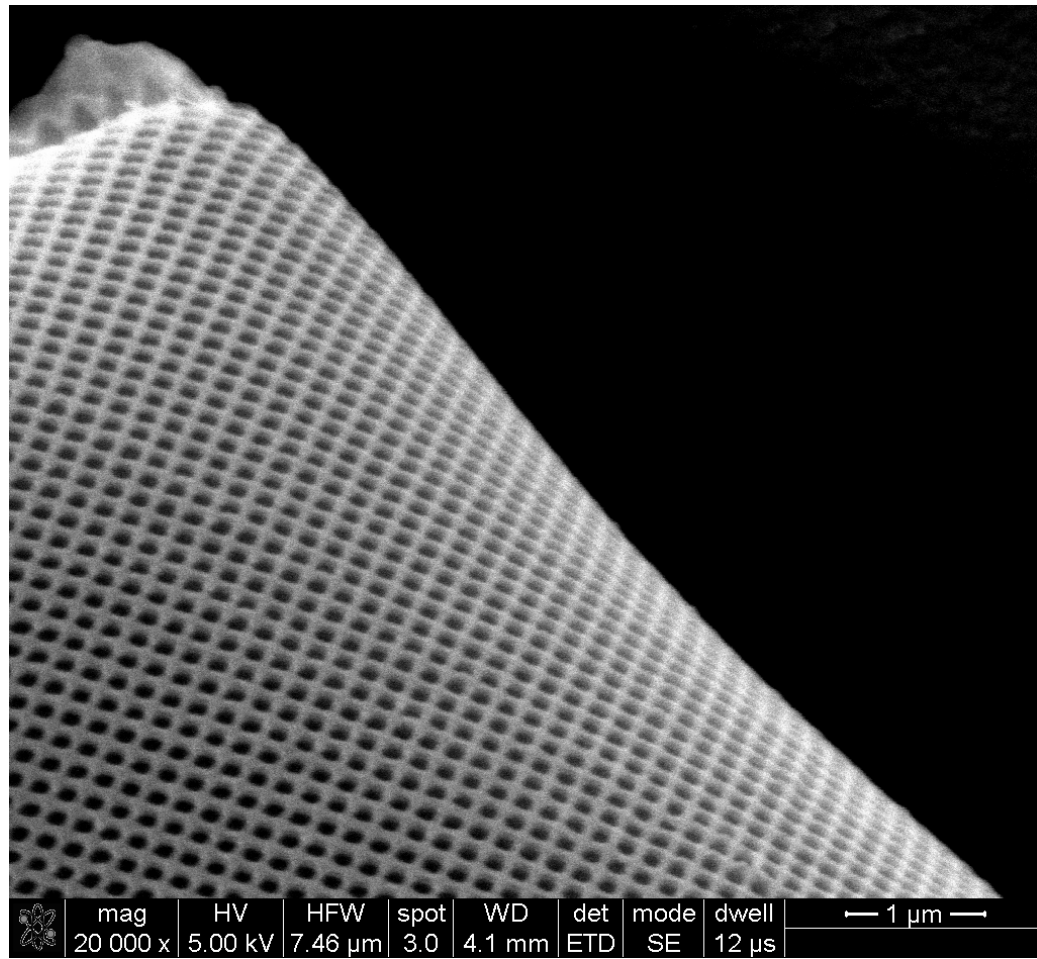


micro & nano - graph

Title:  
**Polymeric  
Nano Mesh**

**Description:**

A thin layer of nano-structured Topas™ delaminated from the bulk and rolled over forming this mesh. The layer contains 100 nm wide and deep holes replicated by injection molding.



Magnification: **20.0 k X**

Submitted by: **Maria Matschuk**

Instrument: **FEI Nova 600 NanoSEM**

Affiliation: **DTU Nanotech, Technical University of Denmark**





micro & nano - graph

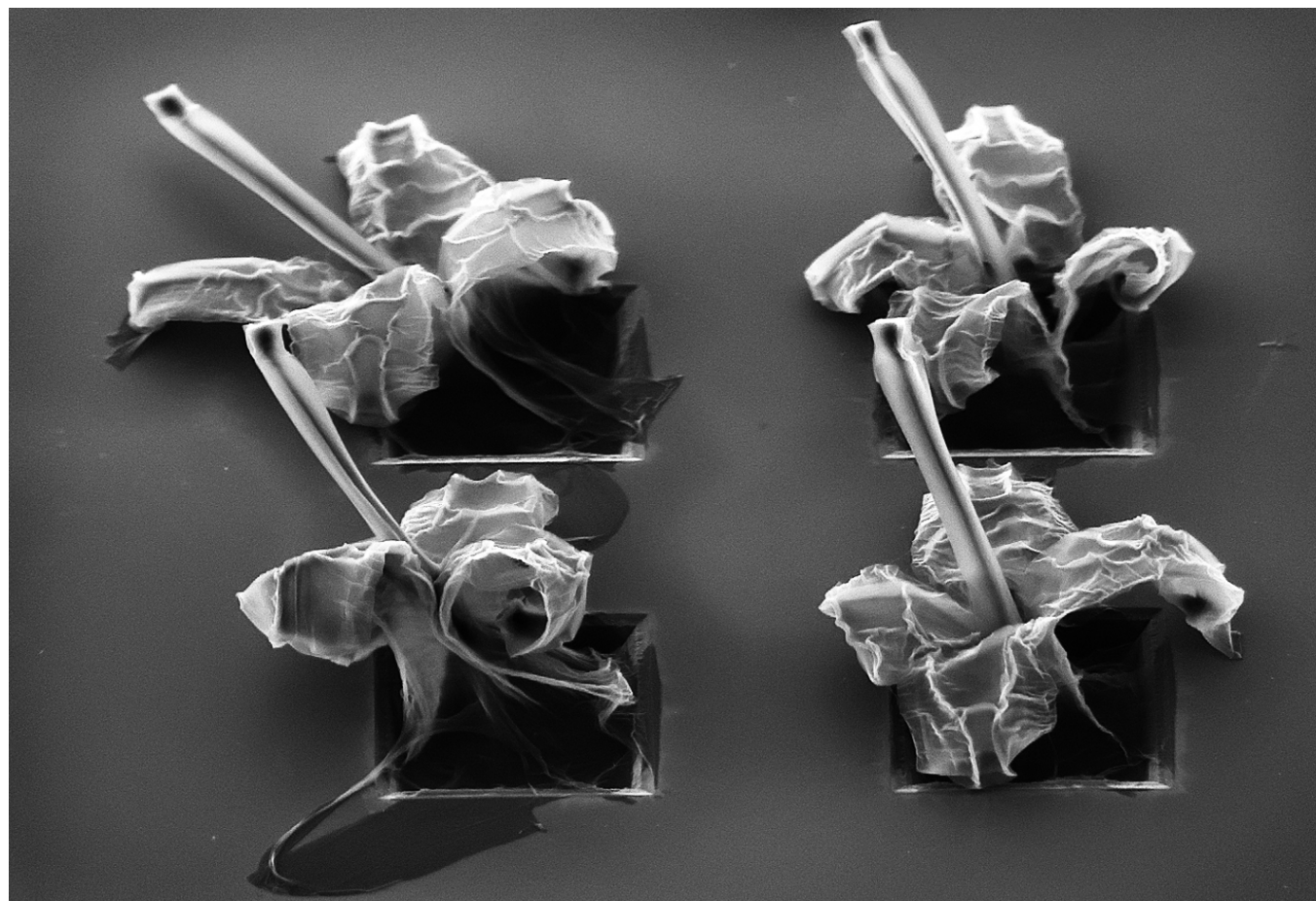
Title:

## Nano-Ikebana

### Description:

Carbon Nanotube

Microflower



Magnification: 100 X

Submitted by: Michael De Volder

Instrument: XL 30 FEG SEM

Affiliation: UMICH-IMEC-KULEUVEN





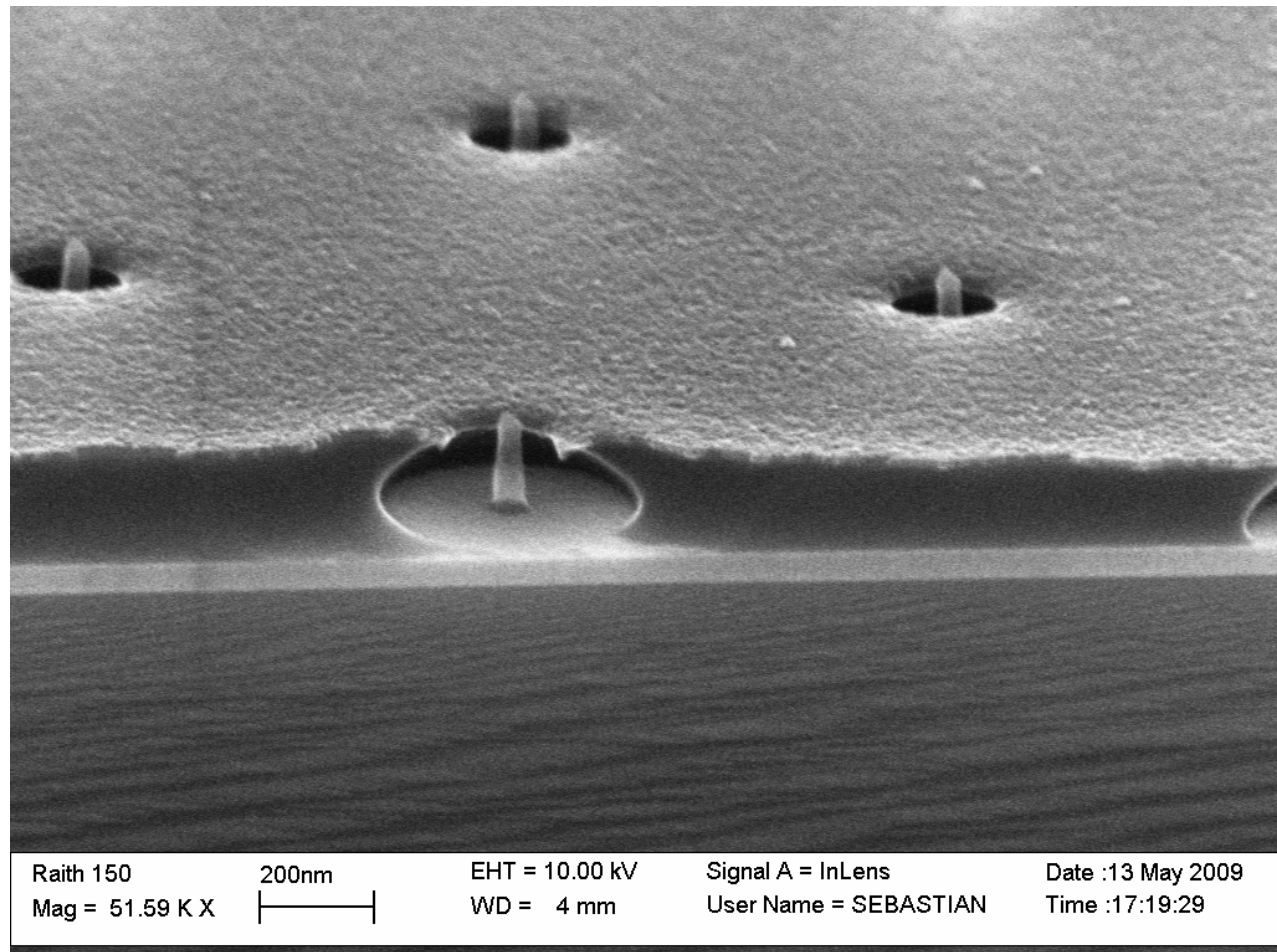
micro & nano - graph

Title:

## Nanostructure array

### Description:

Sideview of a cleaved sample showing a nanostructure array produced by a dot overexposure of PMMA. The central nanopillar is produced by the incident beam, the surrounding rim is produced backscattered electrons and developed PMMA



Magnification: 51.6 k X

Submitted by: Sebastian Gautsch

Instrument: Raith 150 Lithography system

Affiliation: Institute of Microengineering, EPFL





micro & nano - graph

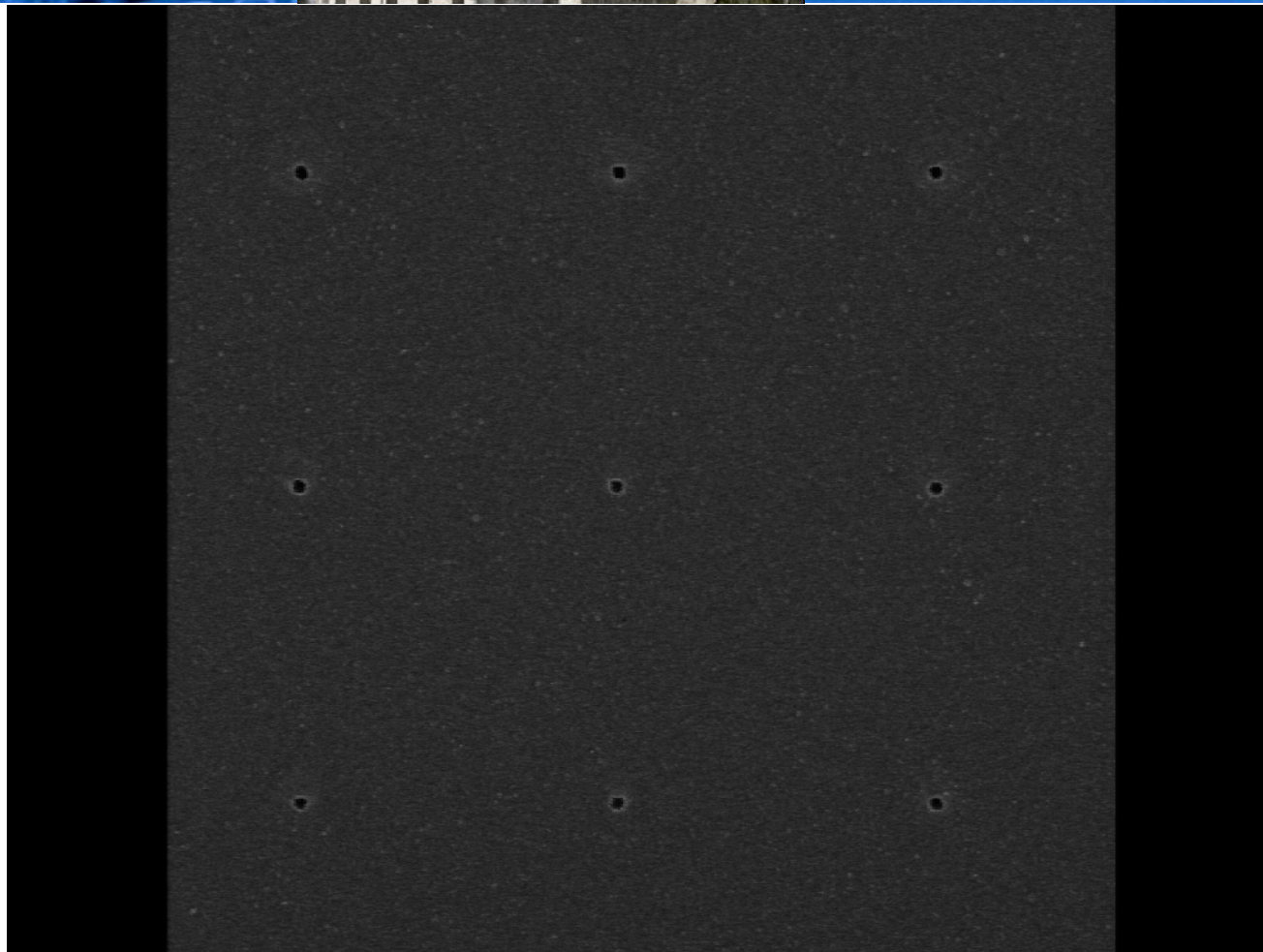
Title:

## Animation of nanostructure evolution

### Description:

Image sequence of  
developped  
nanostructures with  
increasing dot  
exposure dose.

Nanopillars start  
forming in the center  
due to PMMA  
overexposure.



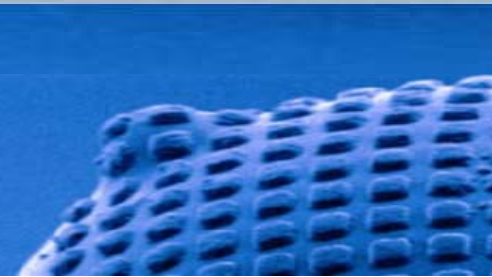
Magnification:  $?.?? \text{ k X}$

Submitted by: **Sebastian Gautsch**

Instrument: **Raith 150 Lithography system**

Affiliation: **Institute of Microengineering, EPFL**





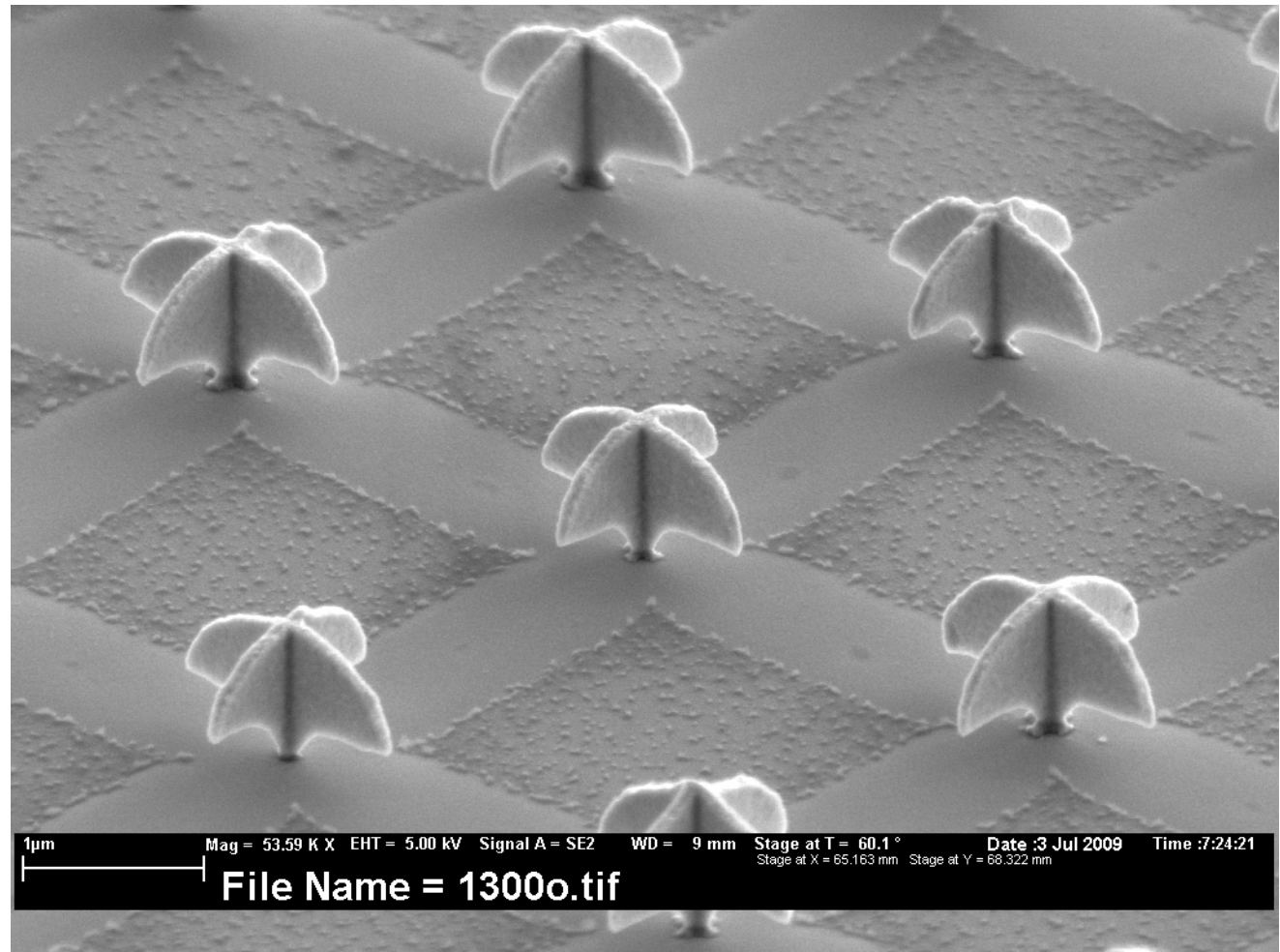
micro & nano - graph

Title:

## Alien nanogarden

### Description:

The exposure dose was just enough to fully develop the resist in the intersections of the cross-grating. The electroplating was therefore able to start at the intersections. The metal (gold) continued to be deposited and at the same time filled the underexposed lines between the intersections.



