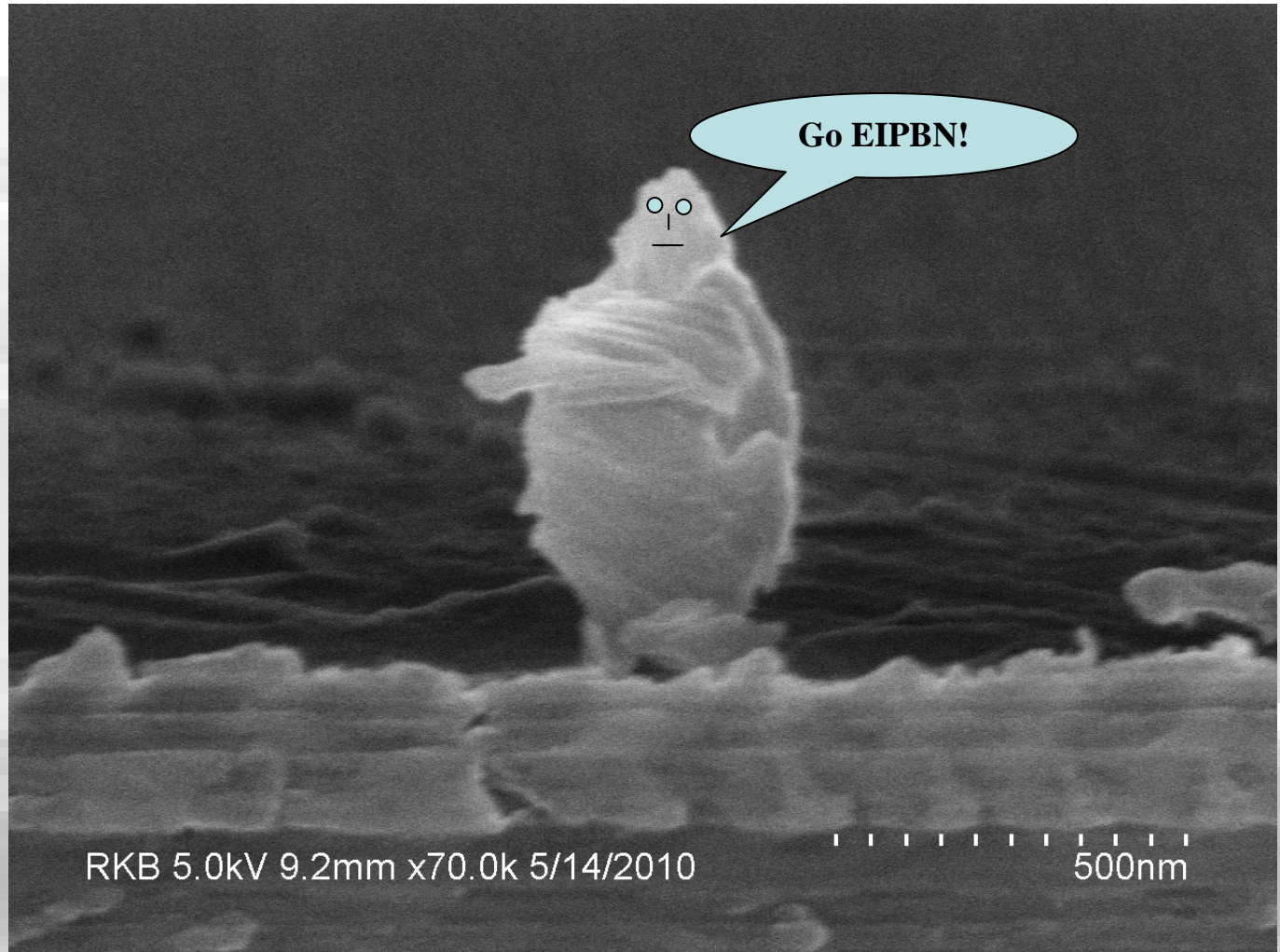




2010 EIPBN MicroGraph Contest



Micrograph Title:
Alaskan Yogi Bear

Description:
It's the bear
from EIPBN
logo above.

Magnification (3"x4" image):
Submitted by: Ravi Bonam

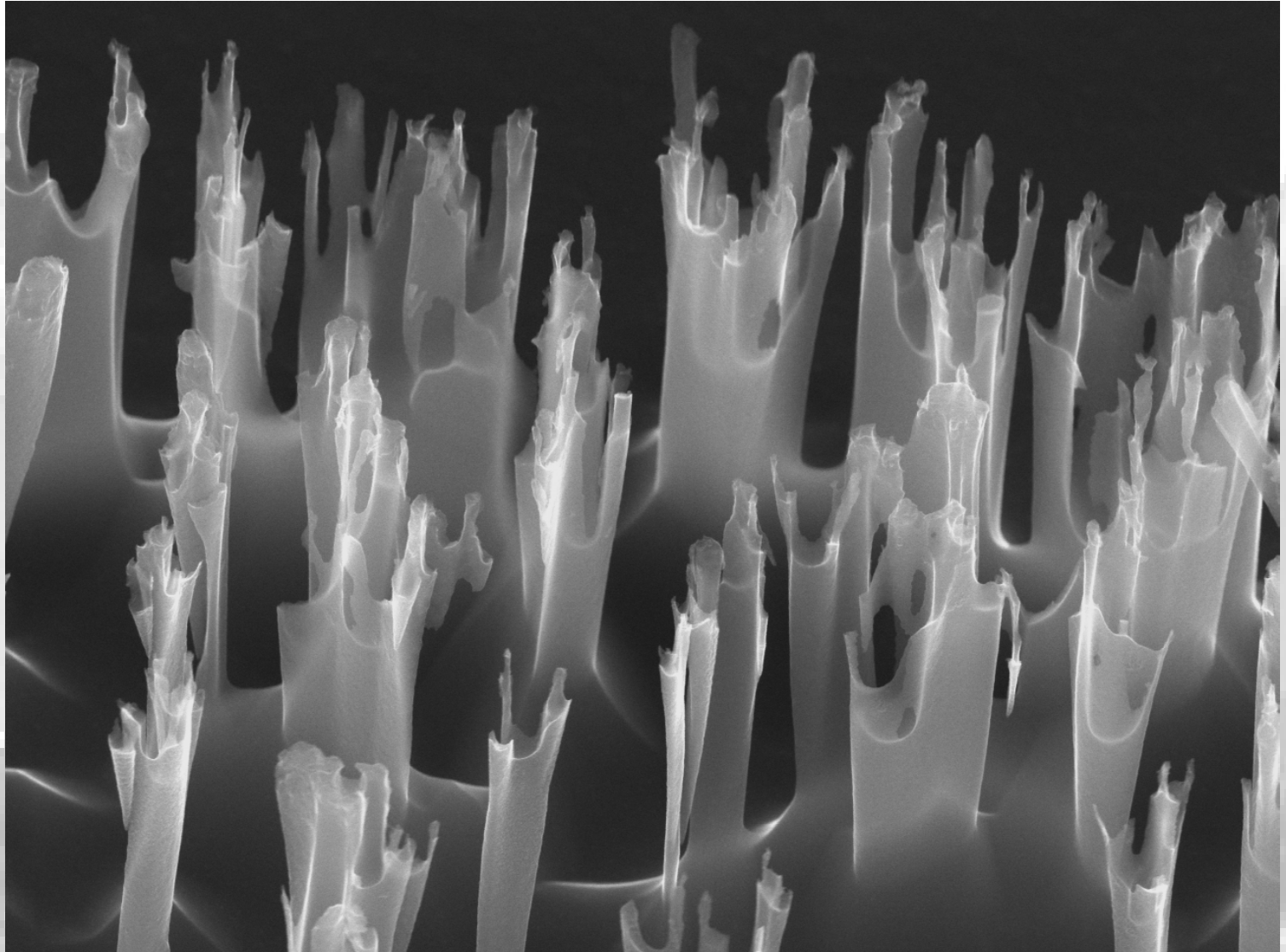
Instrument (Make and Model): Hitachi S-4800
Affiliation: CNSE, University at Albany