Magnification: 53.59 k X

Submitted by: Sergey Gorelick

Instrument: Zeiss SUPRA 55V

Affiliation: Paul Scherrer Institute, Villigen, Switzerland





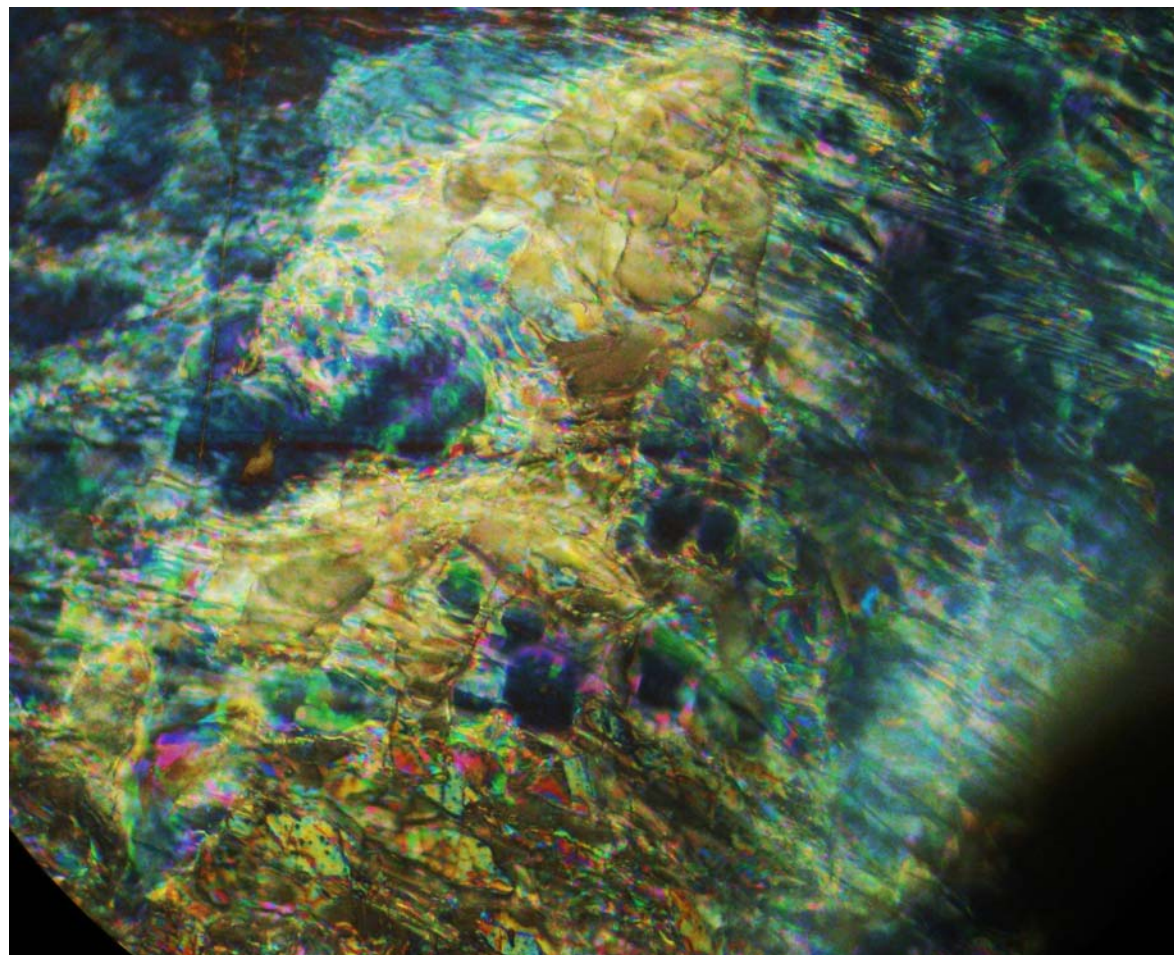
micro & nano - graph

Title:

## **Polymeric Centaur**

### **Description:**

Large-scale deformation in nanostructured Topas causing diffraction of light creating a "centaur". The surface is structured with 100 nm wide and deep holes by injection molding.



Magnification: **0.2 k X**

Submitted by: **Maria Matschuk**

Instrument: **Zeiss LSM Pascal**

Affiliation: **DTU Nanotech, Technical University of Denmark**





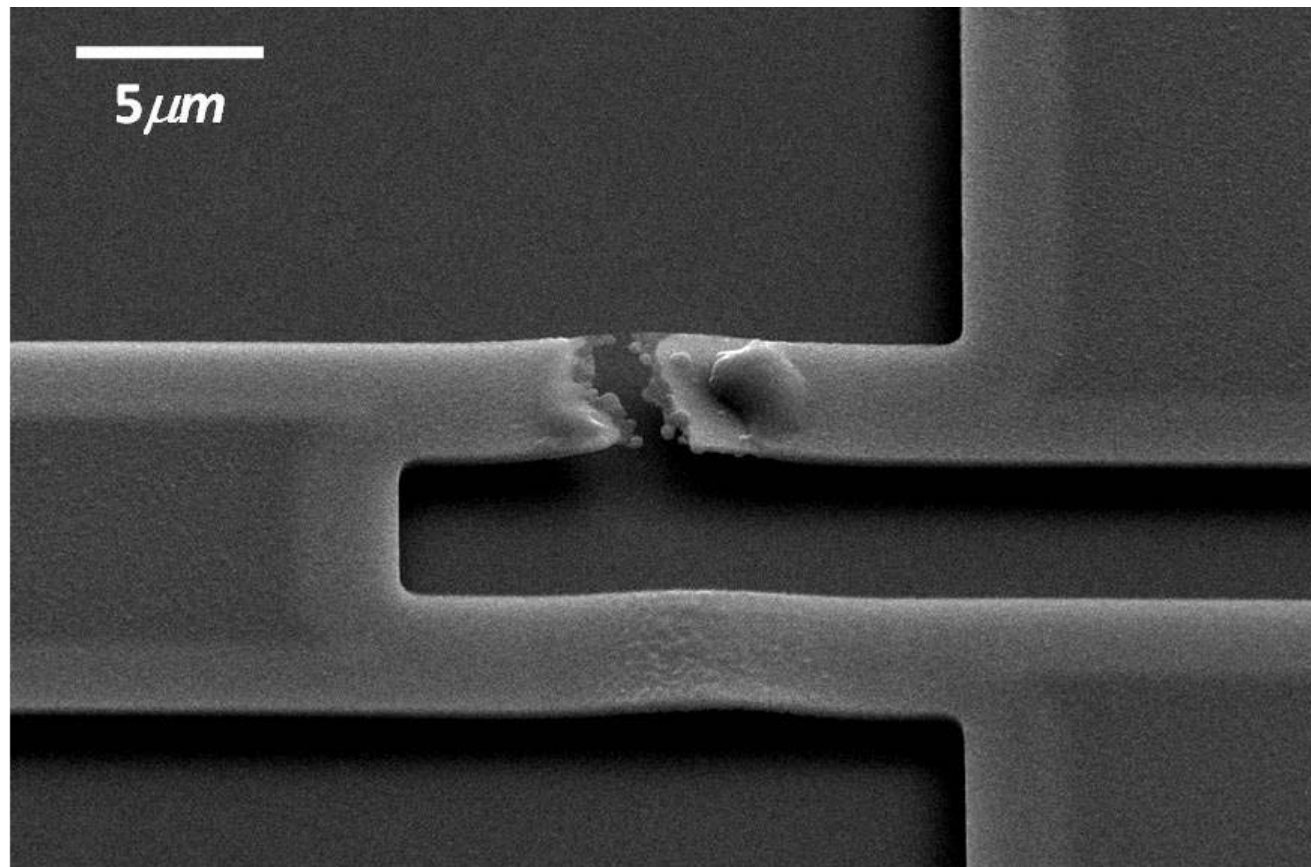
micro & nano - graph

Title:

## Nano Fuse

### Description:

The double clamped poly-nitride-poly trilayer beams are overdriven. One is permanently buckle and the other is broken down. The polysilicon surface was melt a little bit and formed the nano fuse.



Magnification: 7.95 k X

Submitted by: Wilson Zhou

Instrument: Zeiss Ultra 55

Affiliation: Cornell University, USA





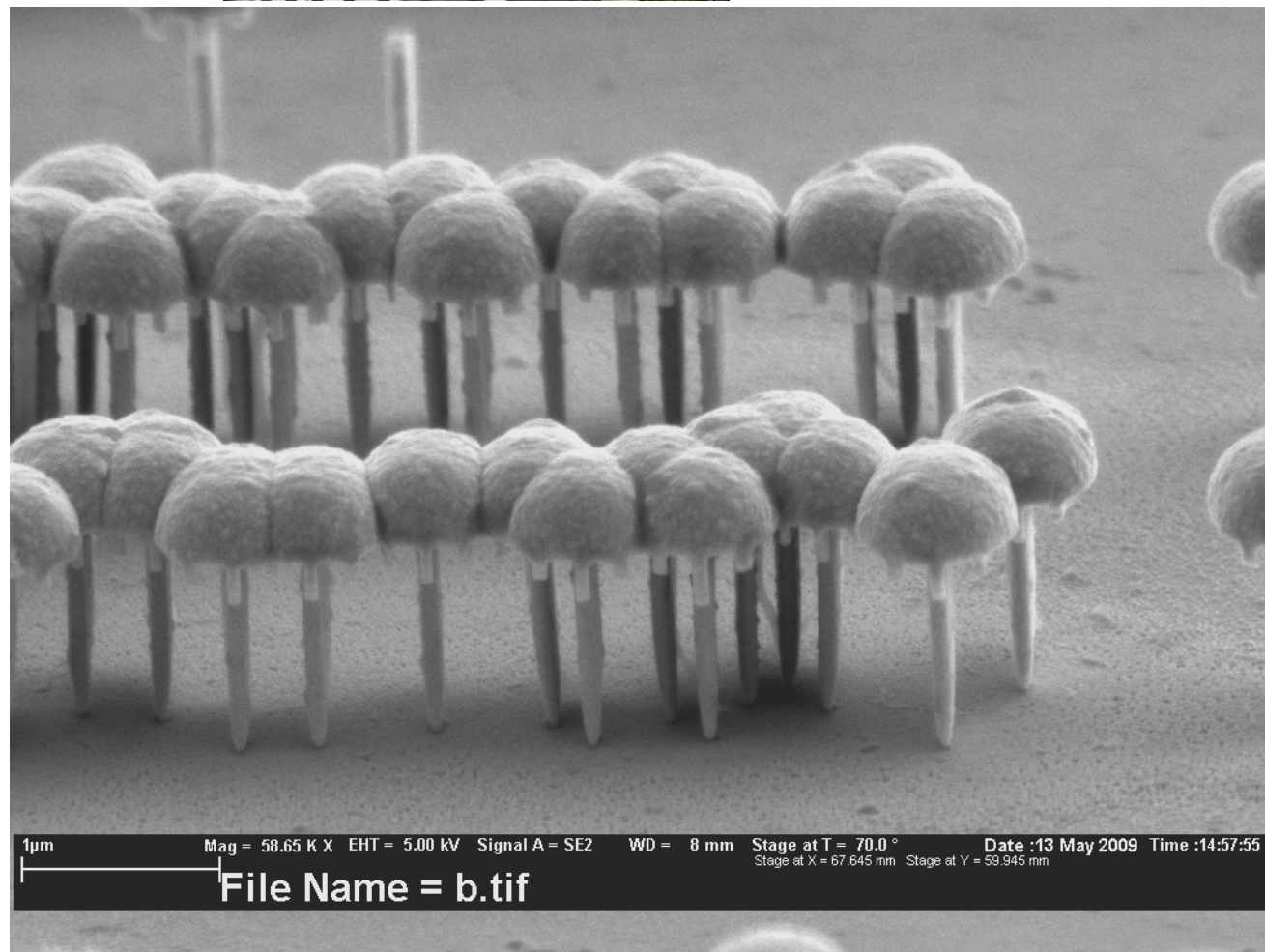
micro & nano - graph

Title:

## Golden nanomushrooms

### Description:

Overplating of deep structures in resist produced golden nanomushrooms. Filling the structures with Au results in the mushroom stem, while continuing plating (overplating) is responsible for formation of the mushroom cap.



Magnification: 58.65 k X

Submitted by: Sergey Gorelick

Instrument: Zeiss SUPRA 55V

Affiliation: Paul Scherrer Institute, Villigen, Switzerland





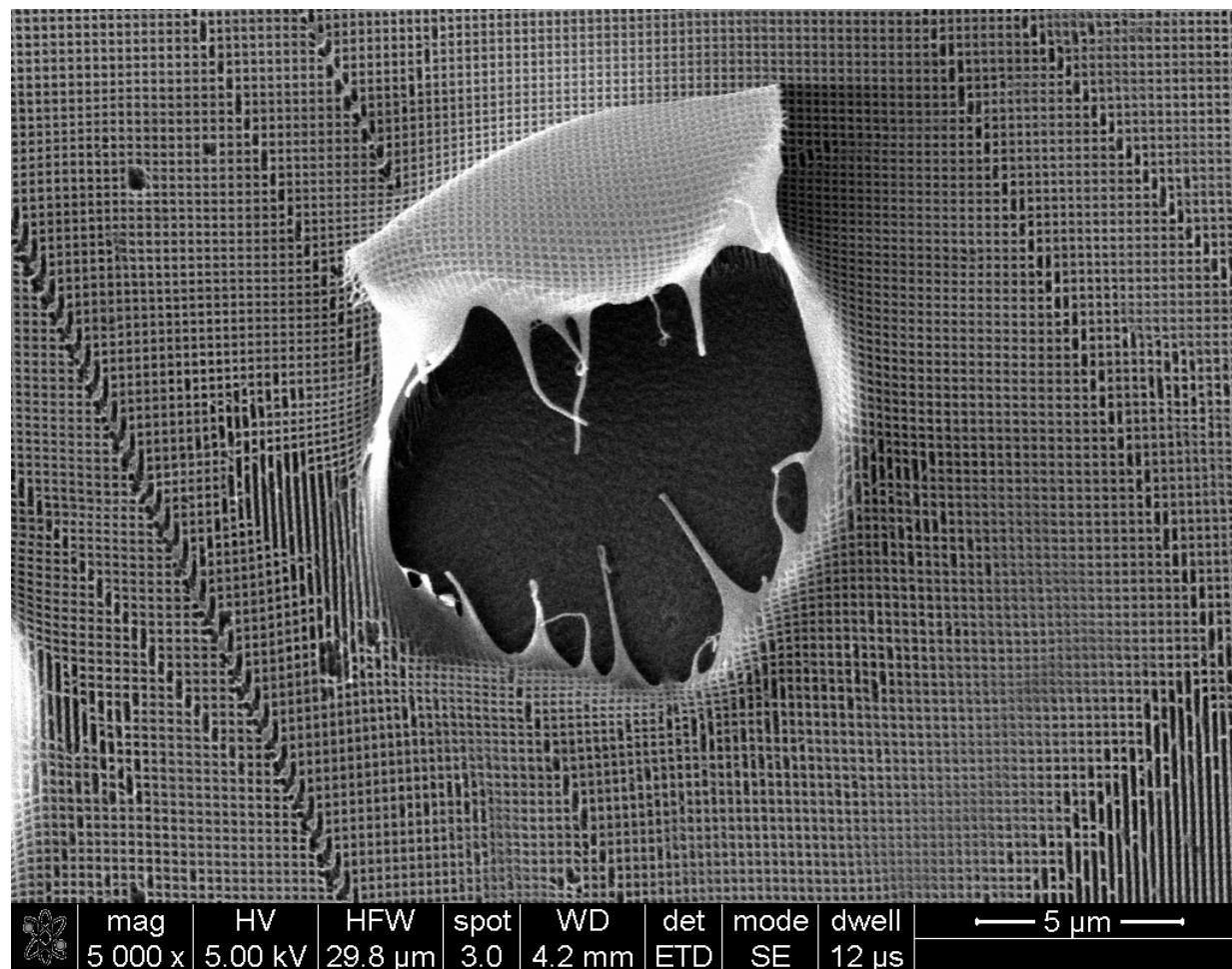
micro & nano - graph

Title:

## Polymeric Nano Monster

### Description:

A thin layer of nano-structured Topas™ delaminated from the bulk Topas™. The layer contains 100 nm wide and deep holes replicated by injection molding.



Magnification: 5.0 k X

Submitted by: Maria Matschuk

Instrument: FEI Nova 600 NanoSEM

Affiliation: DTU Nanotech, Technical University of Denmark





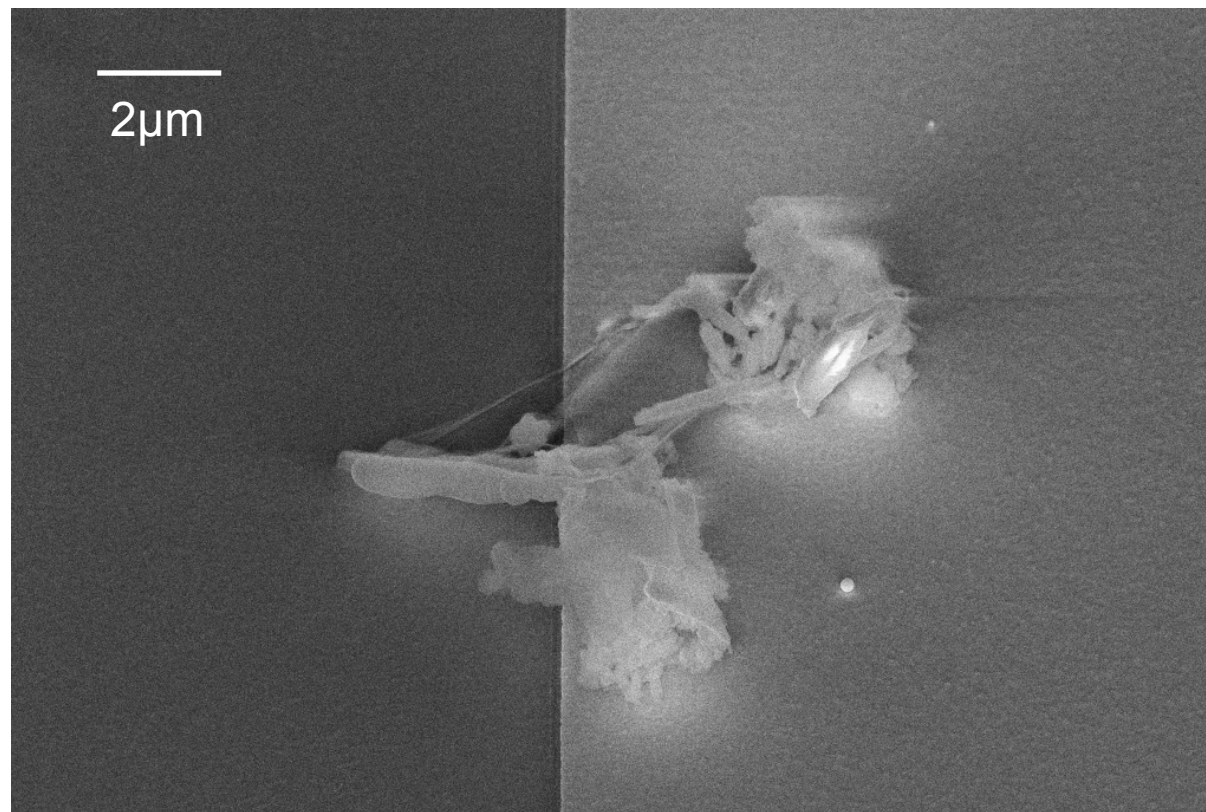
micro & nano - graph

Title:

## Fishing

### Description:

Free-standing structures are naturally formed on an interface between single crystal silicon and polysilicon. It will be more interesting to find out if both structure is anchored, how high the Q of both nanostring and nanobar resonator will be when fully driven...incredible



Magnification: 17.52 k X

Submitted by: Wilson Zhou

Instrument: Zeiss Ultra 55

Affiliation: Cornell University, USA



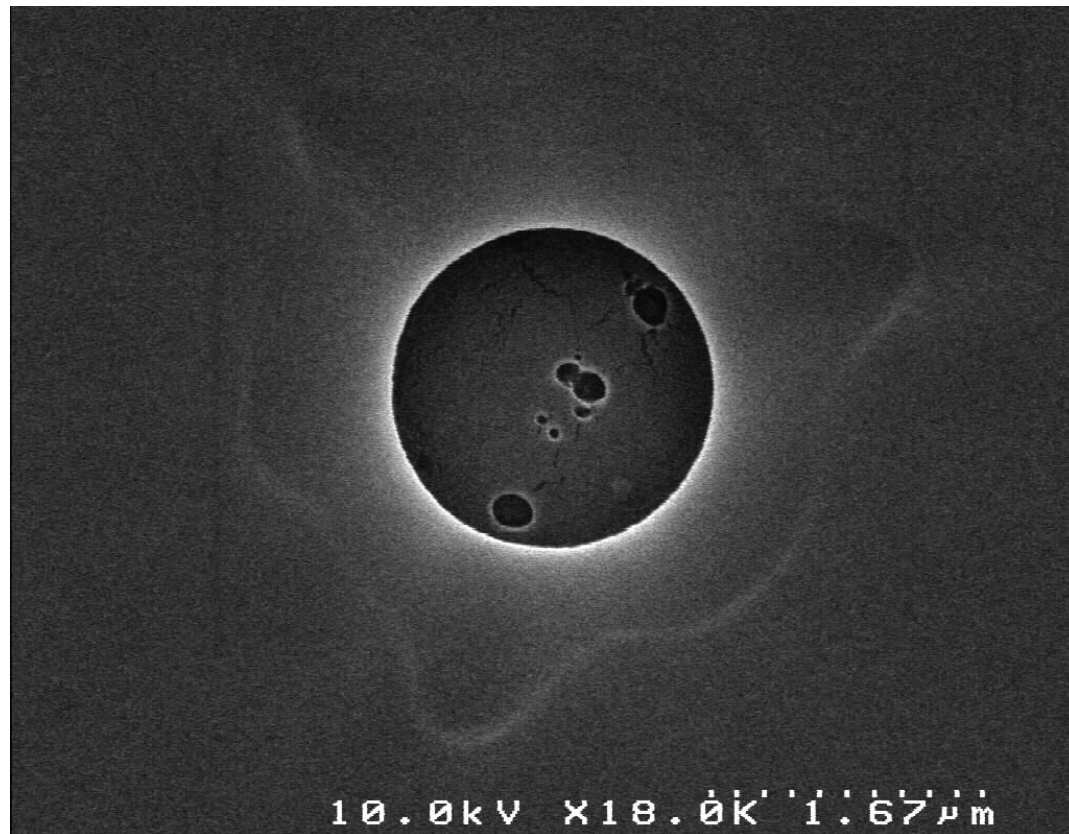


micro & nano - graph  
Title:

## Total Solar Eclipse

### Description:

E-beam exposure on bi-layer positive resists.  
Upper layer resist being exposed and developed,  
lower layer resist being under-exposed



Magnification: **18.0 k X**

Submitted by: **Bing-Rui Lu**

Instrument: **Hitachi S4000**

Affiliation: **Rutherford Appleton Laboratory**

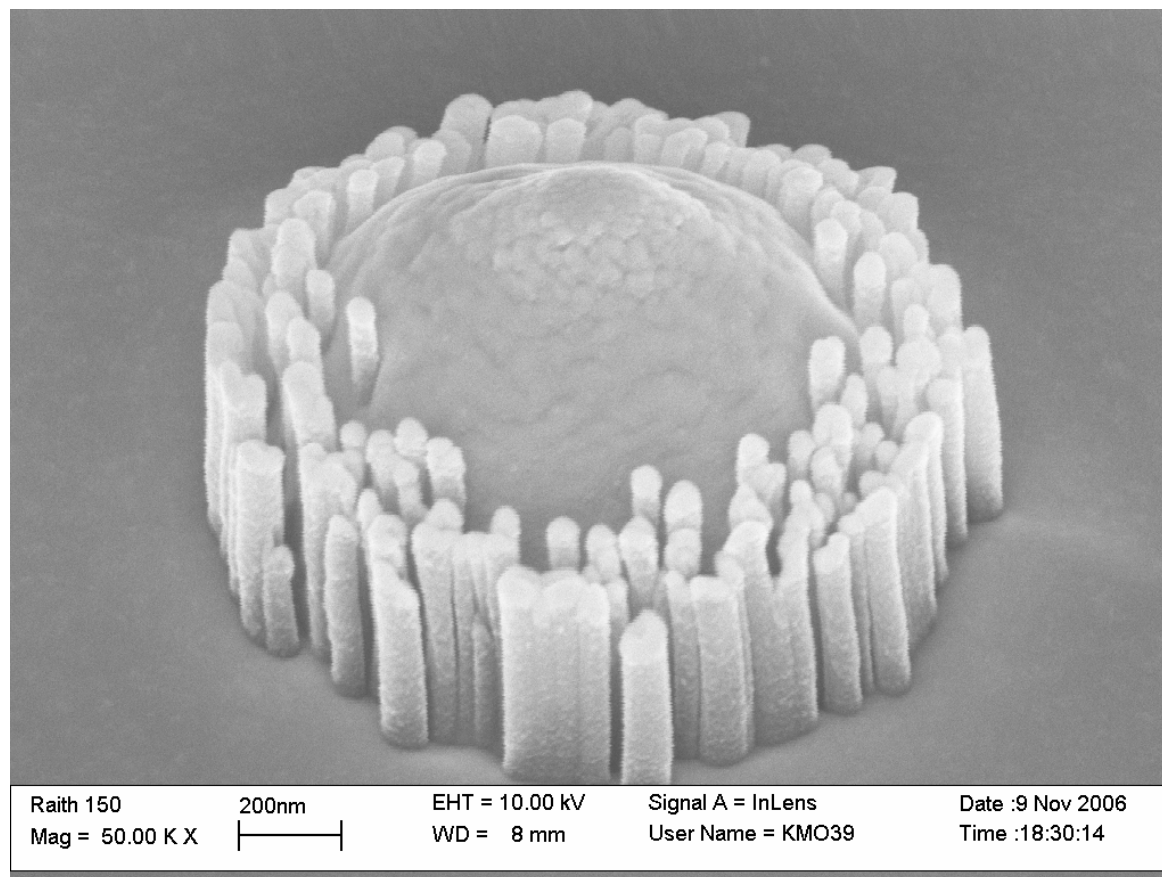




## micro & nano - graph Title: **Quartz Sunflower**

### Description:

A hemispherical structure etched in quartz substrate, its 500 nm in height and 1000 nm in width. The surrounding nano pillars are 30-50 nm in diameter and 400nm in height. During etching of a 3D quartz NIL mold using RIE, the nanopillars have formed due to a combination of nanomasking and polymerization of the sidewalls in CHF<sub>3</sub> plasma.



Magnification: **50.00 k X**

Submitted by: **Maan M. Alkaisi**

Instrument: **Raith-150**

Affiliation: **MacDiarmid Institute - University of Canterbury, NZ**





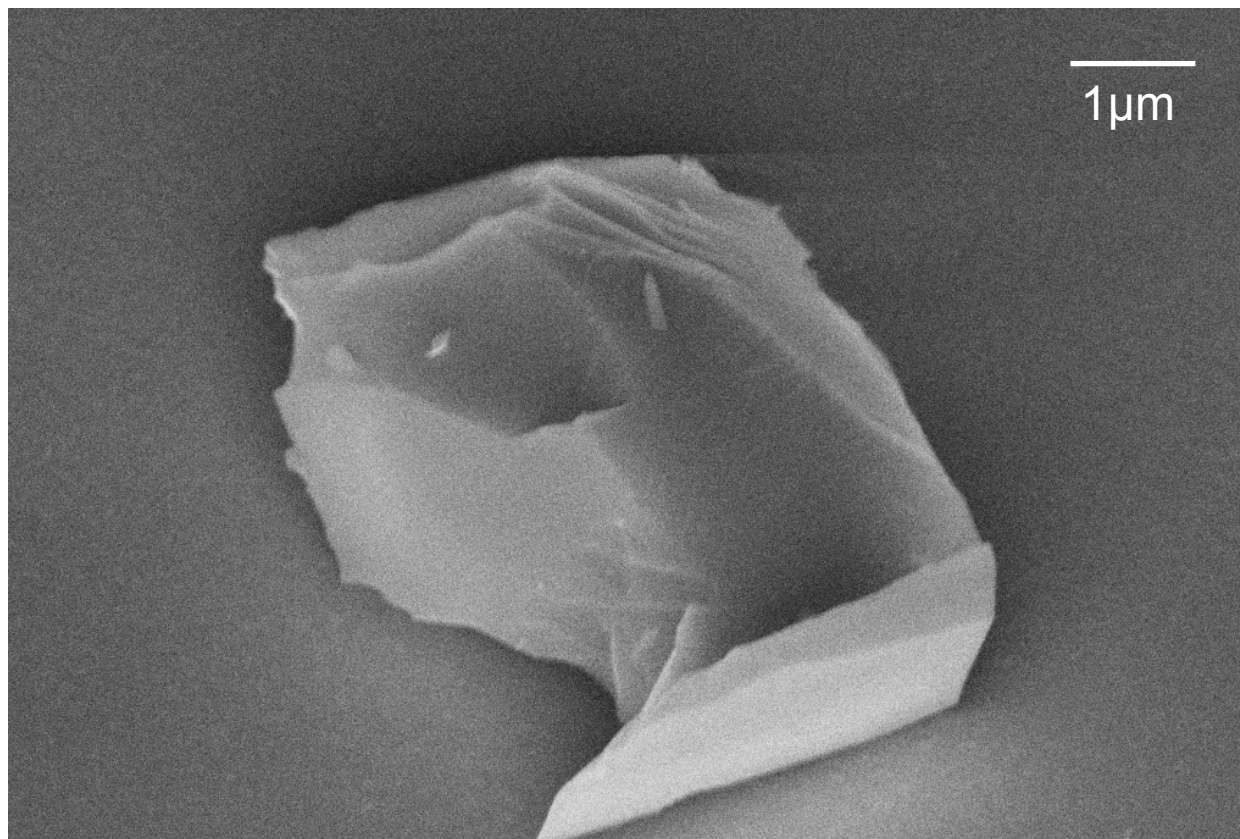
micro & nano - graph

Title:

**Daisy**

### Description:

The corners of samples  
are the most vulnerable  
part of a chip though,  
This sample sent  
greeting from a  
gorgeous lady to those  
hard working scientists  
instead of a technically  
silicon junk...



Magnification: **35.59 k X**

Submitted by: **Wilson Zhou**

Instrument: **Zeiss Ultra 55**

Affiliation: **Cornell University**





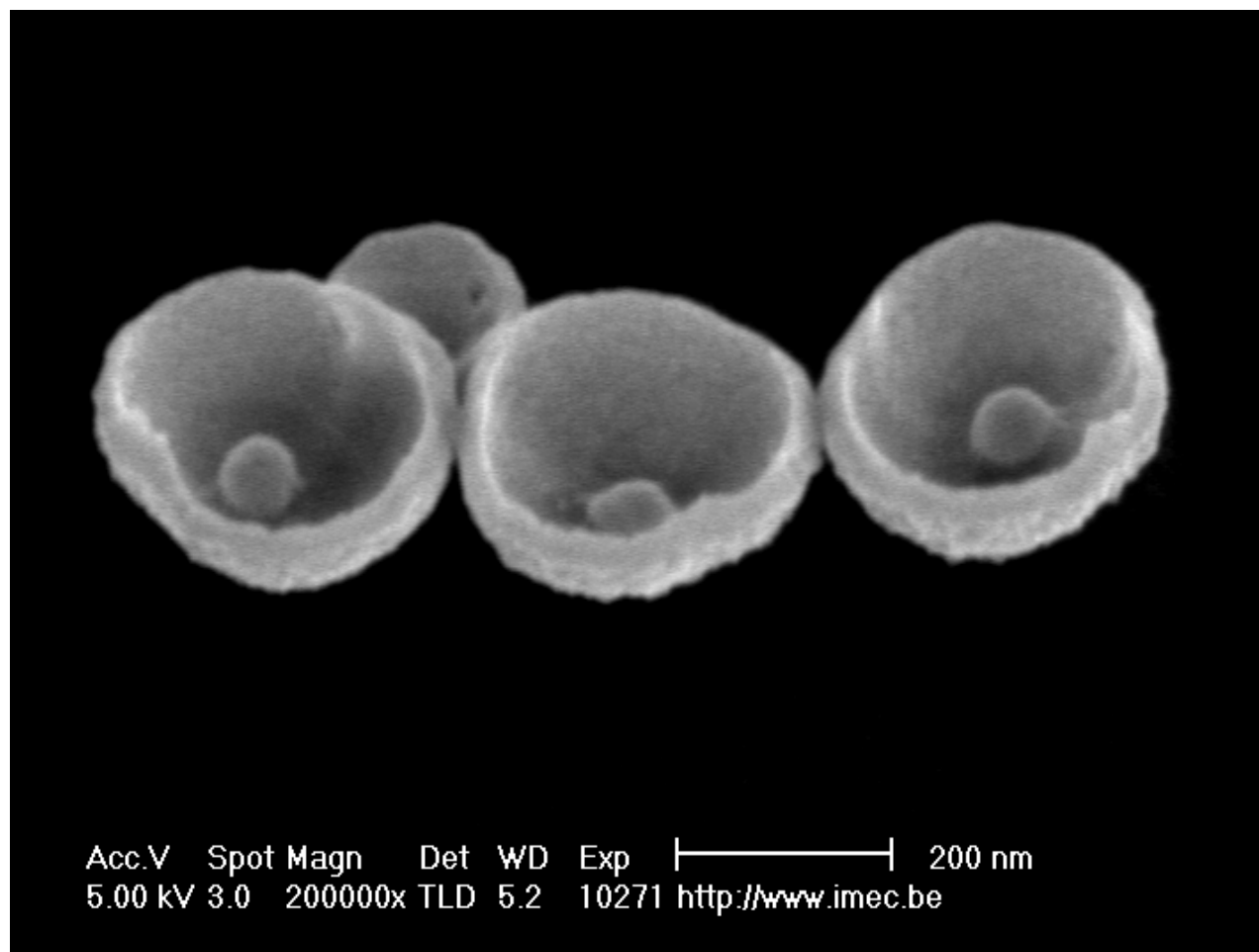
micro & nano - graph

Title:

**Nano gold jewelry –  
nano pearl in nano  
oyster shell**

**Description:**

An ion milling and vapor HF etching process are applied on gold-silica-gold core-spacer-shell nanoparticles, resulting in complex nanometer scaled gold pearl cores and oyster shells.



Magnification: **200 k X**

Submitted by: **Jian Ye**

Instrument: **Philips XL30 FEG**

Affiliation: **IMEC Belgium**





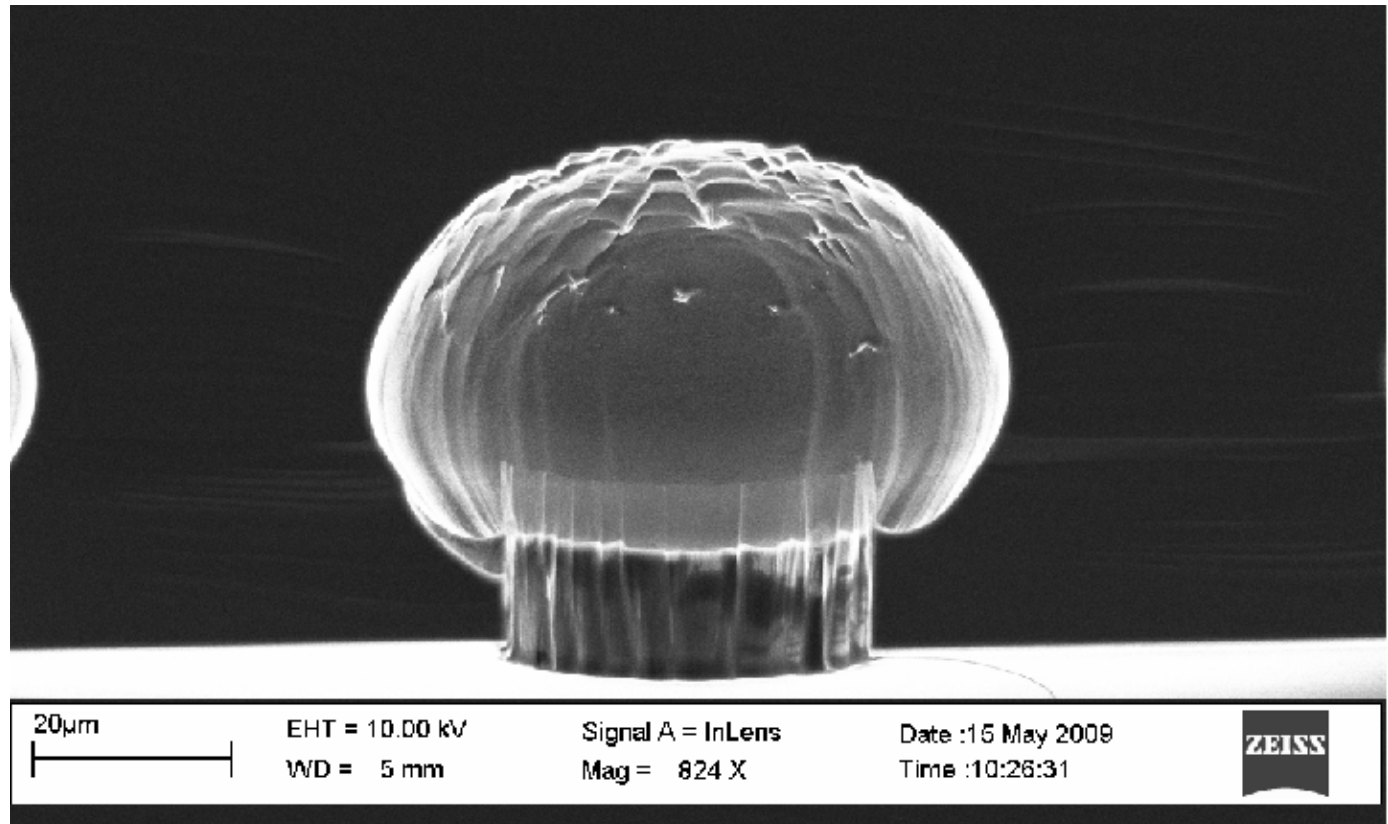
micro & nano - graph

Title:

## Micro- Mushroom

### Description:

A cross-section image of a hole etched into a silicon wafer. The image is "upside down". The sidewalls of an anisotropically etched hole were protected by silicon dioxide to form the foot of the mushroom. Then etching was changed to isotropic to create the cap of the mushroom.



Magnification: **824 X**

Submitted by: **Lauri Sainiemi**

Instrument: **Zeiss Supra 40**

Affiliation: **Helsinki University of Technology - Finland**





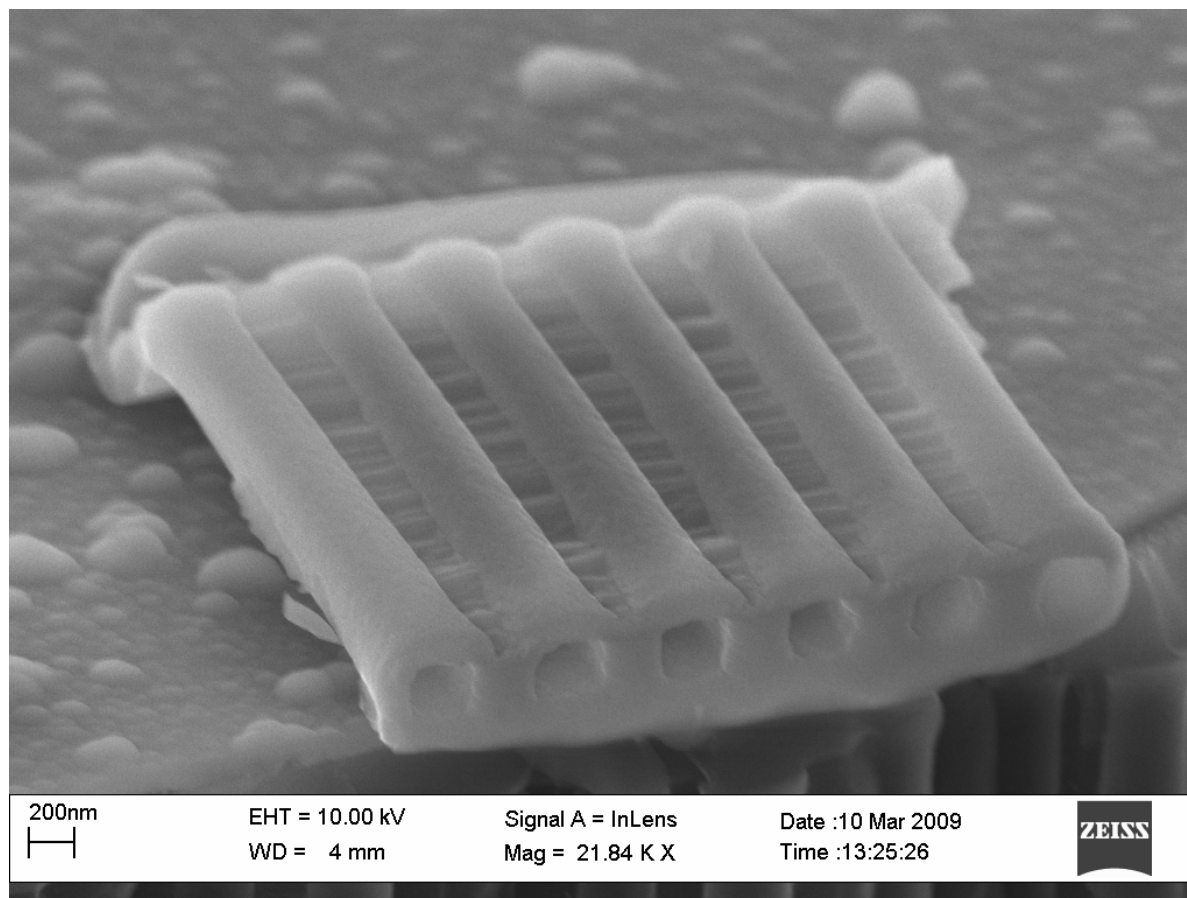
micro & nano - graph

Title:

## Nano pipe organ

### Description:

Alumina deposited in to the pores of a silicon filter by atomic layer deposition. The pores go through the 3  $\mu\text{m}$  thick silicon filter. The alumina pipes were released during the cleavage of the sample. The material between the alumina pipes is silicon.