2010 EIPBN MicroGraph Contest

**Micrograph
Title:**
Ice Castles

Description:
Silicon cryo-
etched at -110
C. MaN etch
mask failed
under 50W RF
eroding the
desired pillar
pattern.



Magnification (3"x4" image): 20,000X
Submitted by: Scott Braswell

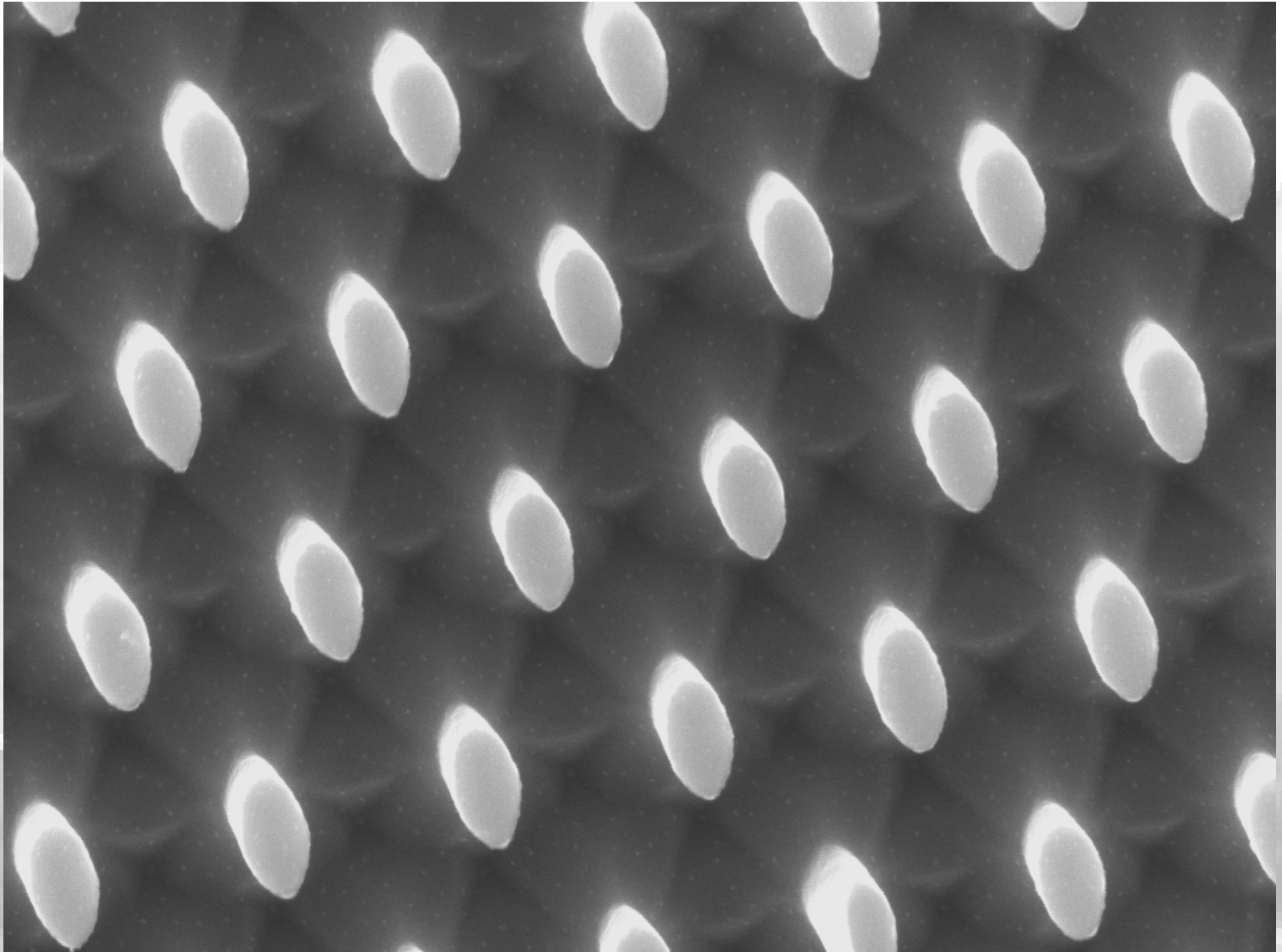
Instrument (Make and Model): FEI Sirion XL30
Affiliation: University of Washington - NTUF



2010 EIPBN MicroGraph Contest

**Micrograph
Title:**
Radioactive

Description:
Silicon cryo-
etched with
PMMA mask at
40W RF.
Thinner areas
of the mask
failed resulting
in a 3-tiered
pattern.

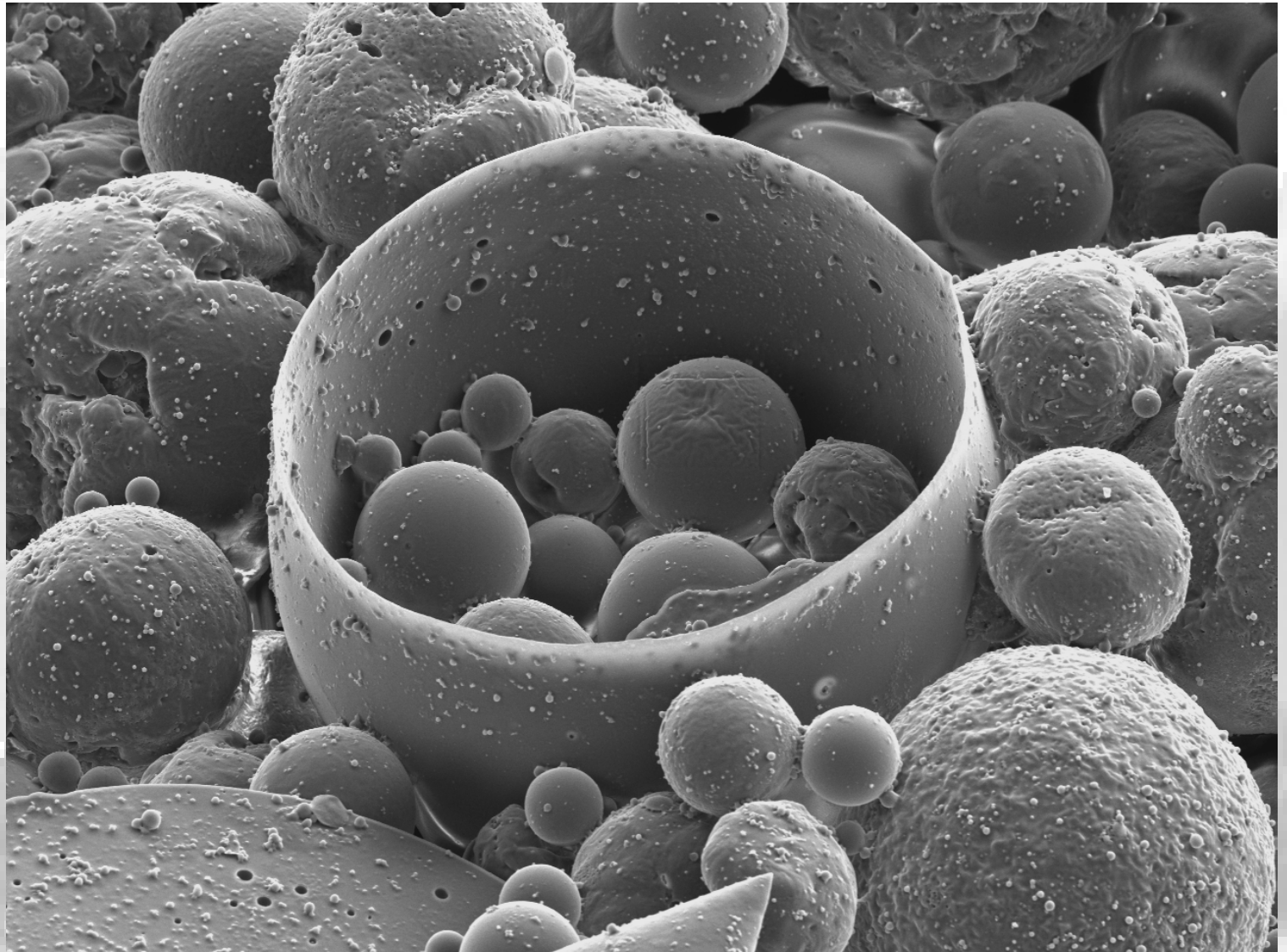


Magnification (3"x4" image): 40,000X
Submitted by: Scott Braswell

Instrument (Make and Model): FEI Sirion XL30
Affiliation: University of Washington - NTUF



2010 EIPBN MicroGraph Contest



Micrograph

Title:

Wedding
Band

Description:

Poly(lactic
acid)
microspheres
formed by a
W/O/W
emulsion and a
three leaf
clover blade.