Magnification: 21.84 k X

Submitted by: Lauri Sainiemi

Instrument: Zeiss Supra 40

Affiliation: Helsinki University of Technology - Finland





micro & nano - graph

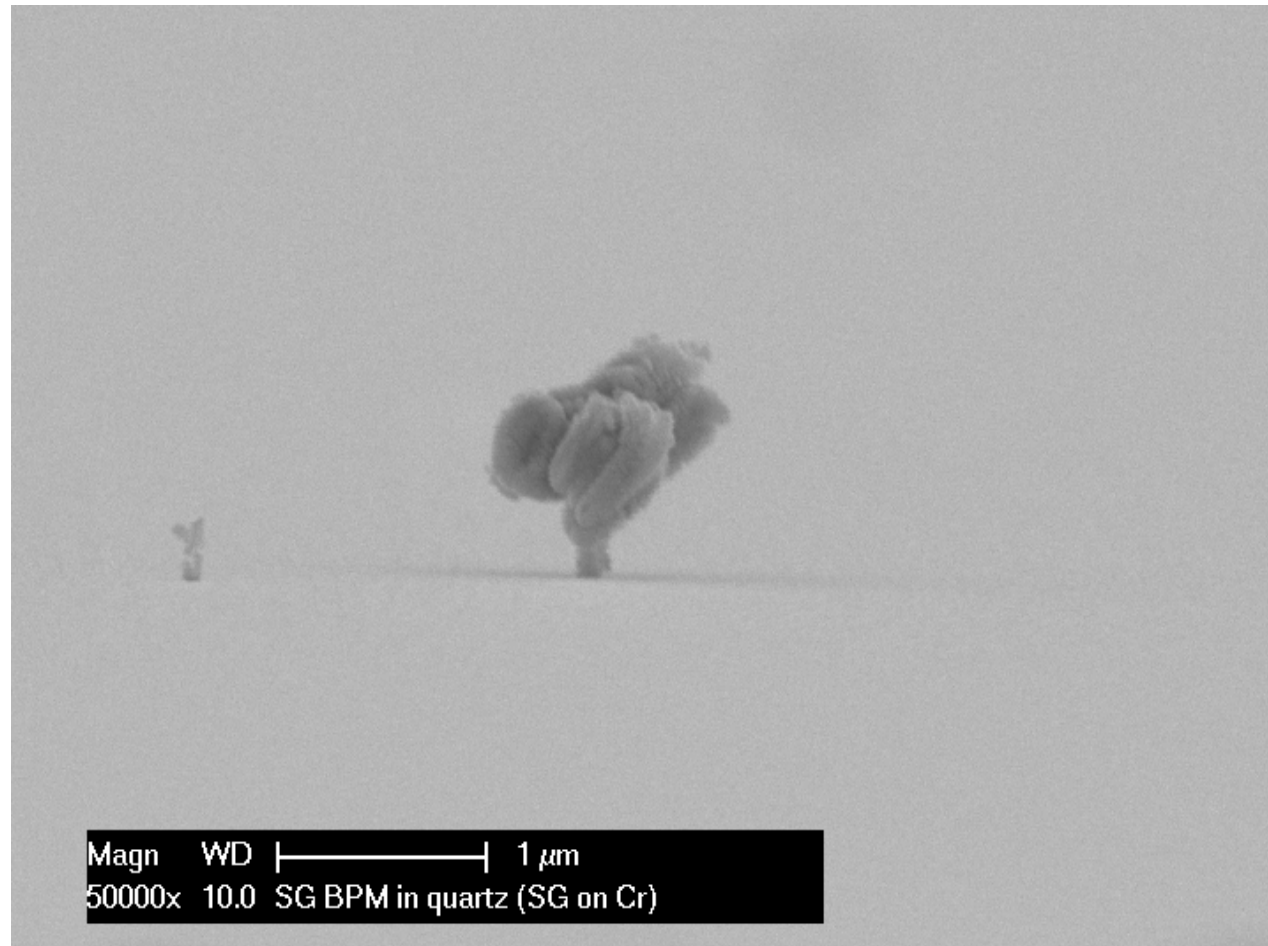
Title:

## What's up doc?

(rabbit looking for shelter)

### Description:

SiO<sub>2</sub> like particles did release from the surface and showed up somewhere else on a 5nm thick chrome deposited area. (quartz wafer)



Magnification: **50.000 X**

Instrument: **FEI XL 40 SEM**

Submitted by: **Hans Buijk / Robert van de Laar**

Affiliation: **Philips Research – MiPlaza – Thin Film Facilities**



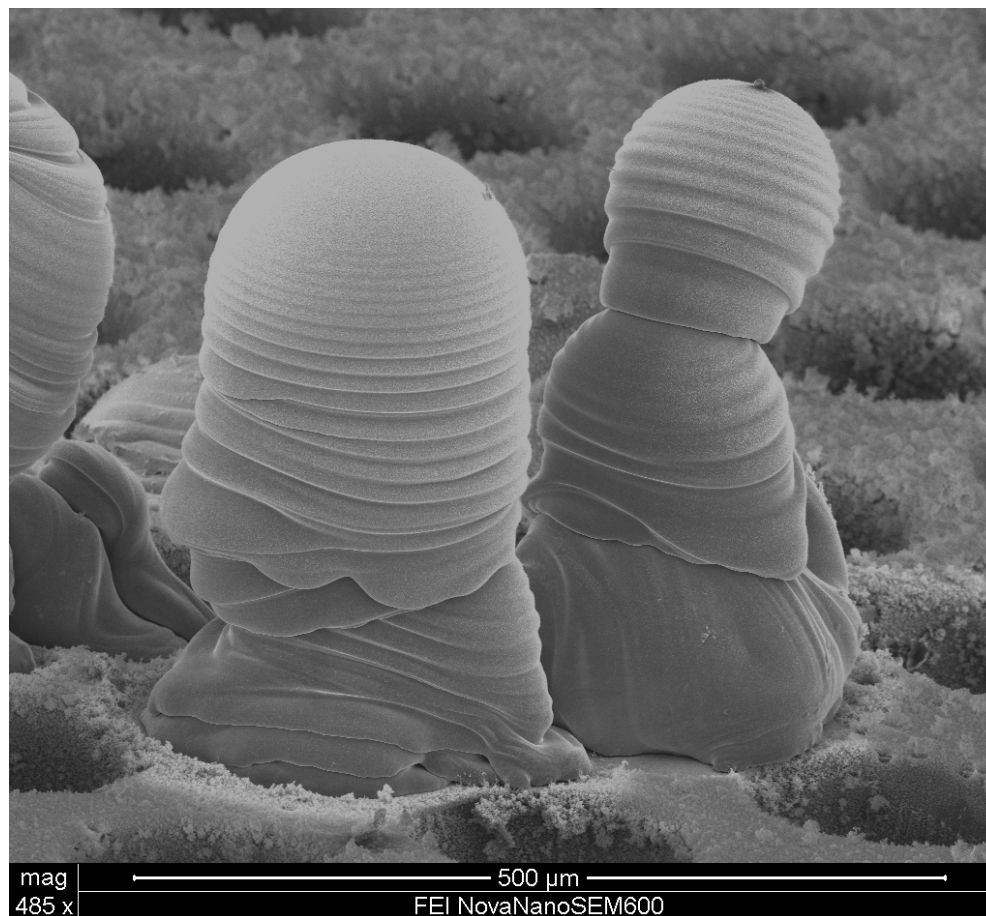


micro & nano - graph Title:

## Welcome on Mars

Description:

**WYSIWYG**



Magnification: **485 X**

Submitted by: **Frans Holthuysen**

Instrument: **FEI Nova Nano SEM**

Affiliation: **Philips Research MiPlaza – Eindhoven – The Netherlands**





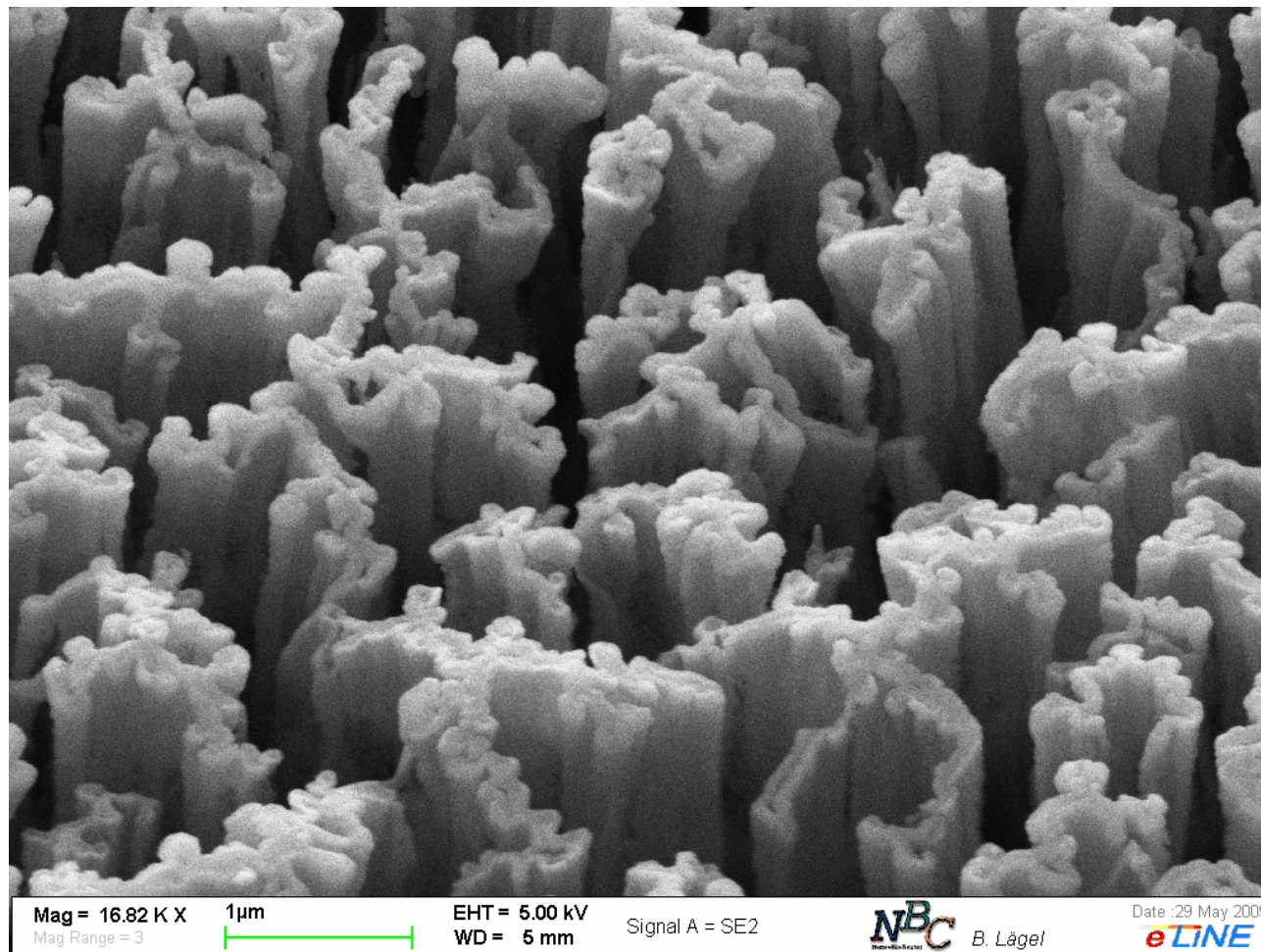
micro & nano - graph

Title:

## Coral reef

### Description:

Polymer residues  
formed on the surface  
of a borosilicate wafer  
after RIE in  $\text{SF}_6$  plasma



Magnification: 16.82 k X

Submitted by: Sandra Wolff

Instrument: Raith e\_LiNE

Affiliation: Nano+Bio Center, TU Kaiserslautern, Germany





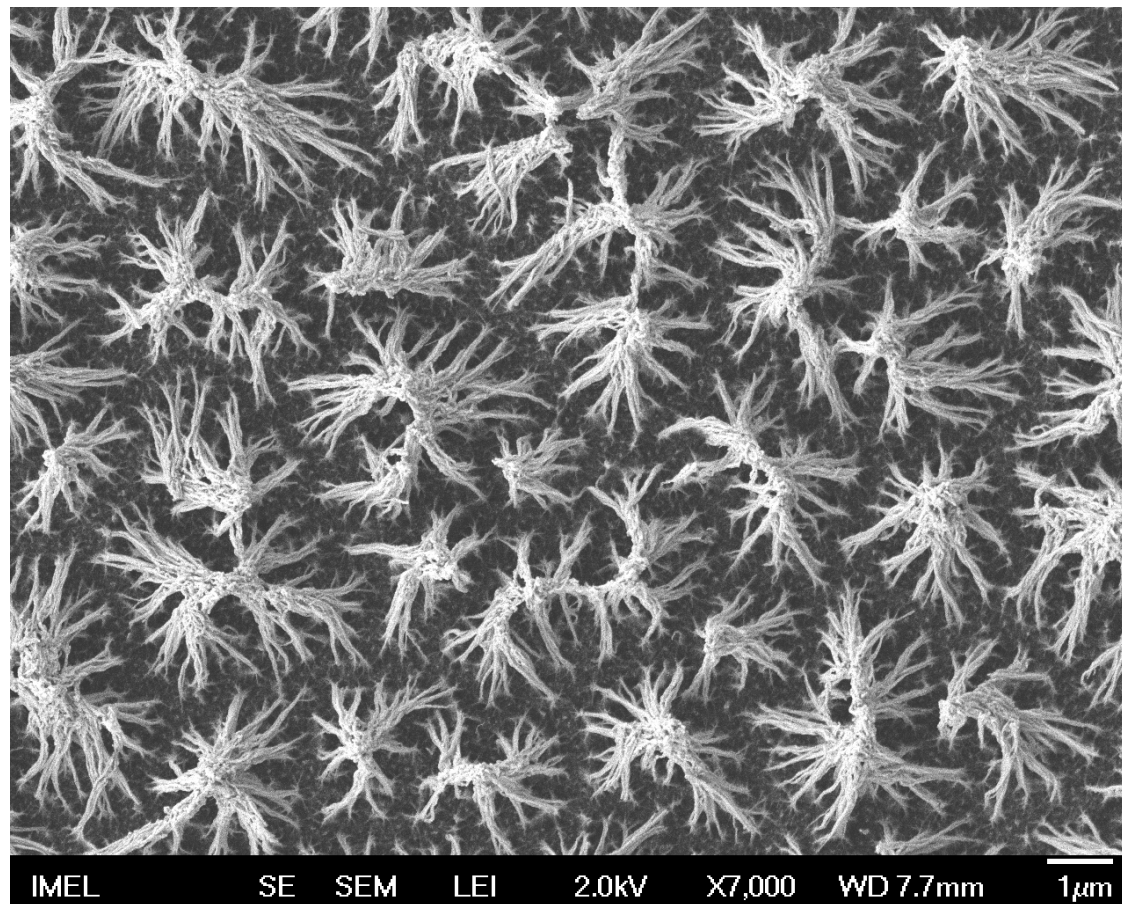
micro & nano - graph

Title:

**“Snowflakes”**

**Description:**

**Bundled SU-8  
nanostructuring**



**Magnification: 7 k X**

**Submitted by: Kosmas Ellinas**

**Instrument: JEOL JSM-7401F FEG-SEM**

**Affiliation: NCSR “Demokritos”**





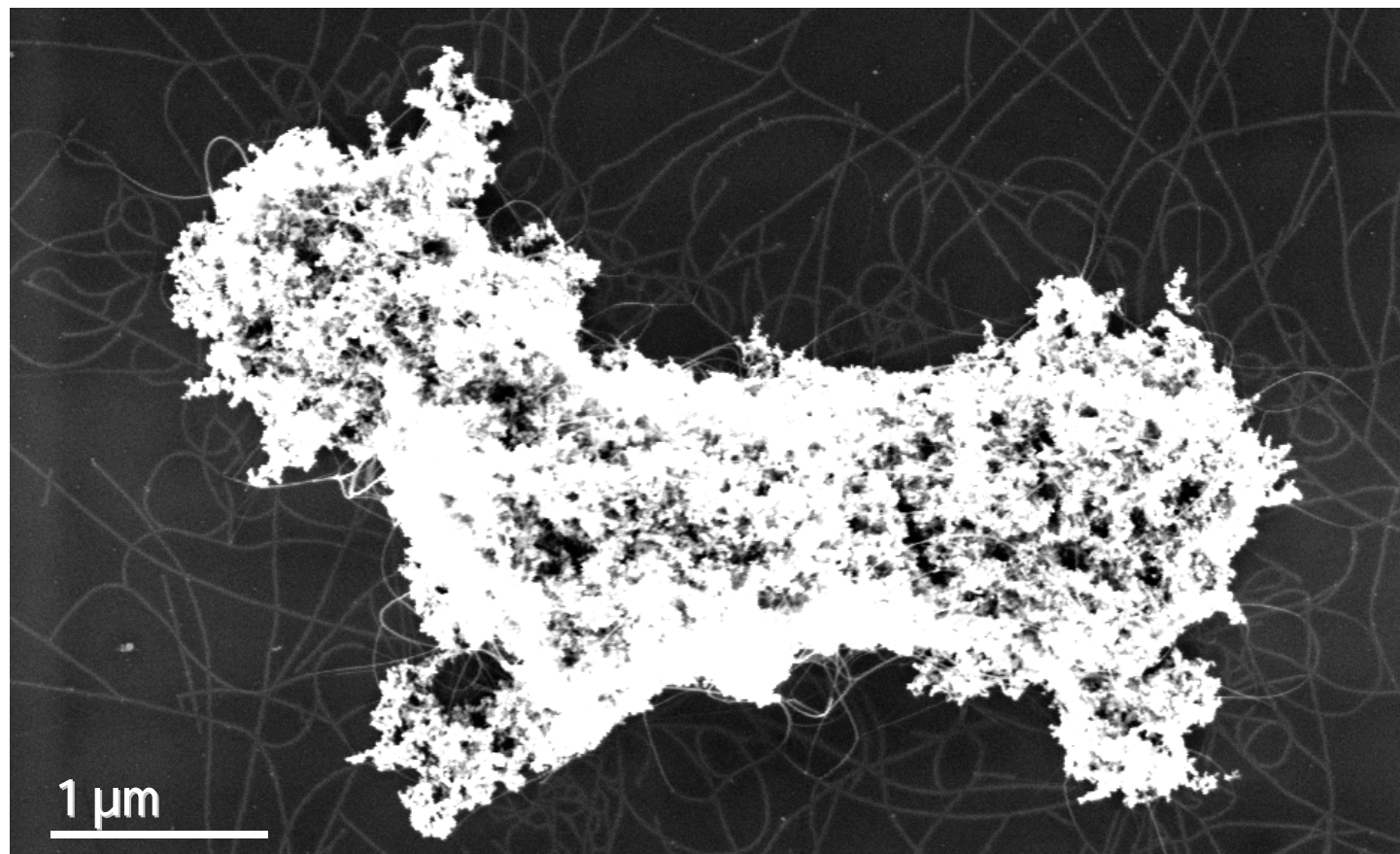
micro & nano - graph

Title:

## Puppy

### Description:

Single-walled carbon  
nanotube synthesis  
after a funny  
deposition of the  
catalyst particles.



Magnification: 40.00 k X

Submitted by: Iñigo Martin-Fernandez

Instrument: 1530 LEO SEM

Affiliation: IMB-CNM-CSIC





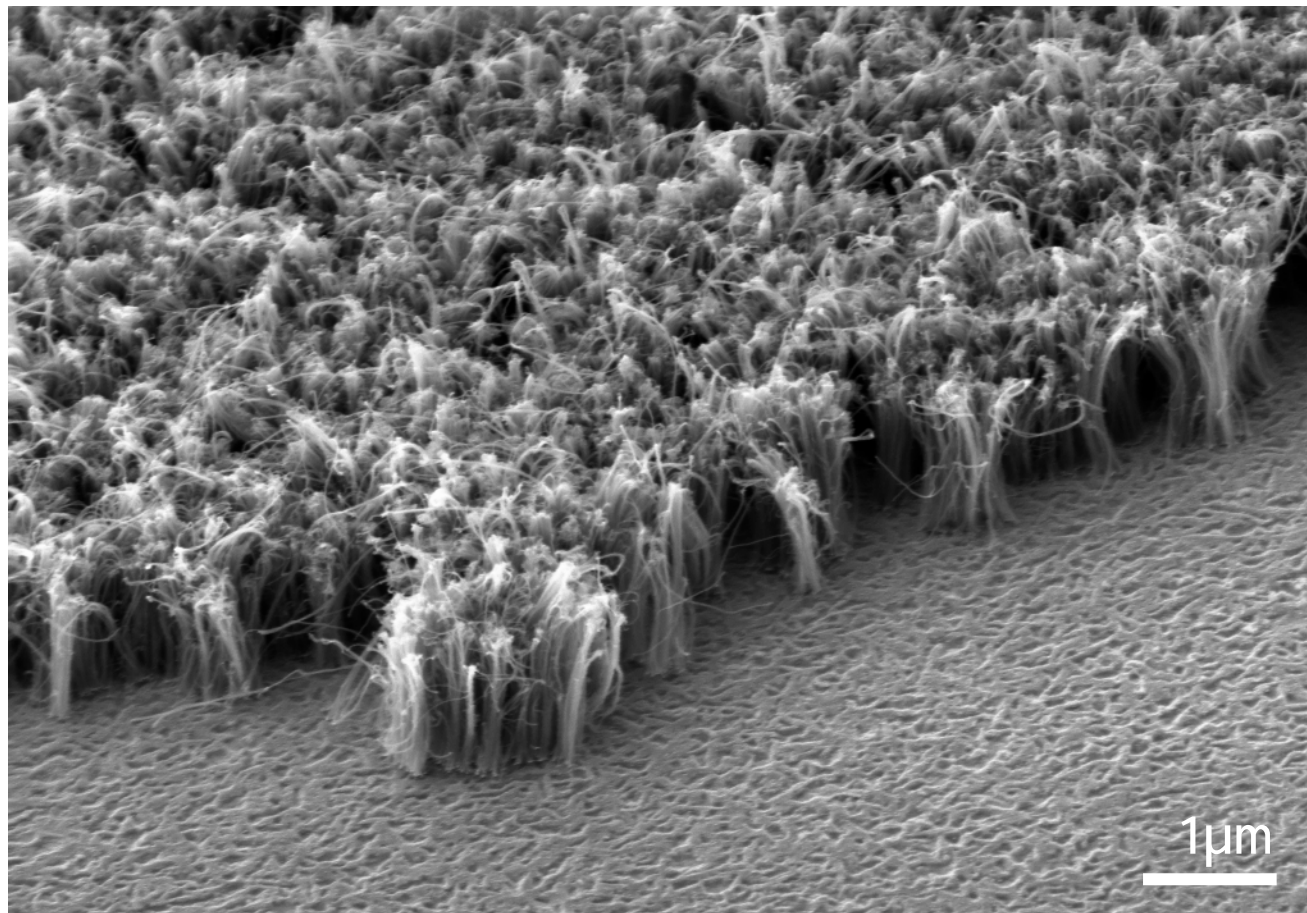
micro & nano - graph

Title:

## Carbon nano-jungle

### Description:

Edge of a vertically  
aligned synthesized on  
a metal electrode multi-  
walled carbon  
nanotube layer. 54°  
tilted SEM image.