Magnification (3"x4" image): 1000X

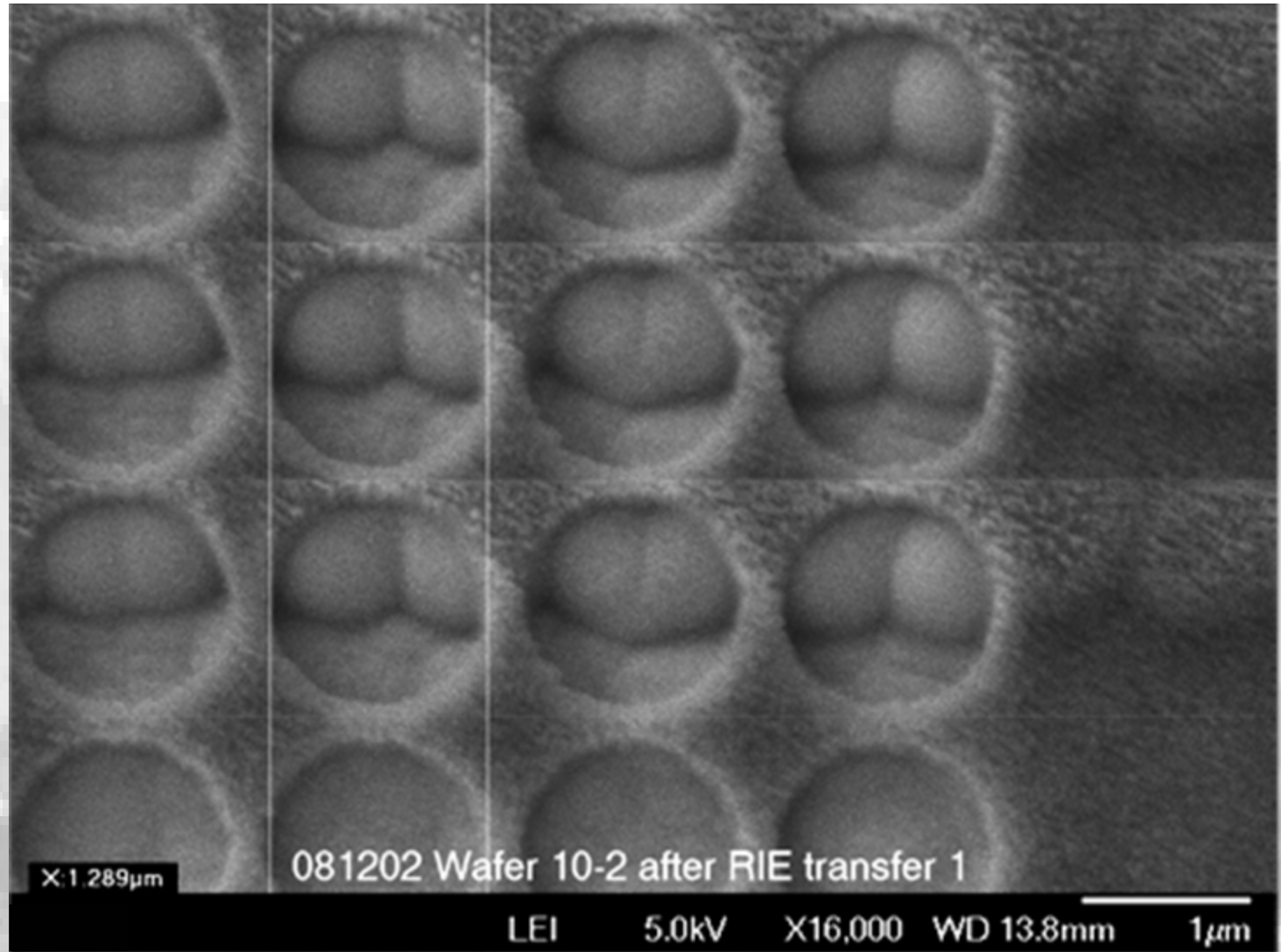
Submitted by: Scott Braswell

Instrument (Make and Model): FEI Sirion XL30

Affiliation: University of Washington - NTUF



2010 EIPBN MicroGraph Contest



Micrograph Title:
Surprise!

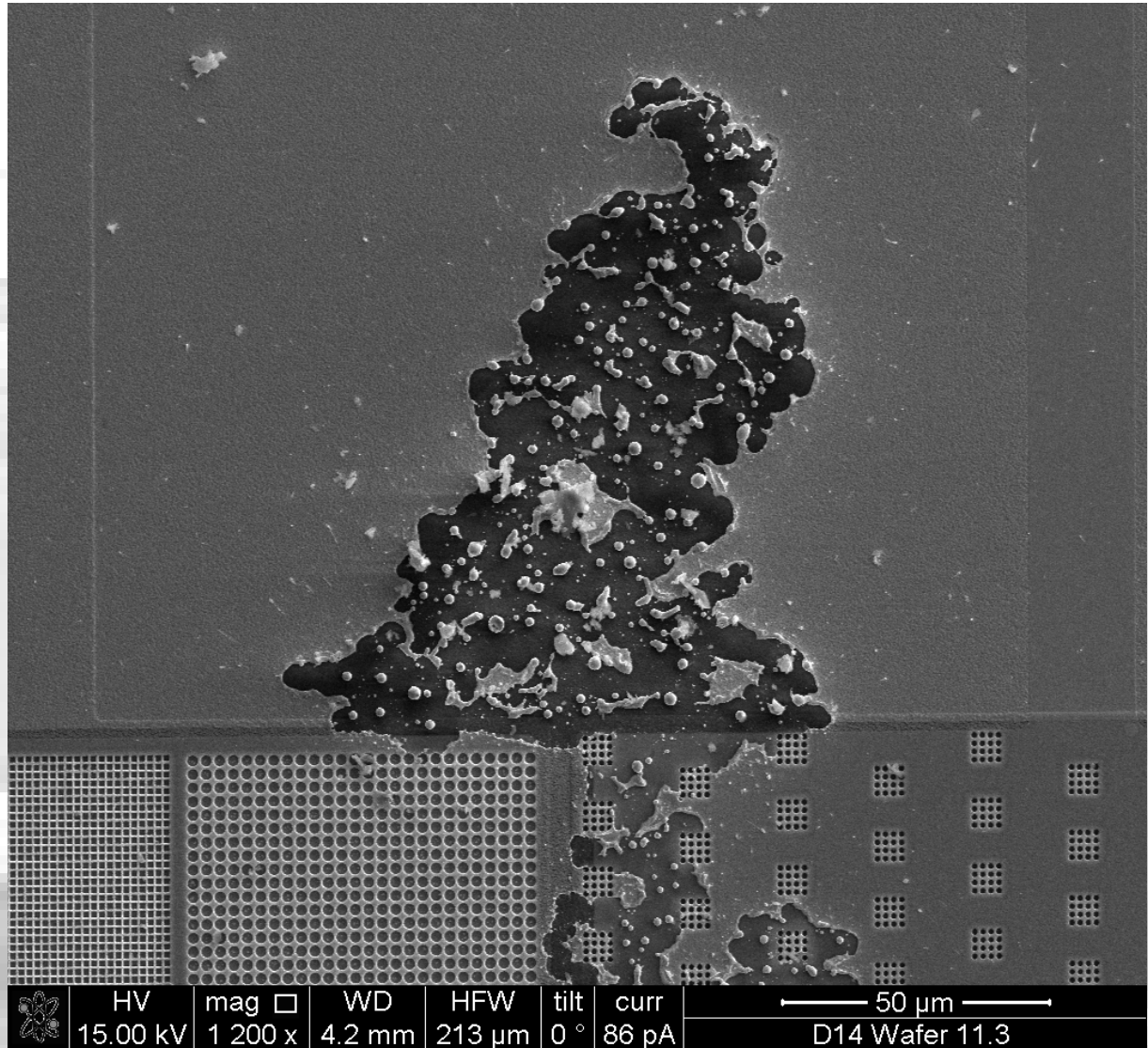
Description:
Funny bottom
structures revealed
beneath the upper
layer after it was
etched out.

Magnification (3"x4" image): 16kx
Submitted by: Yehiel Gotkis & Alan Brodie

Instrument (JEO L JSM-6700)
Affiliation: KLA-Tencor



2010 EIPBN MicroGraph Contest



Micrograph Title:
Merry Christmas
fireworks! Or The sorting
hat from Harry Potter

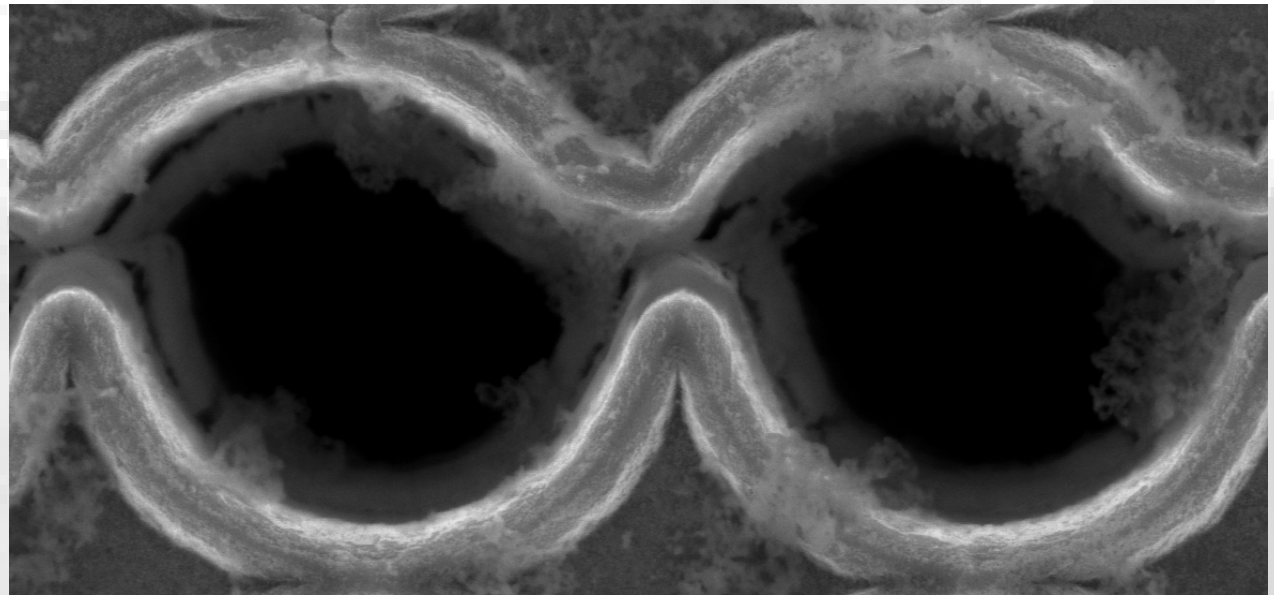
Description: Arc damage

Magnification (3"x4" image):
Submitted by: Alan Brodie & Yehiel Gotkis

Instrument: Hitachi S4800
Affiliation: KLA-Tencor



2010 EIPBN MicroGraph Contest



Micrograph Title:
Where did you get
those micro Foster
Grants

Description:
SEM micrograph of
Sputter re-deposition
around a stitching
error in a deep
plasma etch