Magnification: 30.00 k X

Submitted by: Jordi Llobet &

Iñigo Martin-Fernandez

Instrument:

Affiliation: IMB-CNM-CSIC





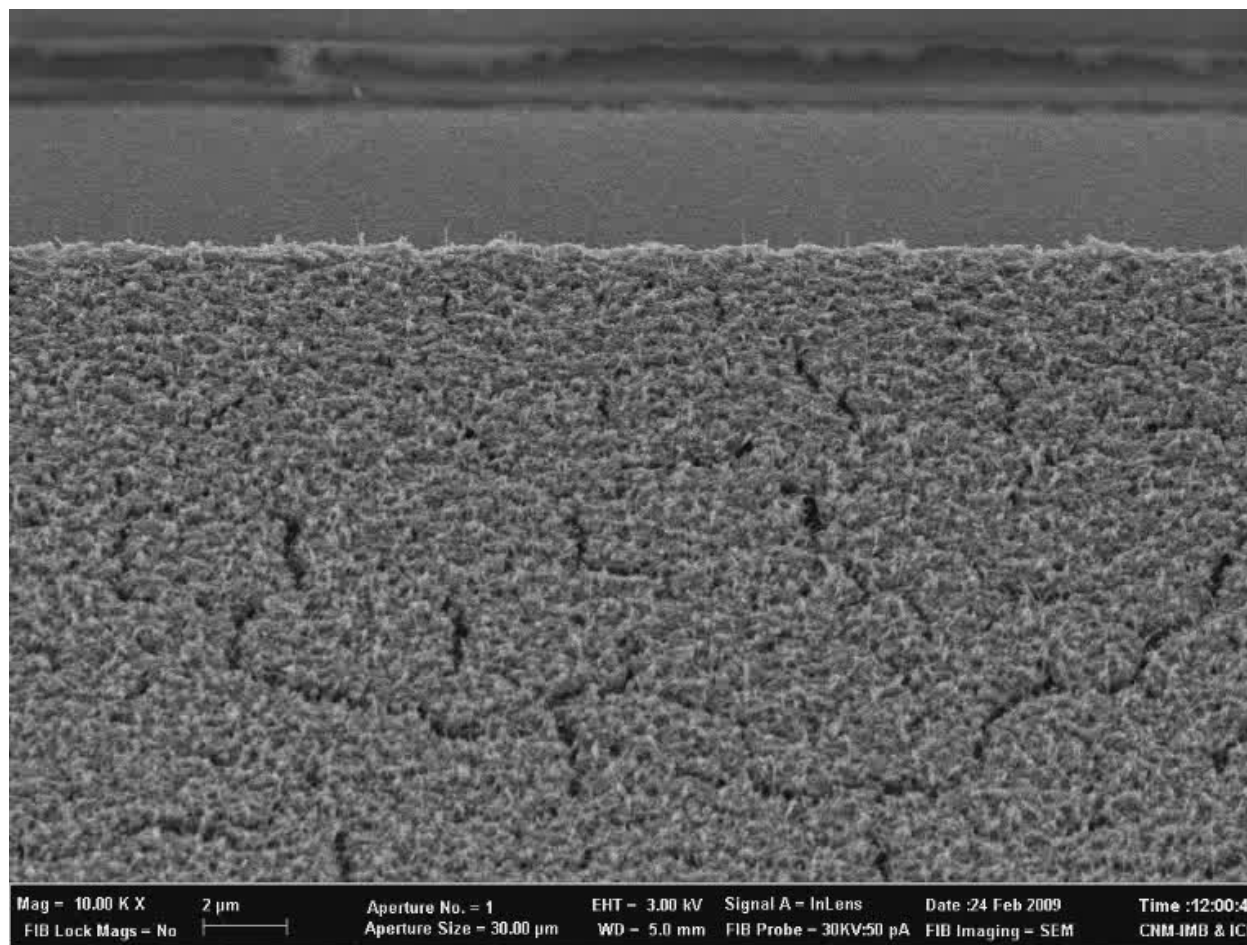
micro & nano - graph

Title:

## **PND (Primary Nanotube Deforestation)**

### **Description:**

It is difficult to achieve a good contact on a carbon nanotube layer by operating an integrated in a FIB probe-station. In this case we show the way not to do it.



Magnification:

Submitted by: **Jordi Llobet &**

**Iñigo Martin-Fernandez**

Instrument: **Zeiss 1560XB Cross Beam FIB**

Affiliation: **IMB-CNM-CSIC**





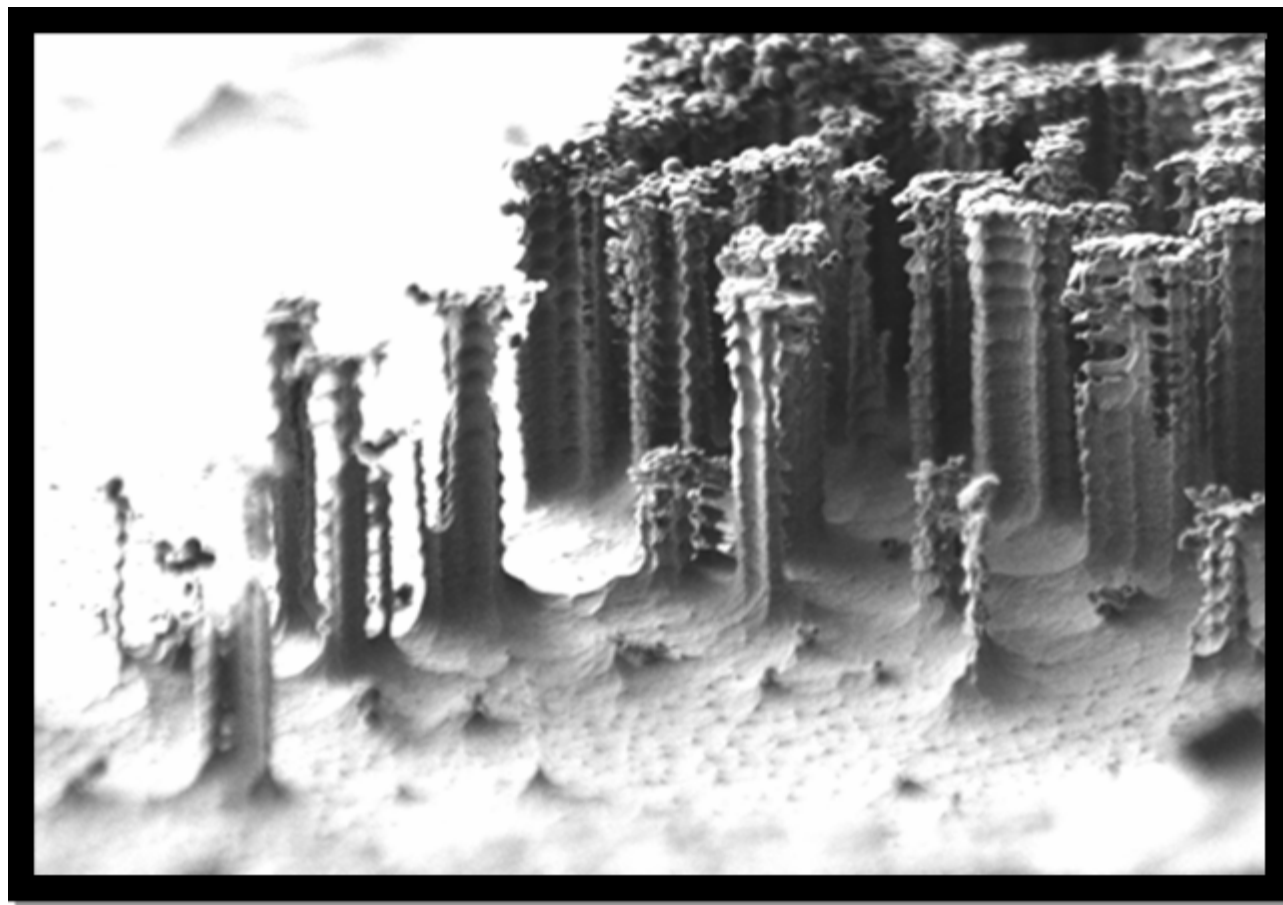
micro & nano - graph

Title:

**WW III**

**Description:**

We wanted to create micropillars on si substrate using colloidal particles and BOSCH process, but it went wrong.



Magnification: **2.200x**

Submitted by: **Kosmas Ellinas**

Instrument: **Jeol JSM-7401 FEG SEM**

Affiliation: **Institute of Microelectronics, NCSR "Demokritos"**





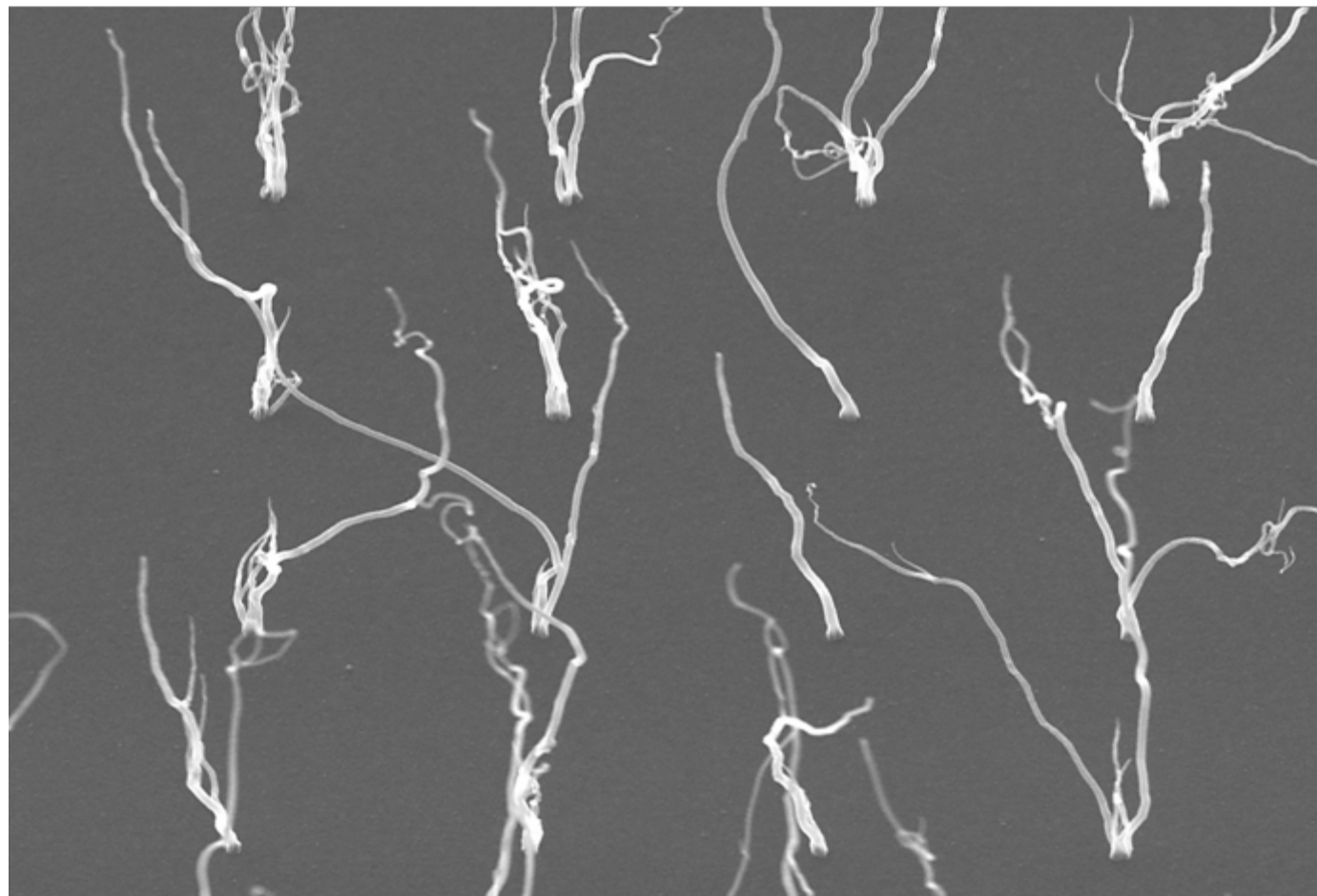
micro & nano - graph

Title:

## Nano garden

### Description:

Individually grown  
carbon nanotubes



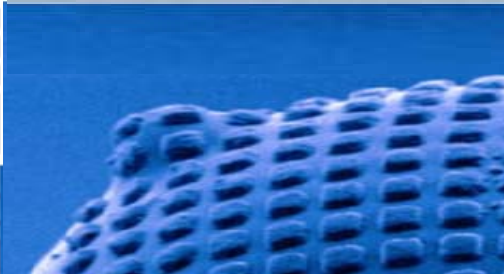
Magnification: 20 k X

Submitted by: Michael Häffner

Instrument: Philips XL 30

Affiliation: University of Tuebingen



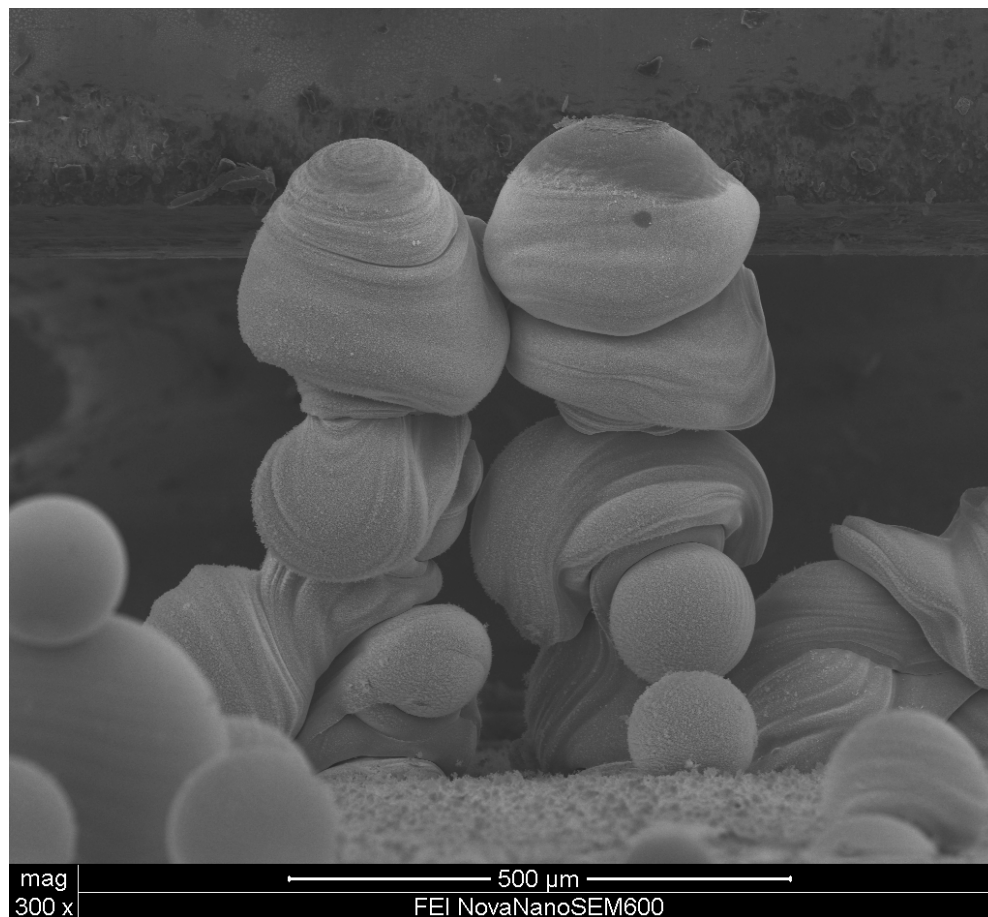


micro & nano - graph Title:

**True Love**

Description:

**WYSIWYG**



Magnification: **300 X**

Submitted by: **Frans Holthuysen**

Instrument: **FEI Nova Nano SEM**

Affiliation: **Philips Research MiPlaza – Eindhoven – The Netherlands**





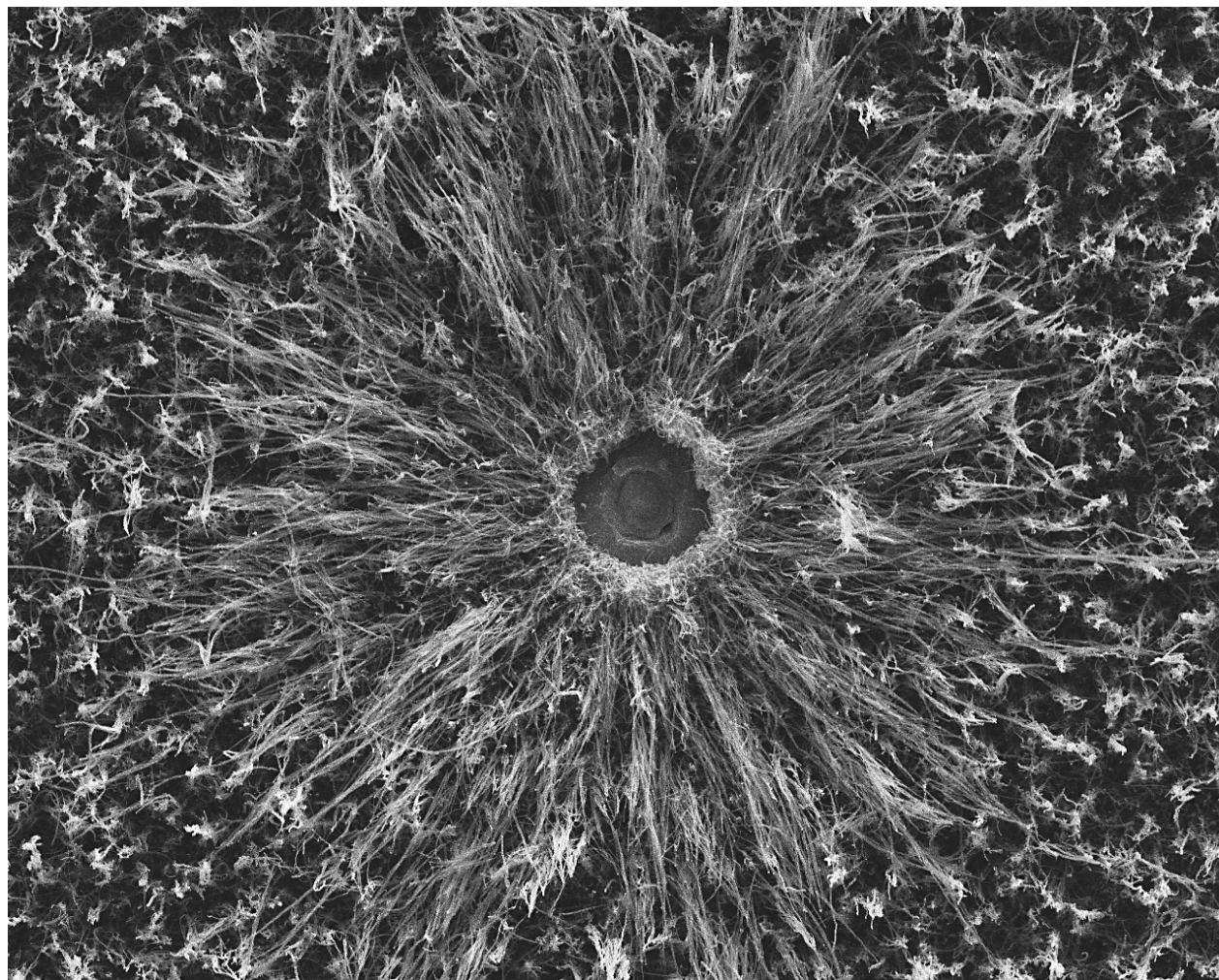
micro & nano - graph

Title:

## Meteorite

### Description:

Discharge into a  
carbon nanotube forest



Magnification: 20 k X

Submitted by: Michael Häffner

Instrument: Philips XL 30

Affiliation: University of Tuebingen





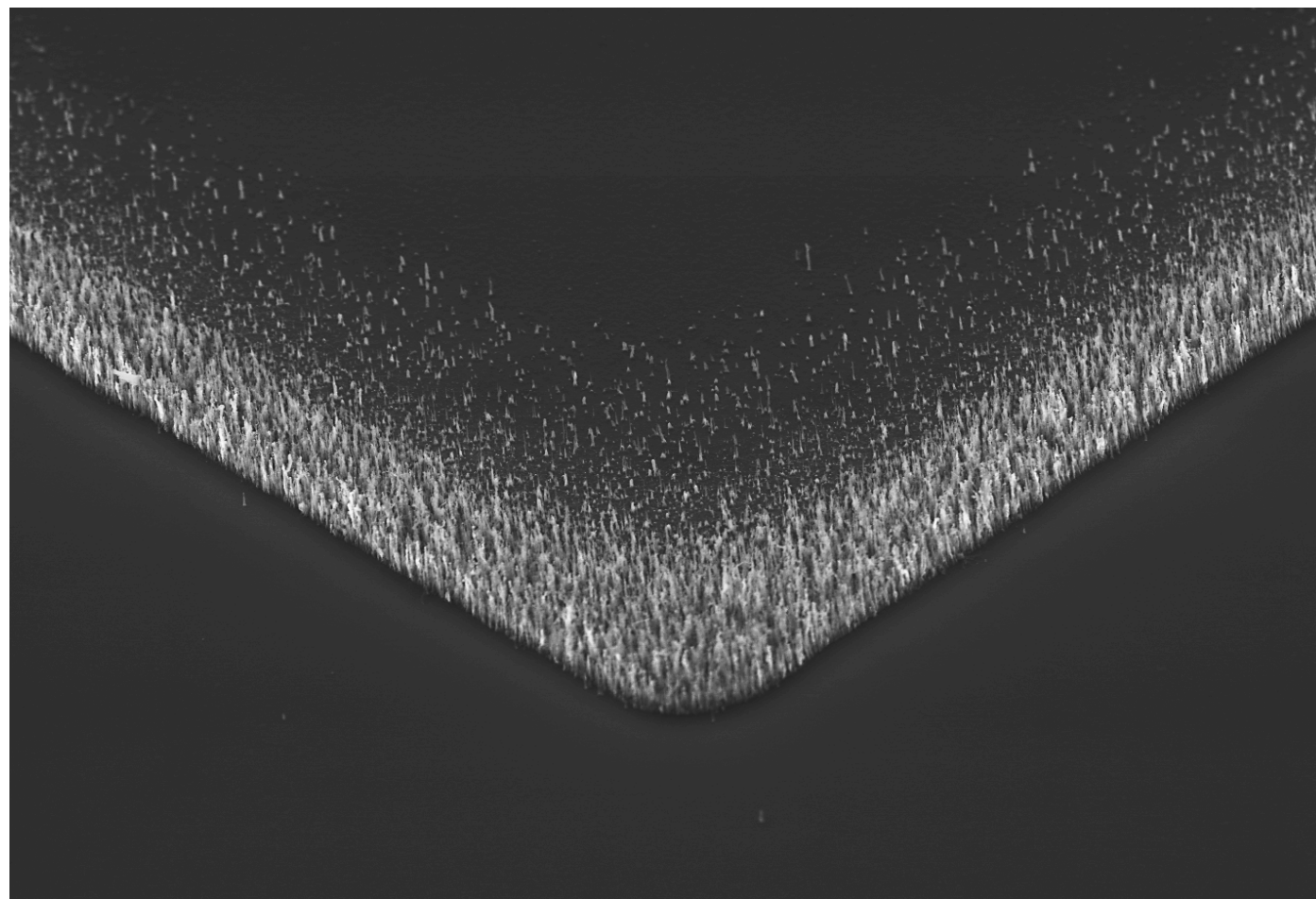
micro & nano - graph

Title:

## Envelope

### Description:

Plasma enhanced  
chemical vapor  
deposition grown  
carbon nanotubes



Magnification: **2 k X**

Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**

Affiliation: **University of Tuebingen**





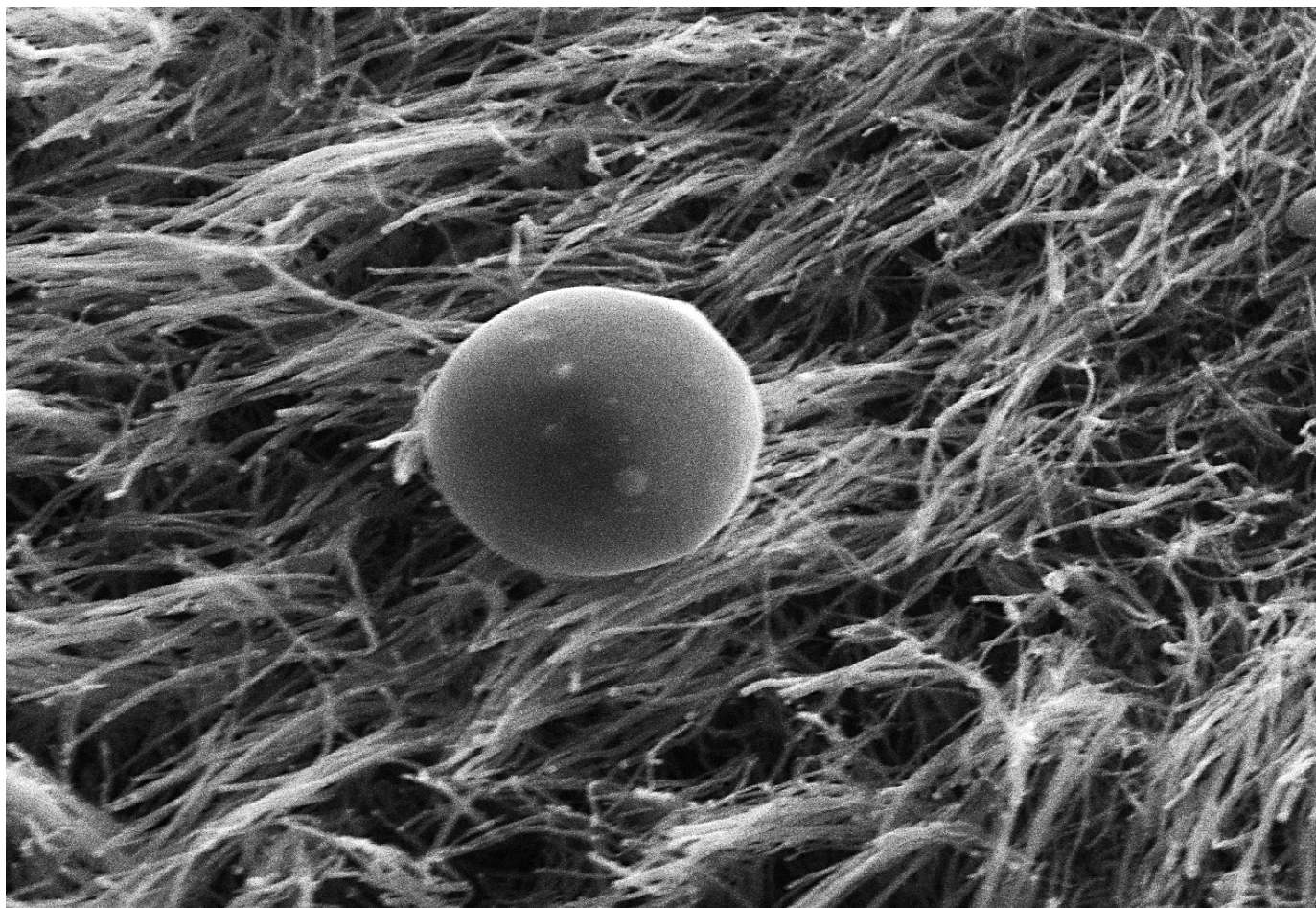
micro & nano - graph

Title:

## Sphere in eelgras

### Description:

Particle on carbon  
nanotubes



Magnification: 22 k X

Submitted by: Michael Häffner

Instrument: Philips XL 30

Affiliation: University of Tuebingen





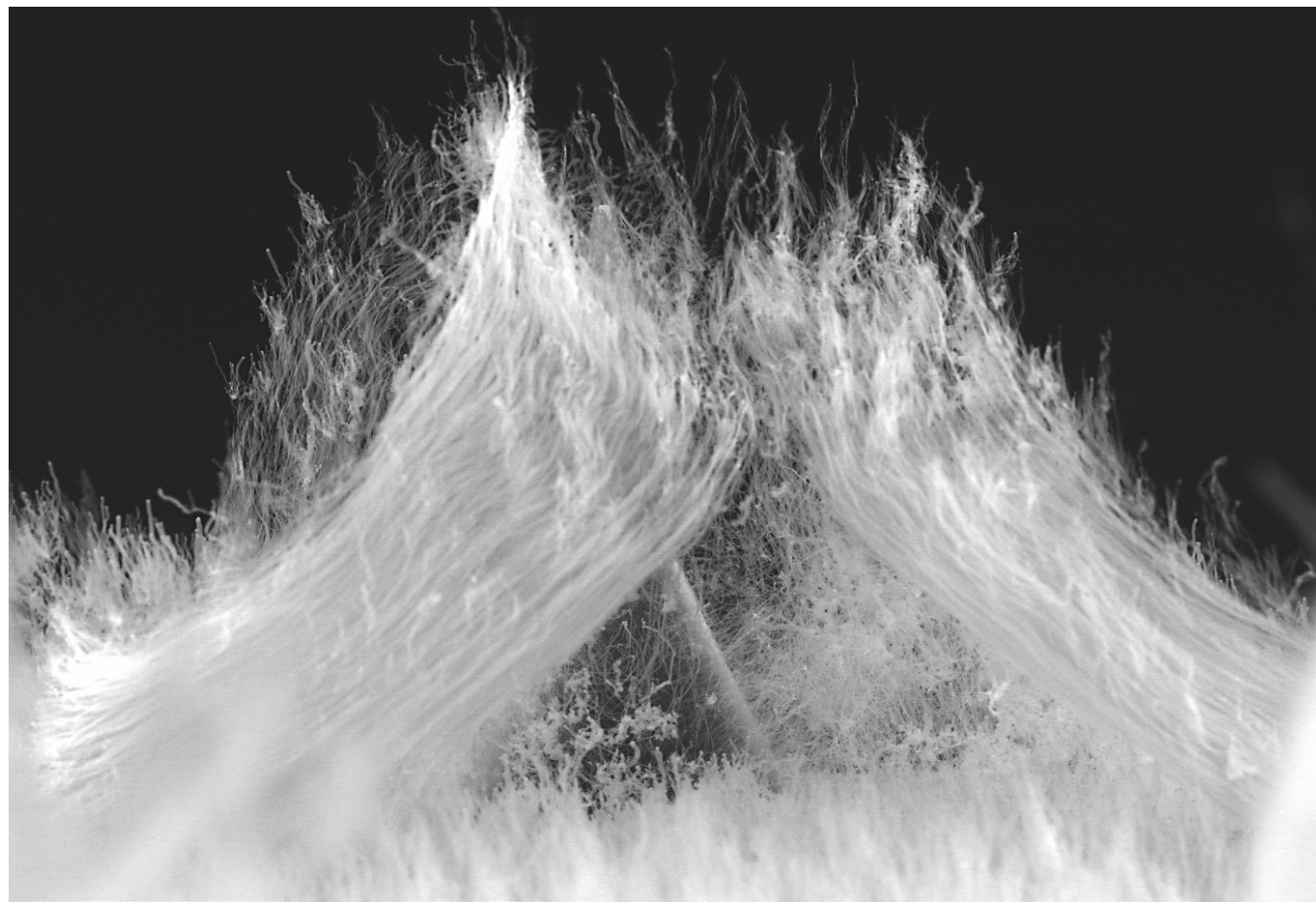
micro & nano - graph

Title:

## Breaking the waves

### Description:

Very dense grown  
carbon nanotubes  
around an AFM tip



Magnification: 20 k X

Submitted by: Michael Häffner

Instrument: Philips XL 30

Affiliation: University of Tuebingen





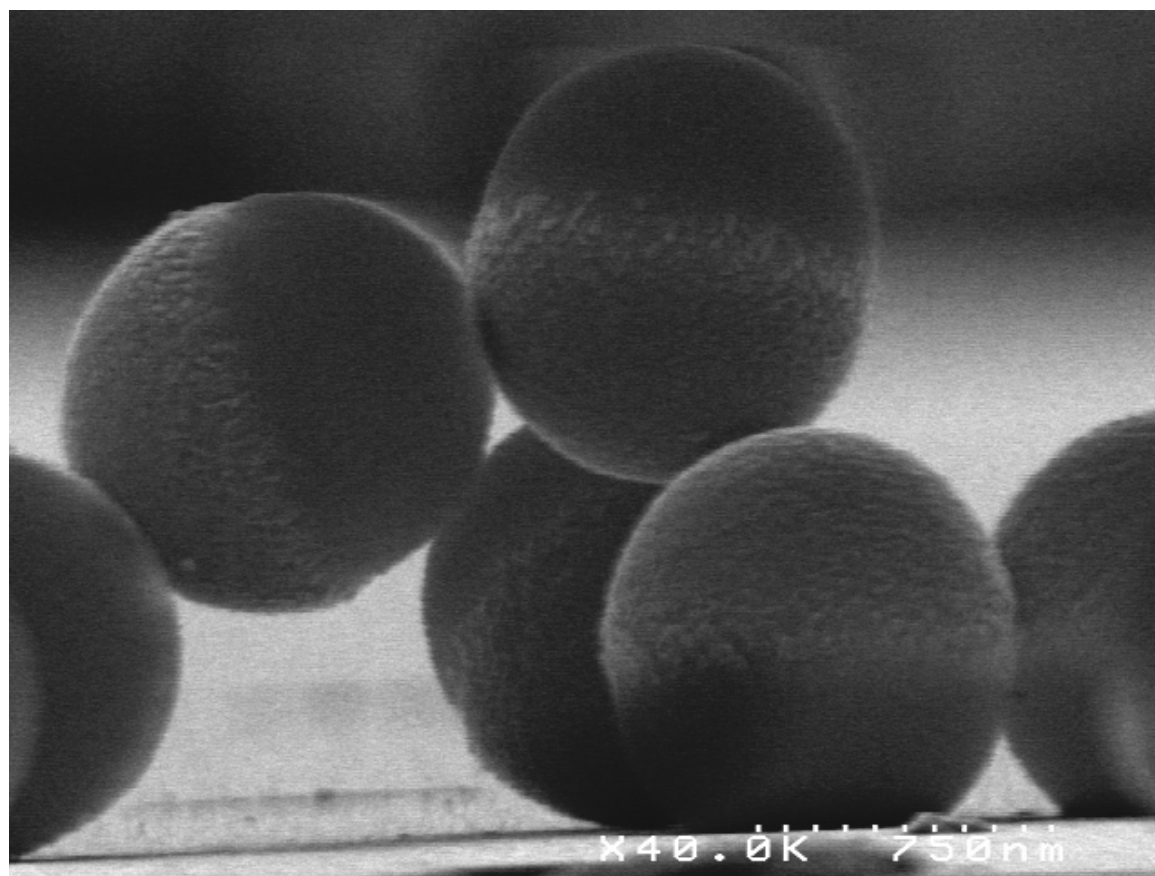
micro & nano - graph

Title:

## Hazelnut Dance

### Description:

Janus particles : 1  $\mu\text{m}$   
diameter polystyrene  
particles with a 100 nm  
Au cap layer



Magnification: X 40.0K

Submitted by: Thibault Honegger

Instrument: SEM JEOL 7500F

Affiliation: ColloNa – LTM - CNRS



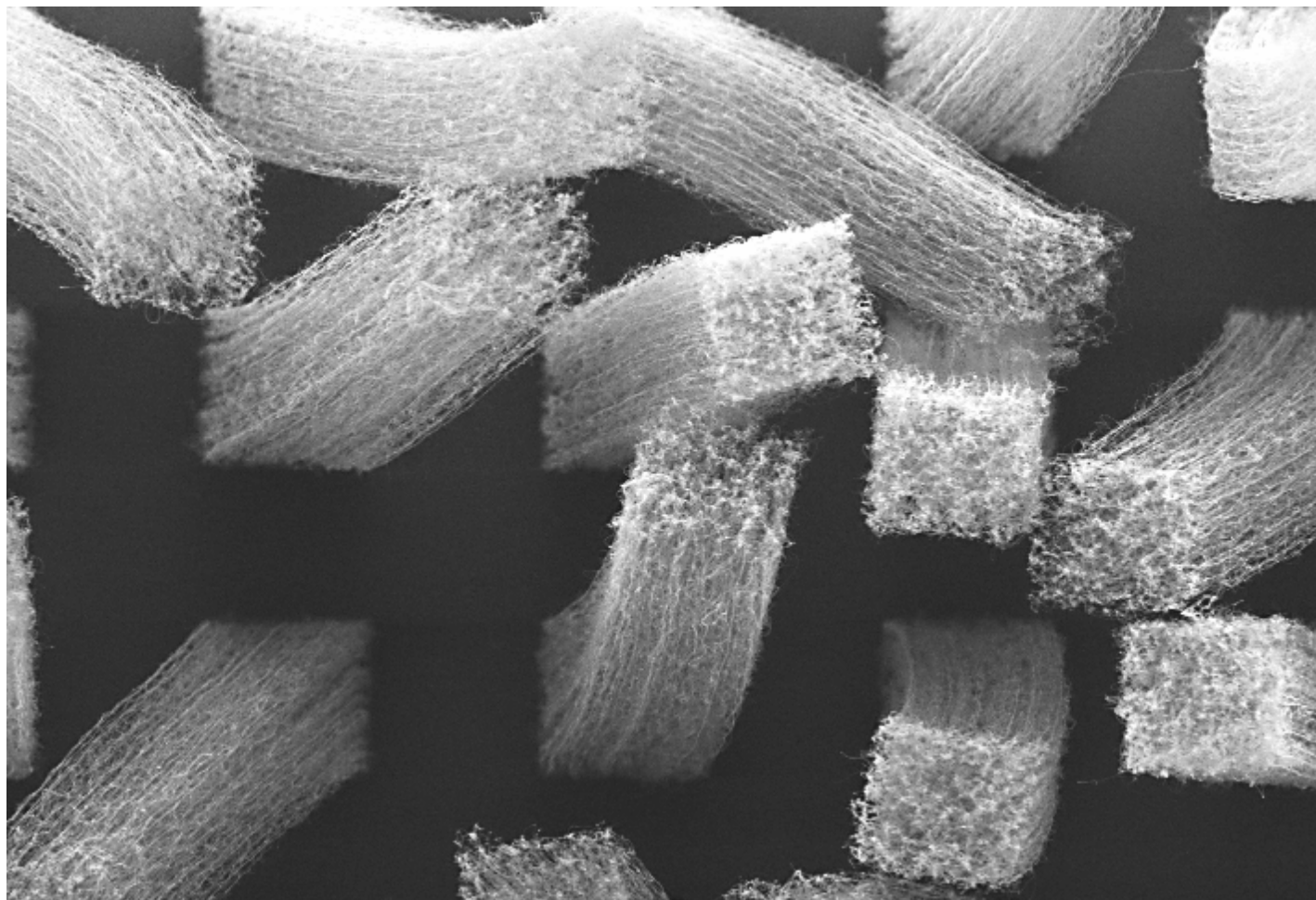


micro & nano –  
graph Title:

## **Bending towers**

### **Description:**

Vertical carbon  
nanotubes after growth  
in a turbulent gas flow



Magnification: **6492 X**

Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**

Affiliation: **University of Tuebingen**



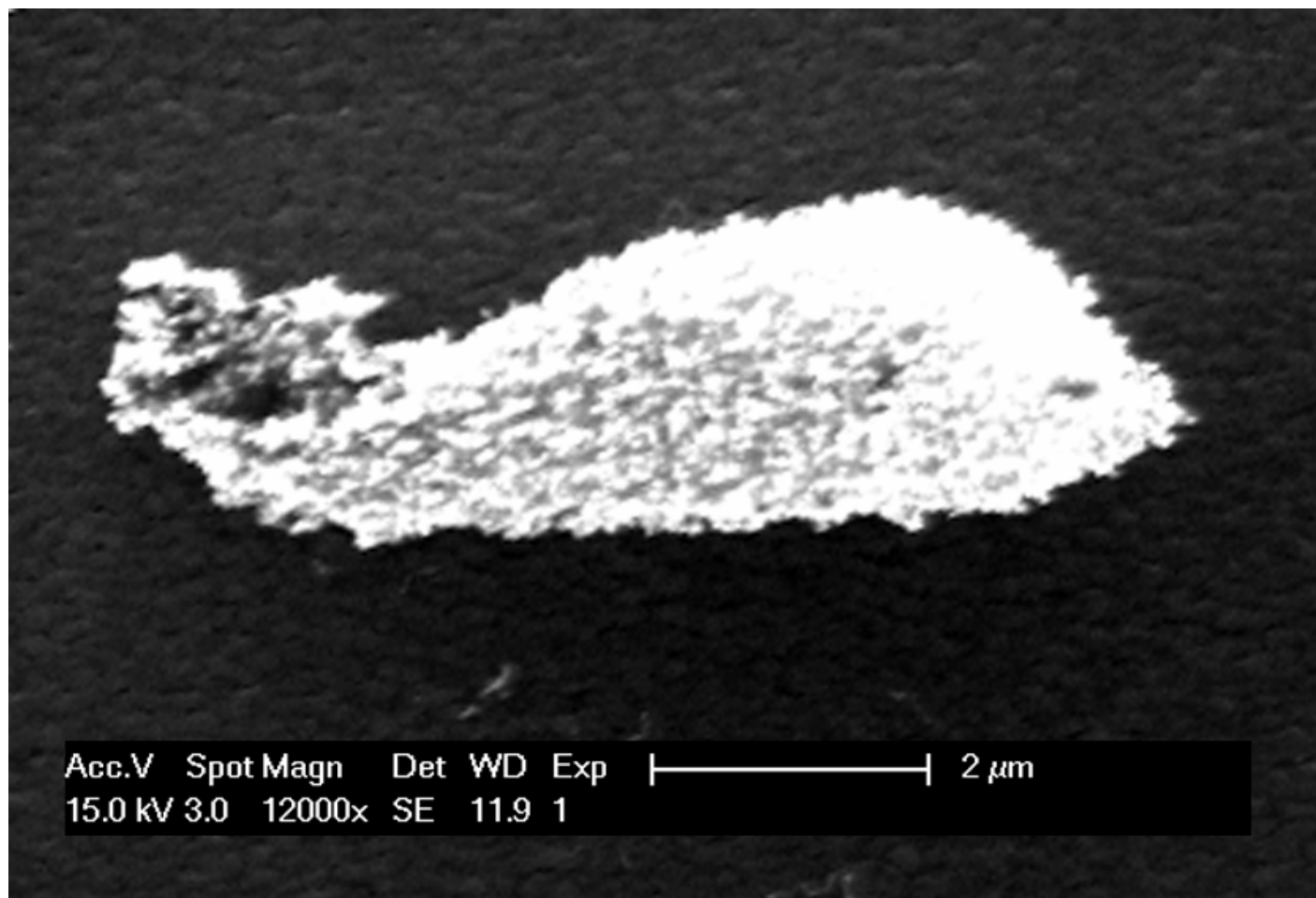


micro & nano –  
graph Title:

**Whale**

**Description:**

Cr-layer after  
incomplete lift-off



Magnification: **12000 X**

Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**

Affiliation: **University of Tuebingen**





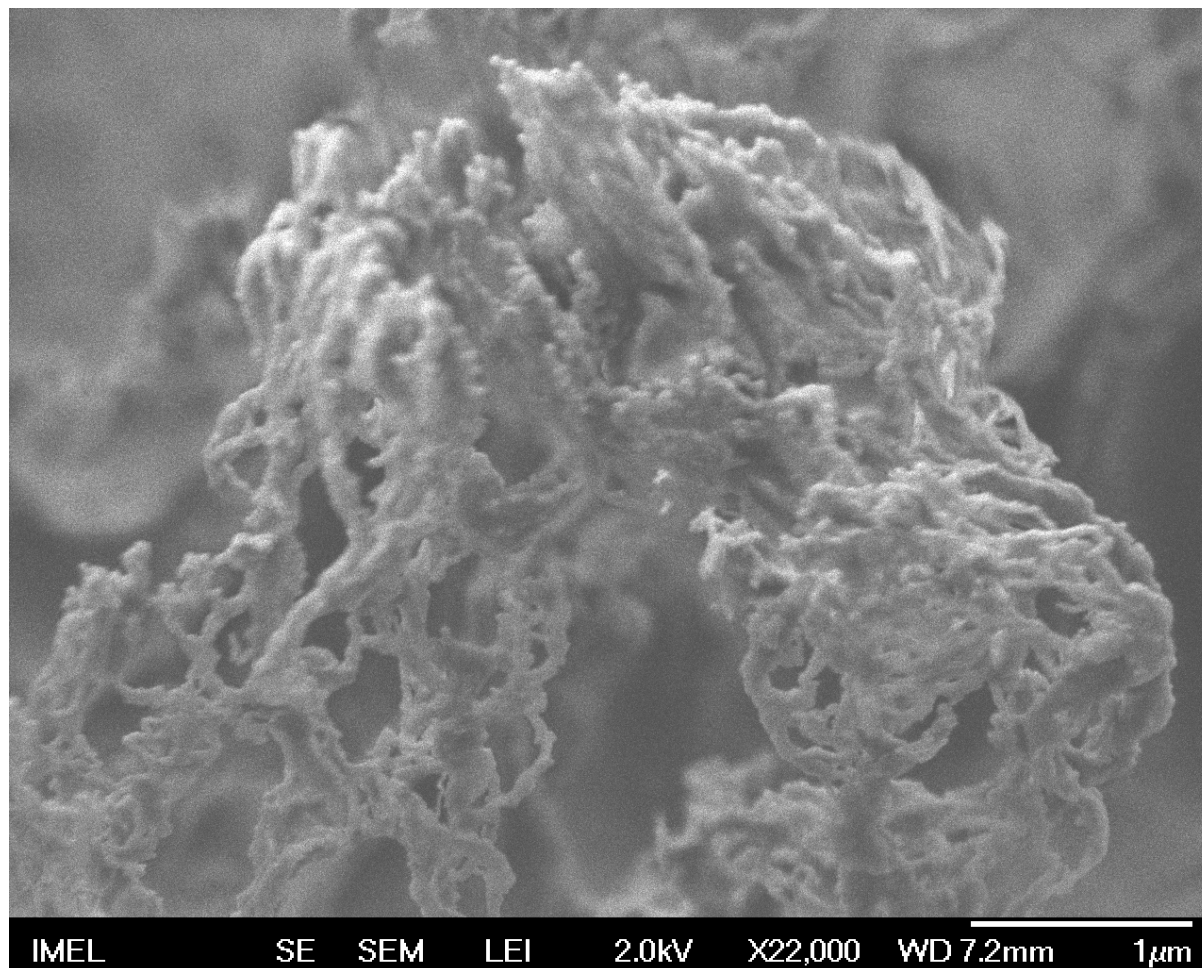
micro & nano - graph

Title:

## Dragon Polymer Head

### Description:

Oxygen Plasma  
Treated PMMA  
substrate



IMEL SE SEM LEI 2.0kV X22,000 WD 7.2mm 1μm

Magnification: 22.000 X

Submitted by: Tsougeni Katerina

Instrument: JEOL JSM-7401F FEG SEM

Affiliation: Institute of Microelectronics\_NCSR Demokritos



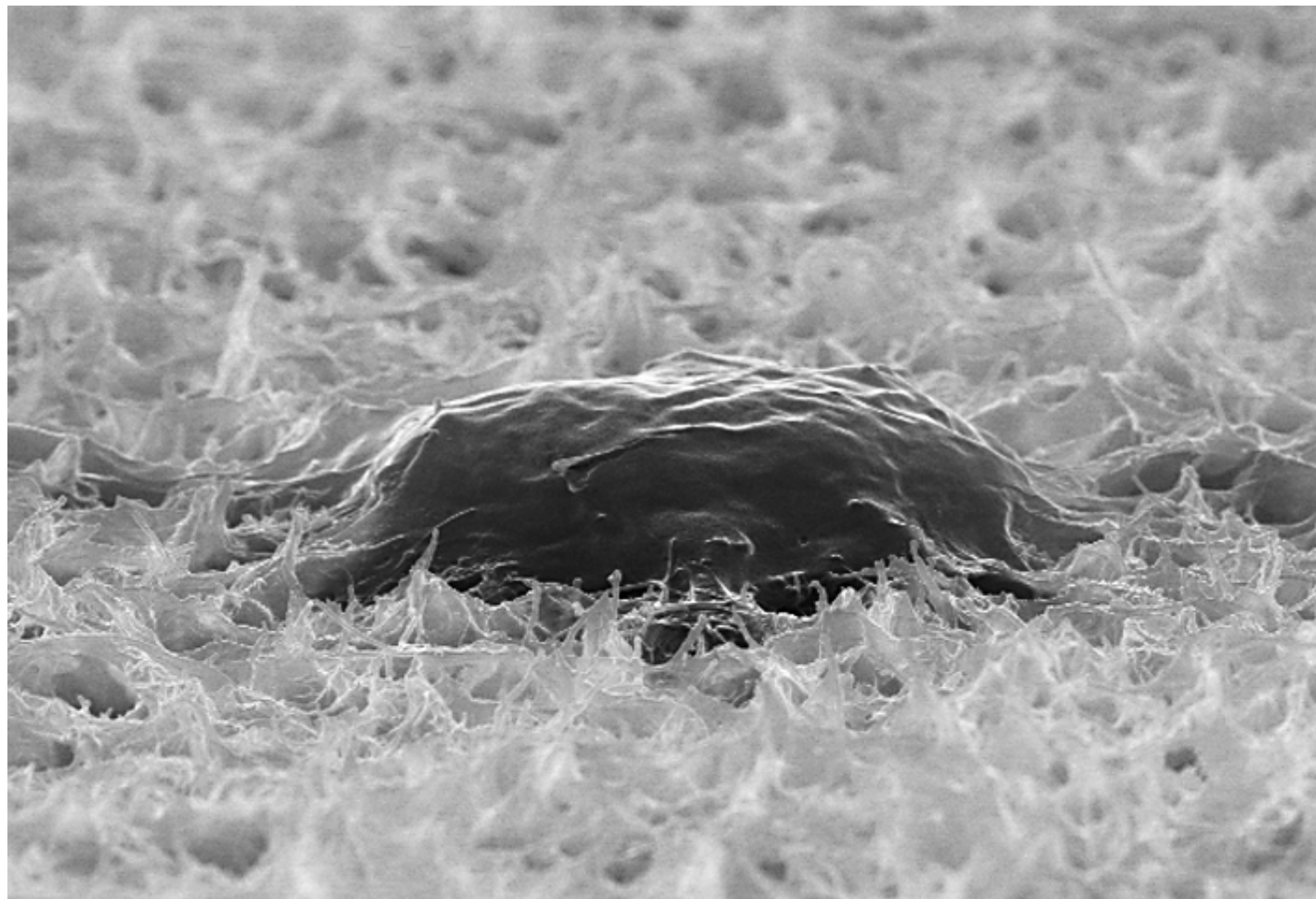


micro & nano –  
graph Title:

## Touch down

### Description:

Cell on carbon  
nanotubes



Magnification: 2000 X

Submitted by: Michael Häffner

Instrument: Philips XL 30

Affiliation: University of Tuebingen





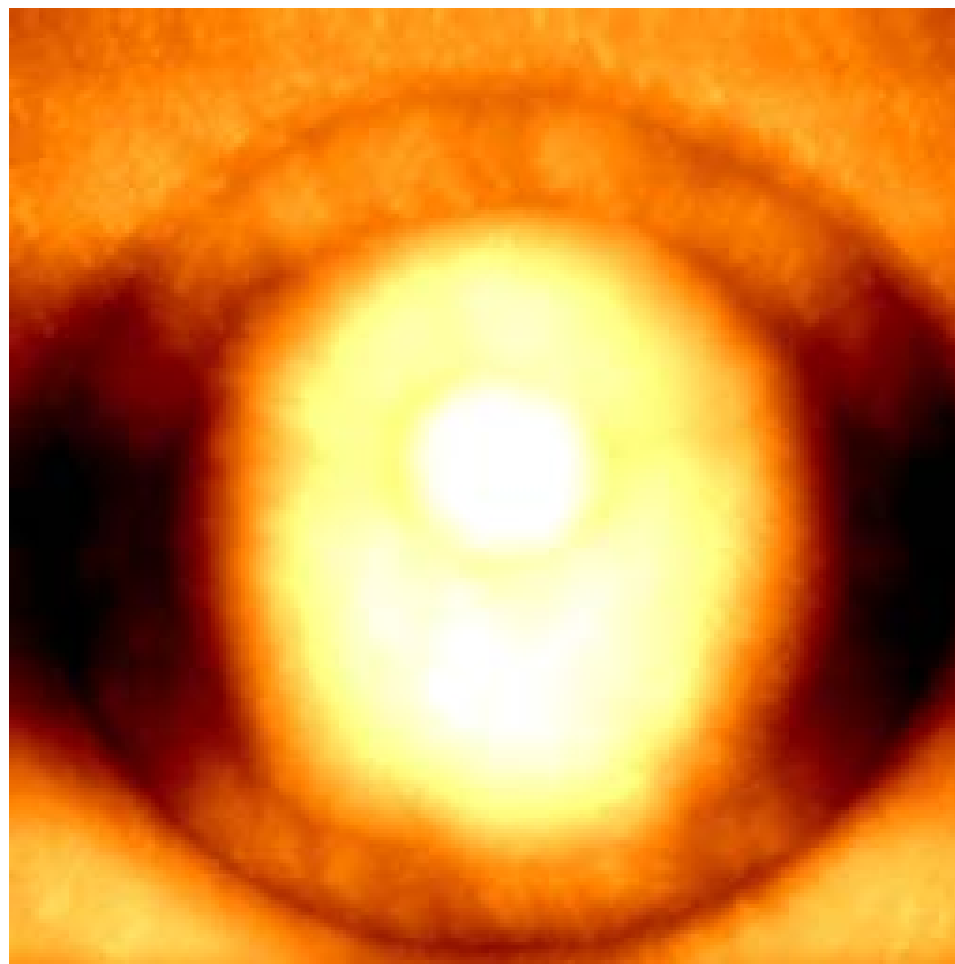
micro & nano - graph

Title:

## “A Bug’s Eye”

Description:

This STM micrograph shows what can happen when an unstable tip meets an uncontrolled motion. In an attempt to condition our very sharp (<5 nm radius of curvature expected) tungsten STM tip, we applied a bias of 6V to the Si(100) sample and brought the tip to within 1nm of the surface for 0.25s. After re-imaging this tip-conditioning area, we saw a large 3 nm tall mound of material inset within an atomically flat, 100nm wide sub-layer. This unprocessed image which looks like an eyeball did indeed alert us to a bug in our tip motion control system.



Magnification: **6.4M**

Submitted by: **Josh Ballard**

Instrument: **Zyvex Labs UHV STM**

Affiliation: **Zyvex Labs**



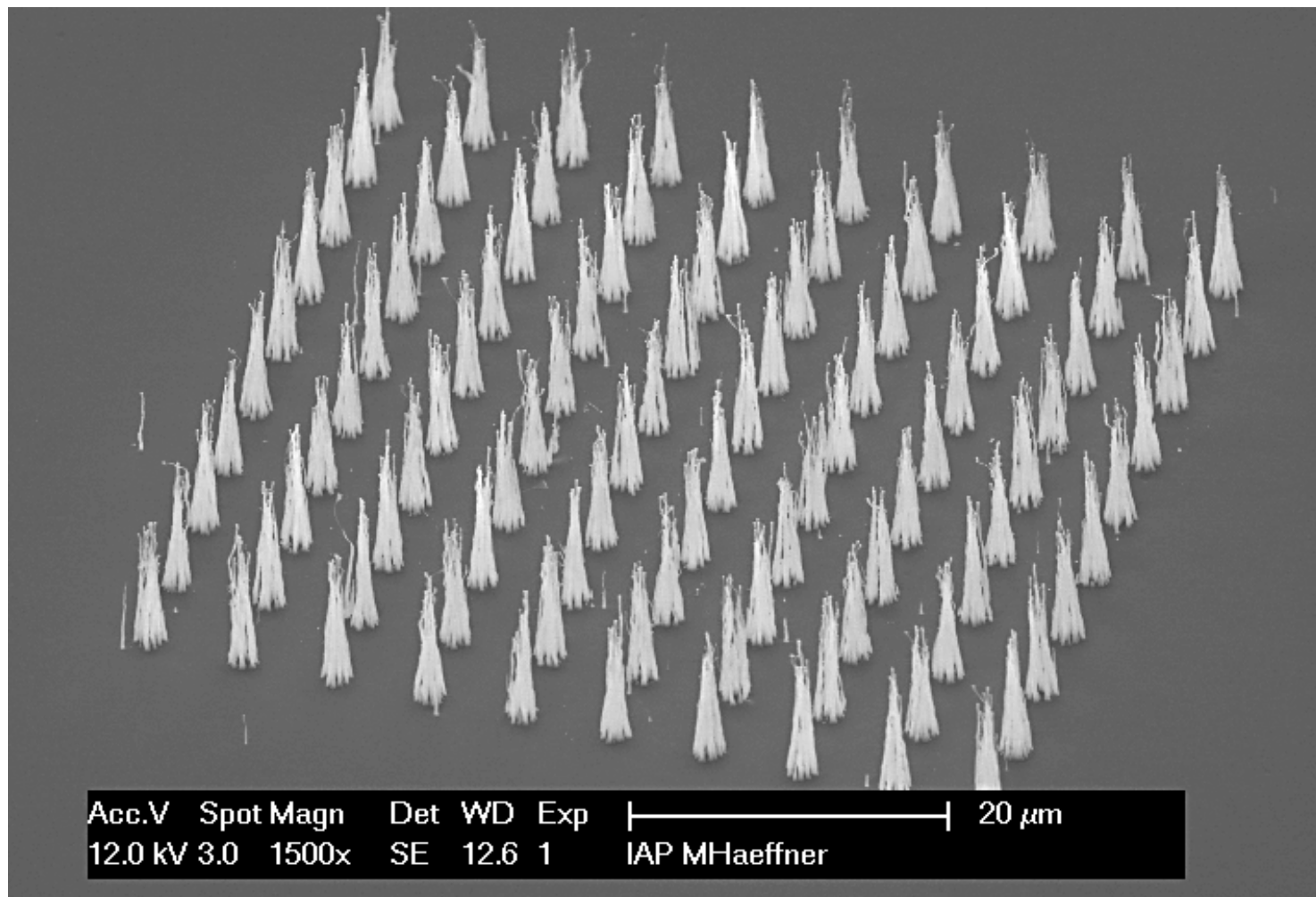


micro & nano –  
graph Title:

## The flames

### Description:

Vertically aligned  
carbon nanotubes



Magnification: **1500 X**

Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**

Affiliation: **University of Tuebingen**



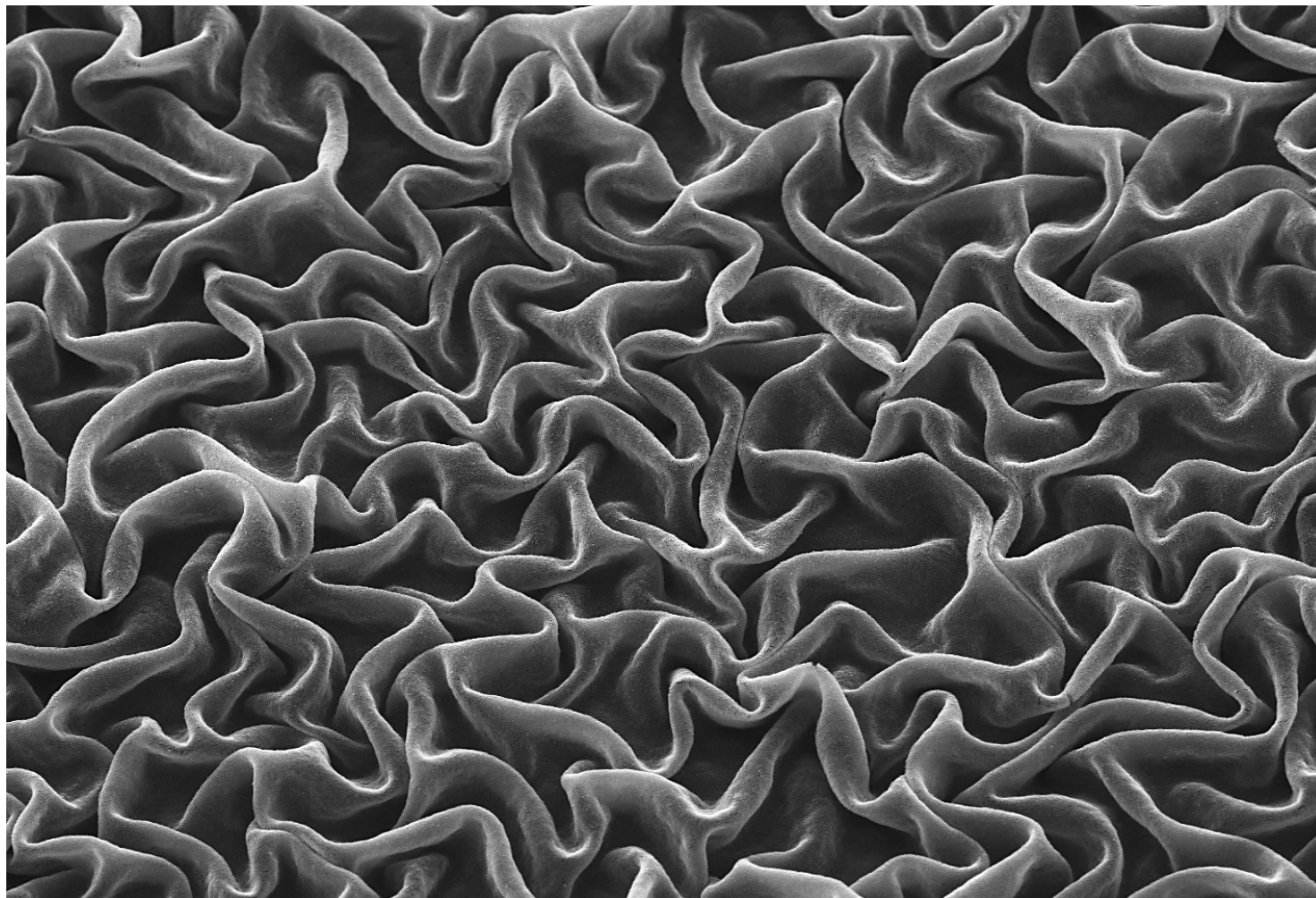


micro & nano –  
graph Title:

## Rumpled cloth

**Description:**

Stressed cobalt layer



Magnification: **650 X**

Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**

Affiliation: **University of Tuebingen**



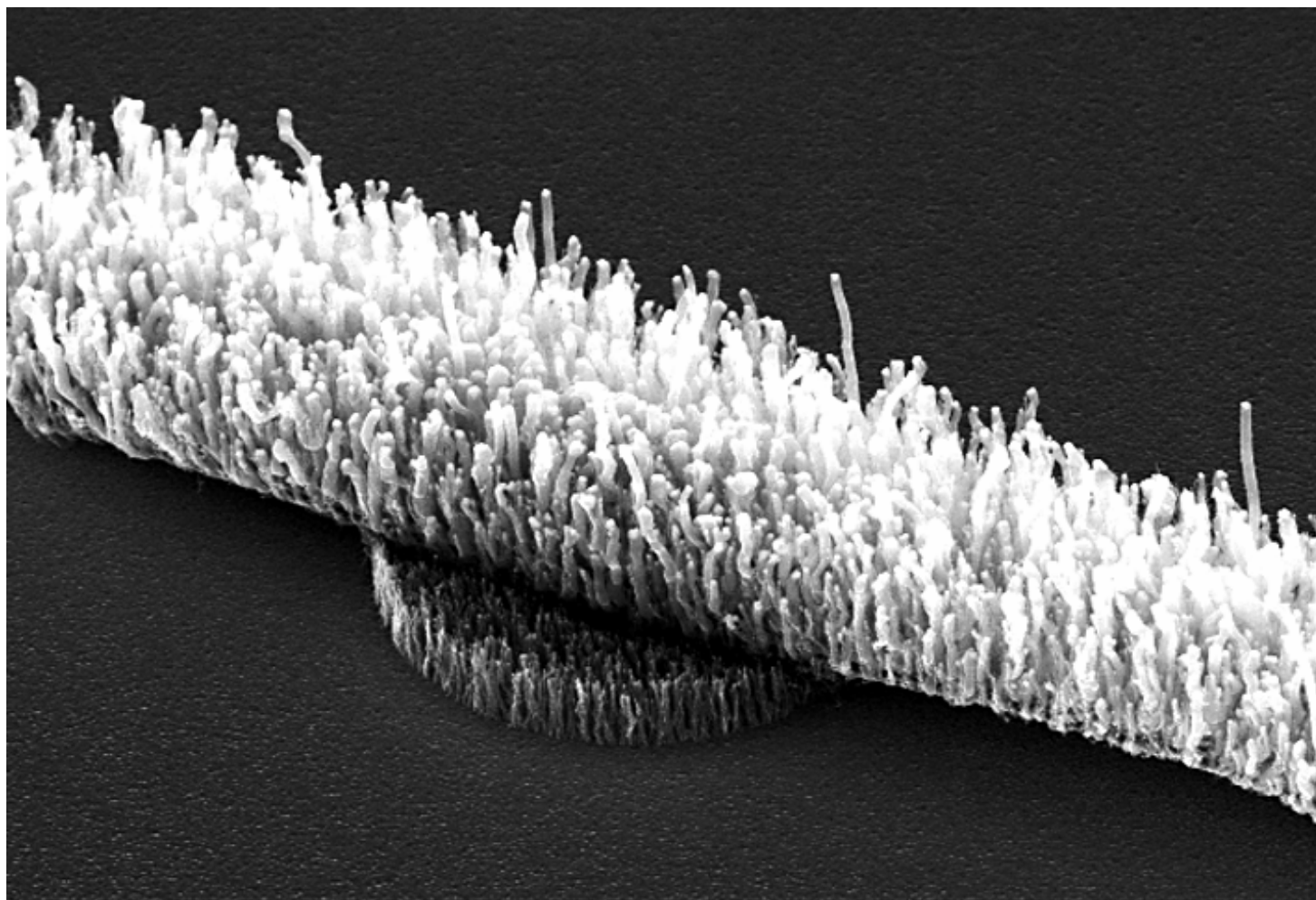


micro & nano –  
graph Title:

## Pivot point

### Description:

Nanotubes on top of  
nanotubes



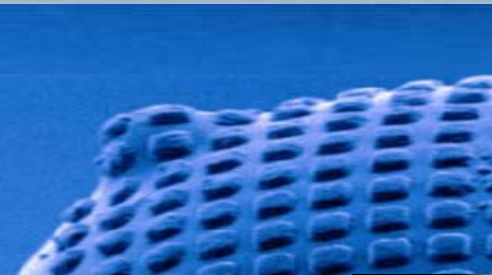
Magnification: **1500 X**

Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**

Affiliation: **University of Tuebingen**





micro & nano - graph

Title:

**Happy hour!**

### Description:

The attempt to perform a vacuum package by using SU-8. We can see the result after an UV exposure through a glass wafer and the development of SU-8.

The teeth are polysilicon resonators

This package was really happy to see us!!

Thanks to Stephan Keller for taking this picture.

Magnification: **263 X**

Submitted by: **Gabriel Abadal and Gonzalo Murillo.**



|   |         |       |      |     |         |       |         |  |
|---|---------|-------|------|-----|---------|-------|---------|--|
|  | HV      | mag   | spot | det | WD      | dwell | HFV     |  |
|   | 7.00 kV | 263 x | 4.0  | LVD | 18.0 mm | 24 μs | 1.13 mm |  |

Instrument: **FEI Nova 600 NanoSEM**

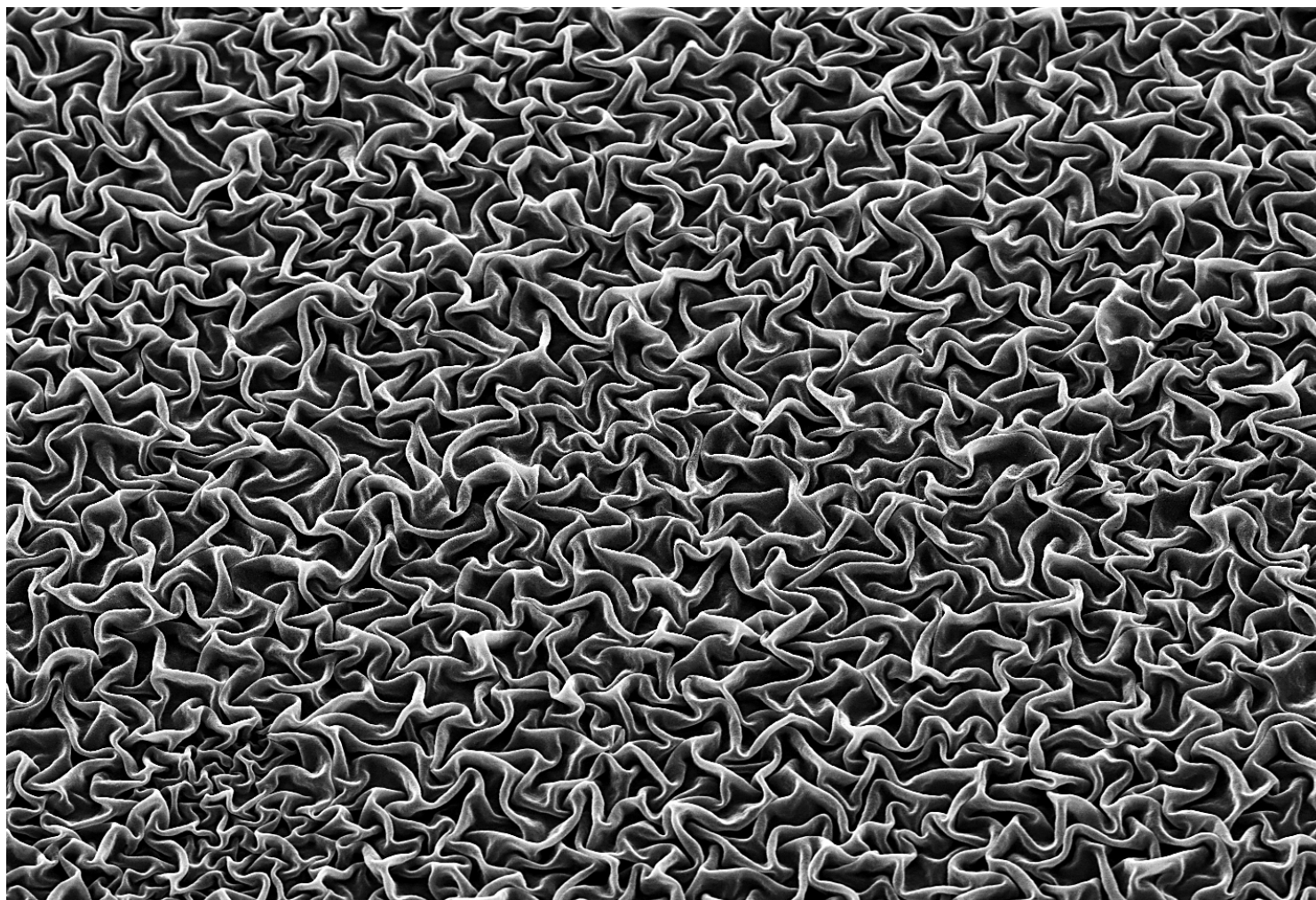
Affiliation: **UAB & DTU**





micro & nano –  
graph Title:  
**no title**

**Description:**  
Stressed cobalt layer



Magnification: **250 X**  
Submitted by: **Michael Häffner**

Instrument: **Philips XL 30**  
Affiliation: **University of Tuebingen**





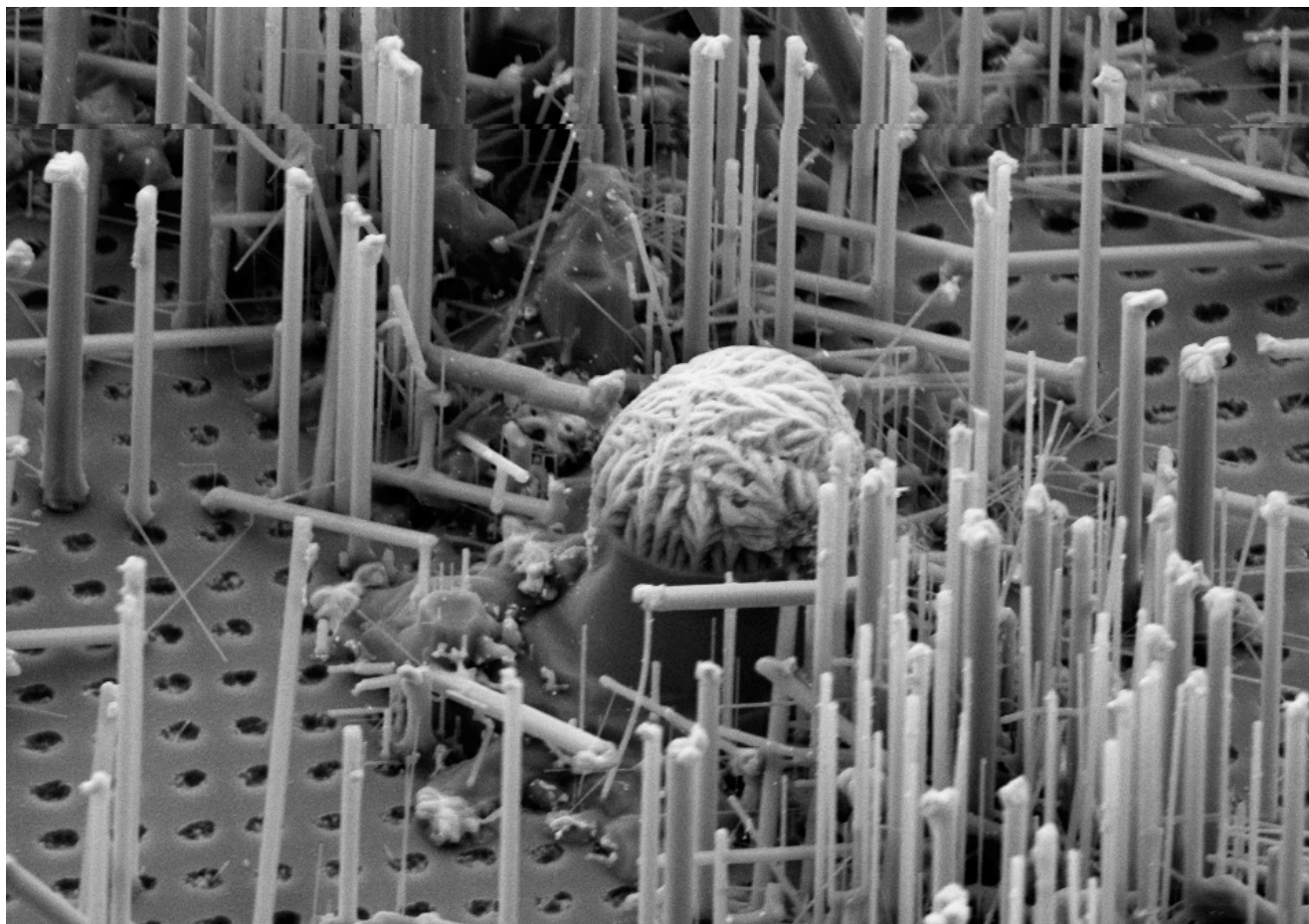
micro & nano - graph

Title:

## The golf ball

### Description:

Silicon nanowires grown from gold nanoparticles. Some of the nanoparticles aggregate and form the thick pillars.



Magnification: 12.09 k X

Instrument: SEM - LEO

Submitted by: Irene Fernandez-Cuesta

Affiliation: DTU Nanotech





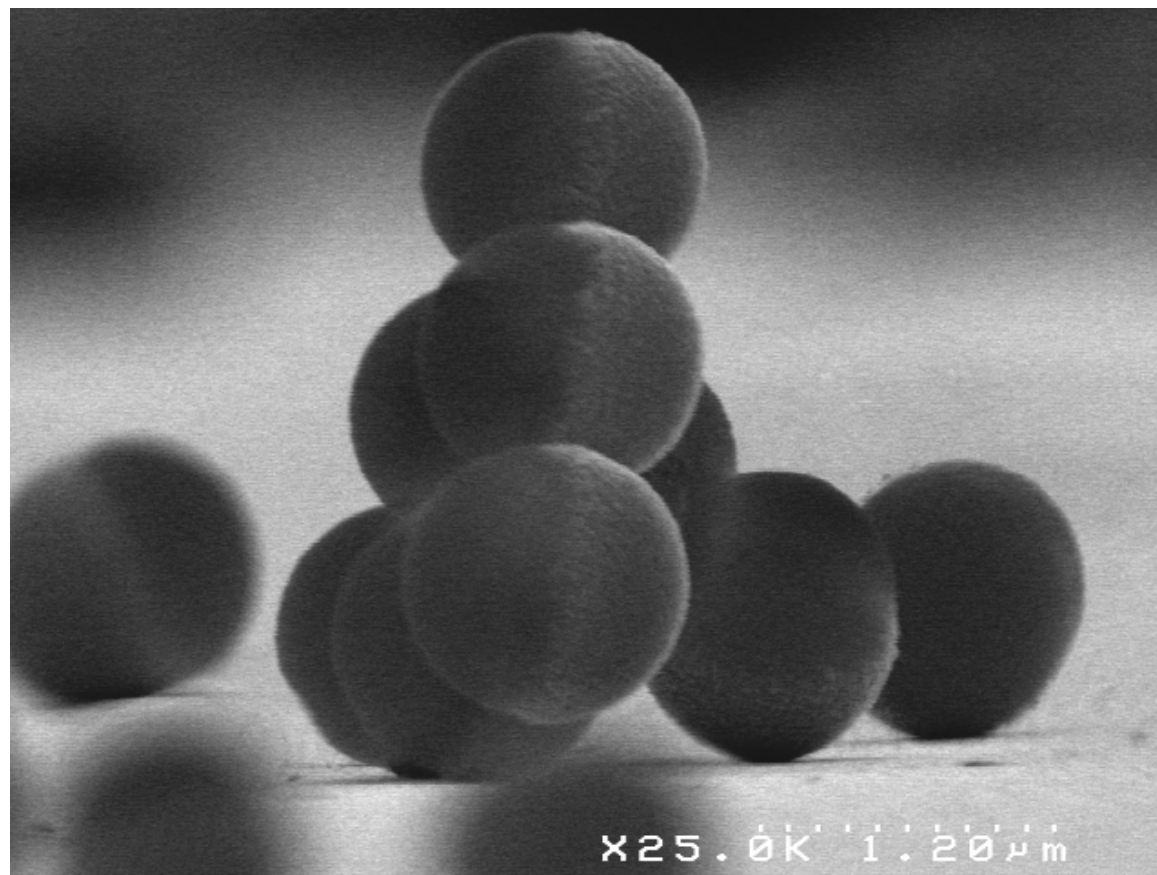
micro & nano - graph

Title:

## Easter Eggs pyramid

### Description:

Janus particles : 1  $\mu\text{m}$   
diameter polystyrene  
particles with a 100 nm  
Au cap layer



Magnification: **X 25.0K**

Submitted by: **Thibault Honegger**

Instrument: **SEM JEOL 7500F**

Affiliation: **ColloNa – LTM - CNRS**





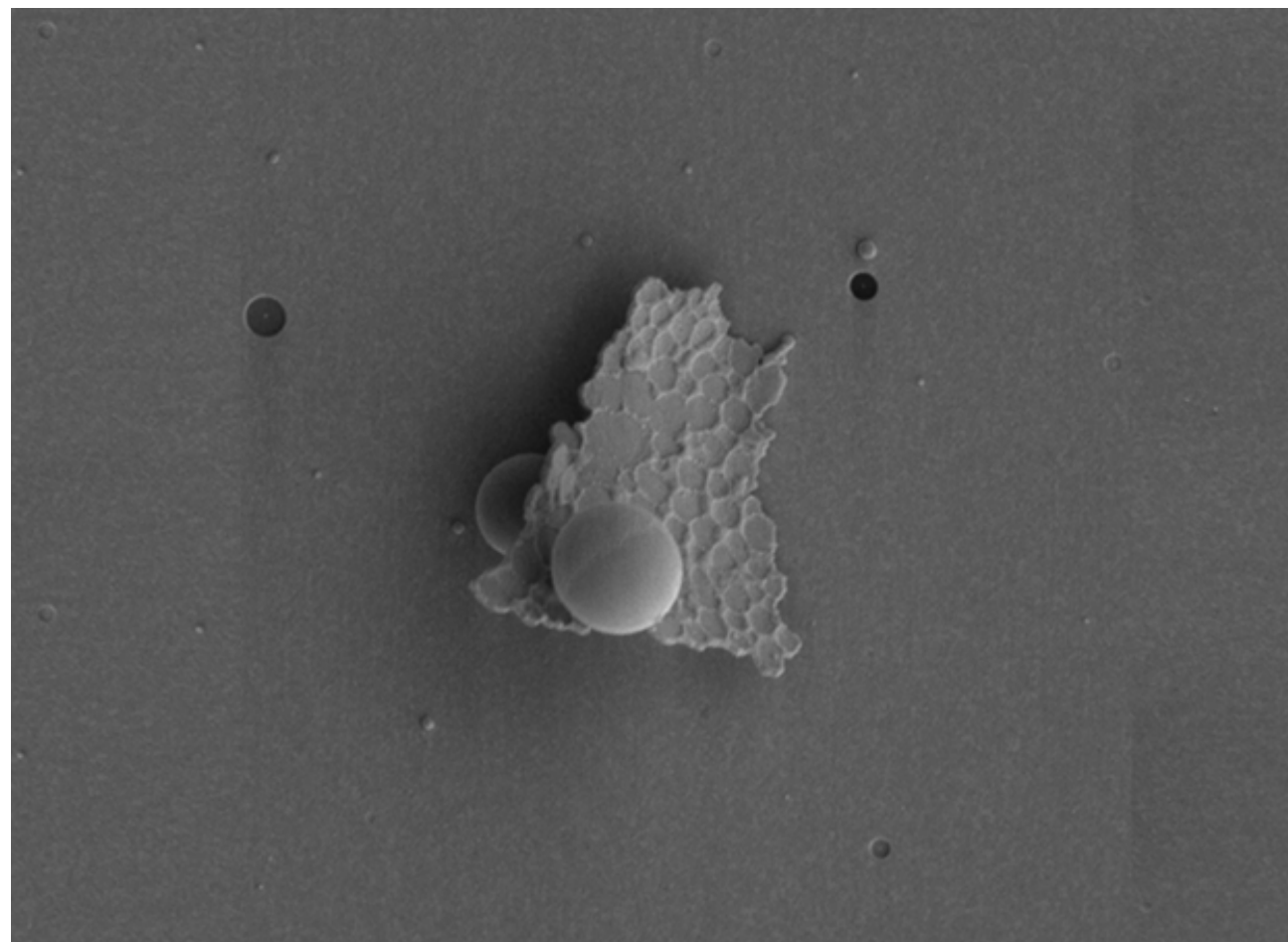
micro & nano - graph

Title:

## The smallest fish ever

### Description:

Gold and PMMA  
residues after a lift-off



Magnification: 14.5 k X

Instrument: SEM - LEO

Submitted by: Irene Fernandez-Cuesta

Affiliation: DTU Nanotech





micro & nano - graph

Title:

## Playing golf

### Description:

Silicon nanowires grown from gold nanoparticles. Some of the nanoparticles aggregate and form the thick pillars.



Magnification: 3.8 k X

Instrument: SEM - LEO

Submitted by: Irene Fernandez-Cuesta

Affiliation: DTU Nanotech