Magnification (3"x4" image): 35kx
Submitted by: Alan Brodie

Instrument (Make and Model): Hitachi S4800
Affiliation: KLA-Tencor

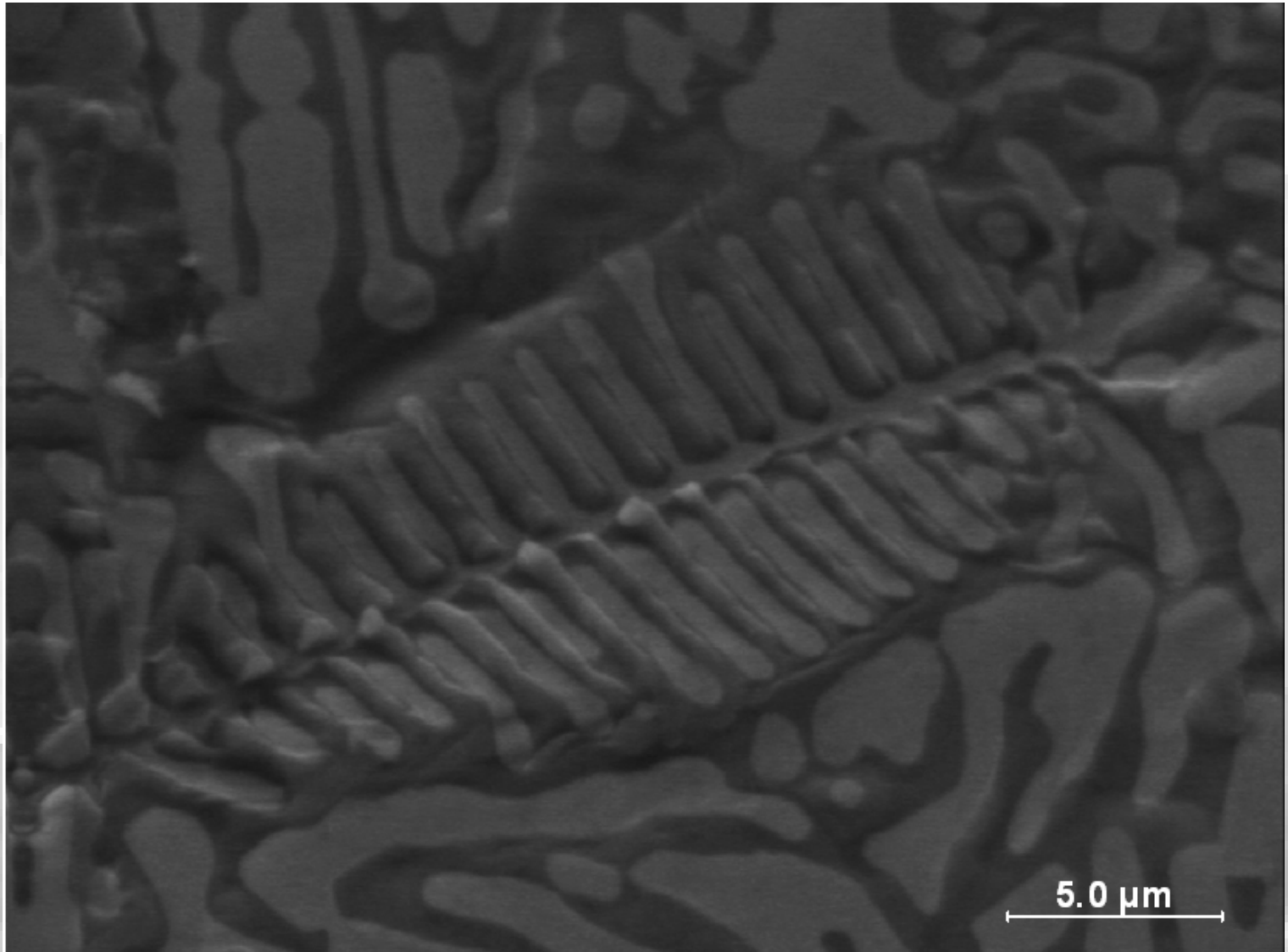


2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Fossilized
Micro-Fish**

Description:

**SEM of
Aluminum-
Germanium
eutectic alloy
showing
dendritic
phase
separation**

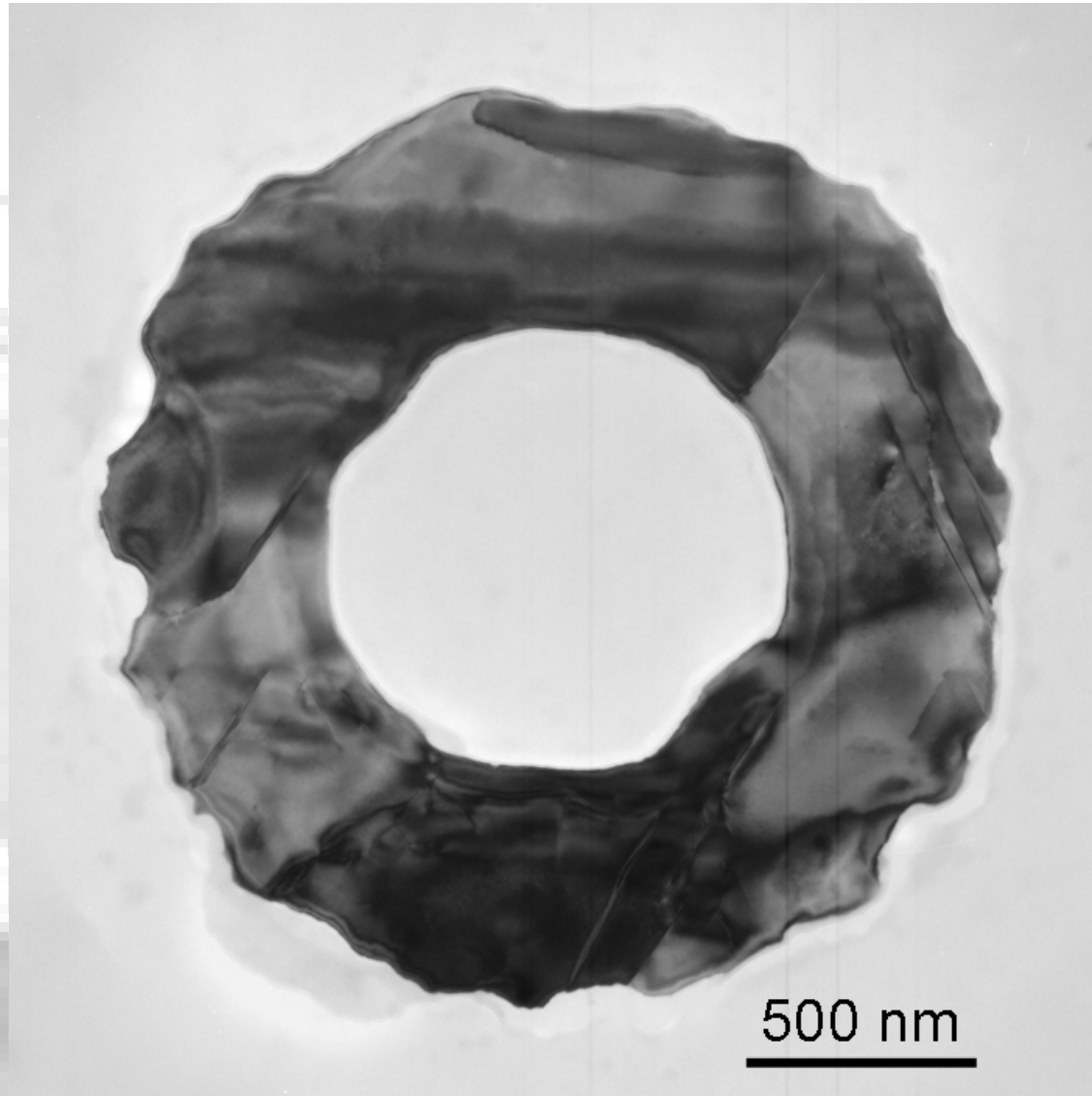


**Magnification (3"x4" image): 10,000X
Submitted by: F. Crnogorac**

**Instrument (Make and Model): FEI Sirion
Affiliation: Stanford University**



2010 EIPBN MicroGraph Contest



Micrograph

Title:

**Monolithic
Christmas
Wreath**

Description:

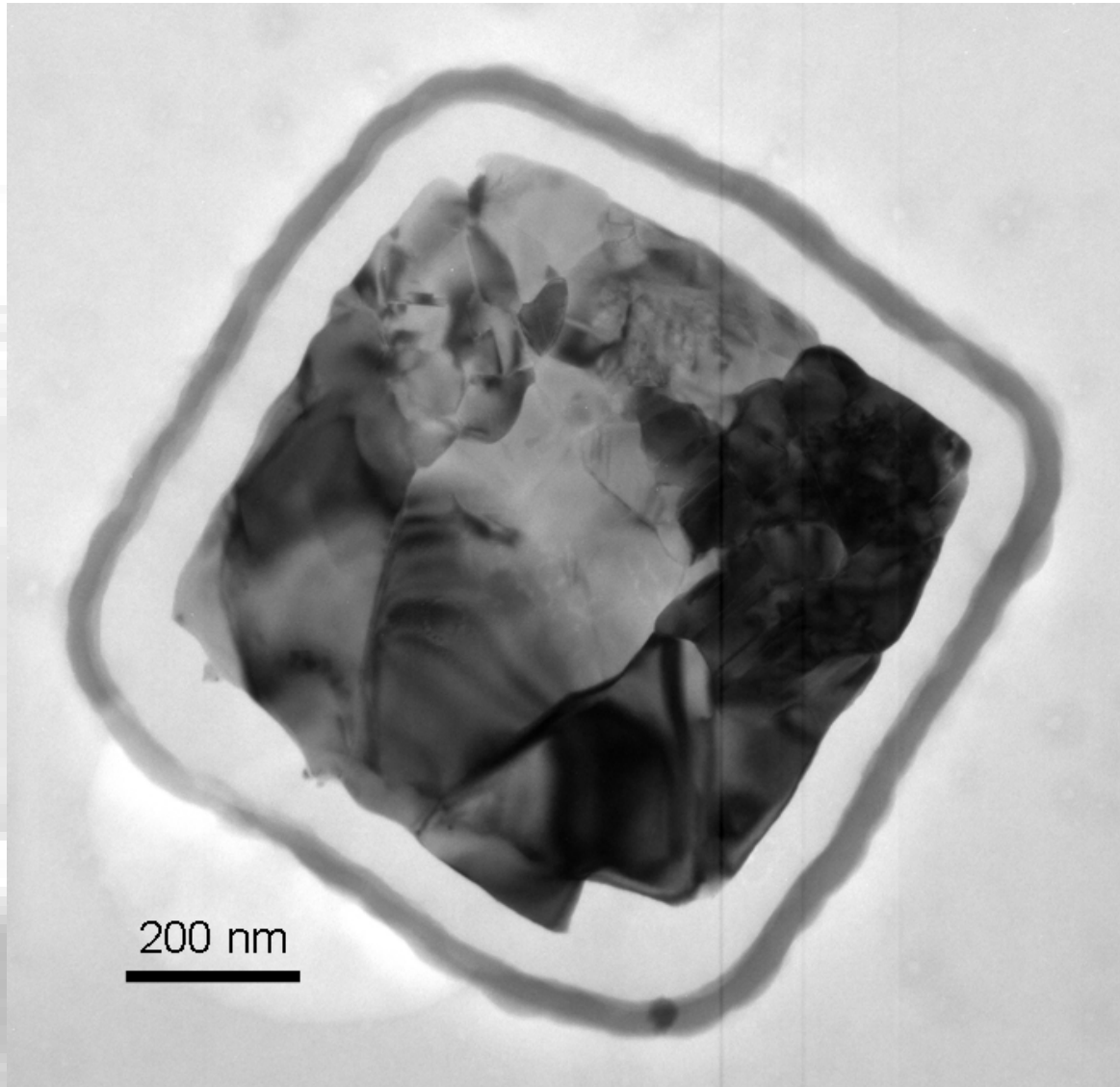
**Bright field
TEM of
crystallized
germanium
island on
silicon nitride
membrane
(50nm thin)**

Magnification (3"x4" image): 70,000X
Submitted by: F. Crnogorac

Instrument (Make and Model): Phillips C-20 TEM
Affiliation: Stanford University



2010 EIPBN MicroGraph Contest



**Micrograph
Title:
Crooked Still
Life Painting**

Description:

**Bright field
TEM of
crystallized
germanium
island
encapsulated
by silicon
nitride (50nm
thin)**

**Magnification (3"x4" image): 140,000X
Submitted by: F. Crnogorac**

**Instrument (Make and Model): Phillips C-20 TEM
Affiliation: Stanford University**



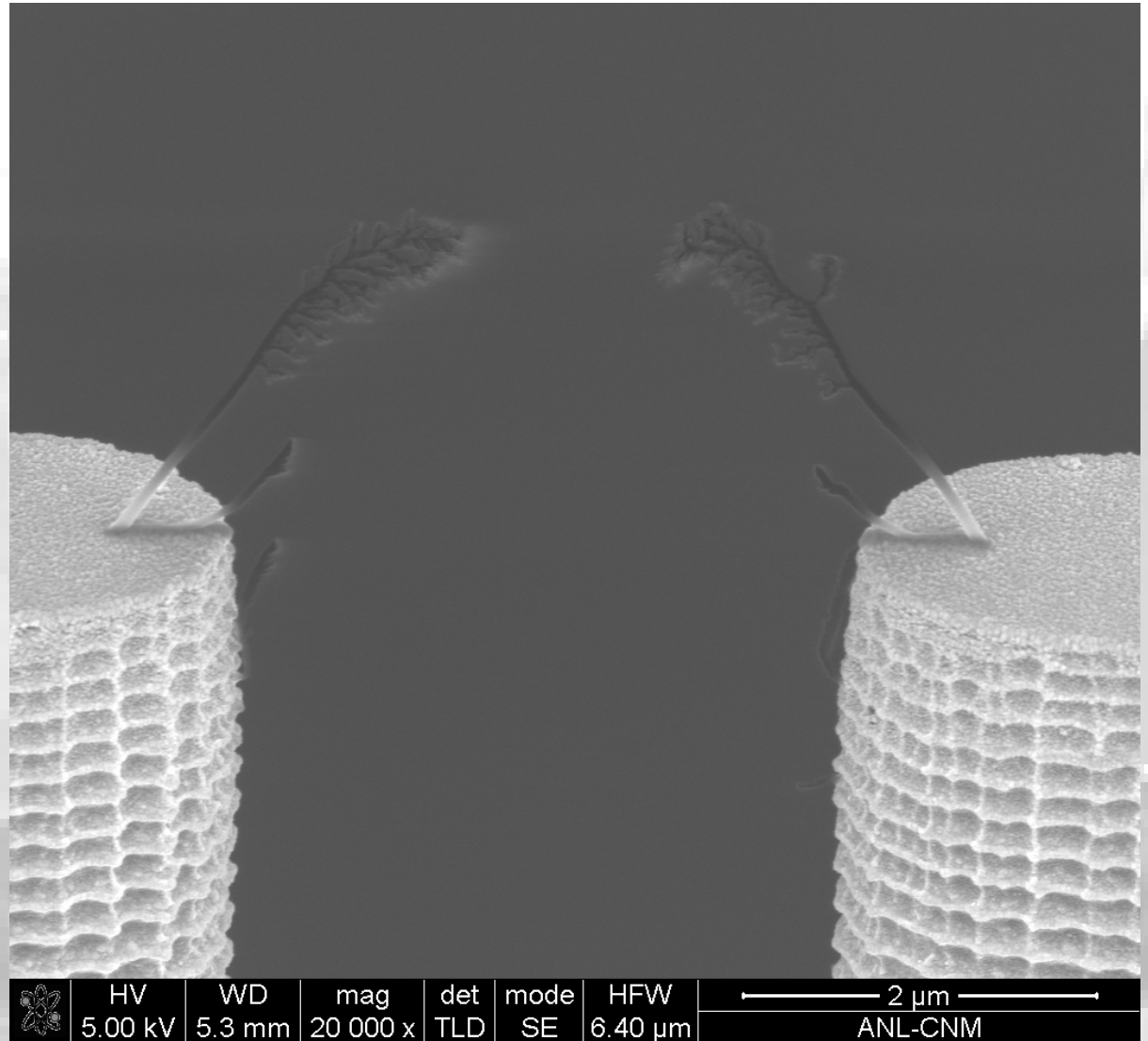
2010 EIPBN MicroGraph Contest

Micrograph Title:

Desire

Description:

The branching structures are made by e-beam deposition from TEOS precursor in an attempt to bridge the gap between the Bosch-etched Si fingers. The growth process was based on two single line scans (e-beam normal to the surface at 0° stage tilt) starting from the fingers and proceeding towards the center of the gap in between them. The SEM image was taken at 54° stage tilt. The surface of the Si fingers was covered with 50 nm gold prior the TEOS deposition.



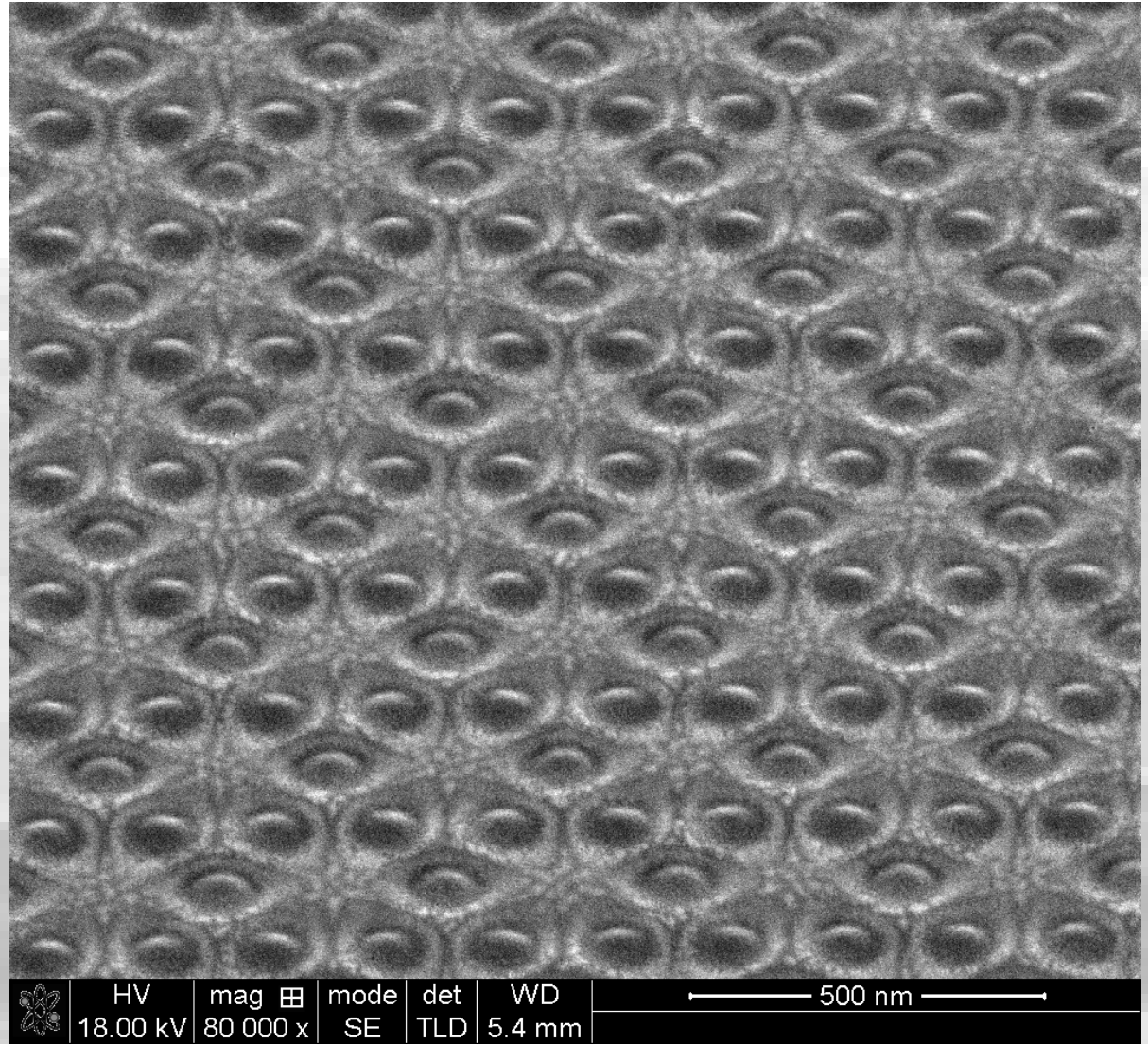
Magnification (3"x4" image): 20 KX

Submitted by: A. Joshi-Imre & I. W. Jung
Lab.

Instrument (Make and Model): FEI Nova NanoLab
Affiliation: Center for Nanoscale Materials, Argonne Nat. Lab.



2010 EIPBN MicroGraph Contest



Micrograph Title:

When the pattern ends up beating the spatial resolution of your patterning tool

Description:

The finely structured surface unexpectedly evolved when trying to pattern circular islands on a kagome lattice into carboniferous film (with metal and dielectric layers underneath) by 30kV Ga focused ion beam. SEM image was taken at 54 degree stage tilt.

Magnification (3"x4" image): 80 KX

Submitted by: A. Joshi-Imre & C. Phatak

Instrument (Make and Model): FEI Nova NanoLab

Affiliation: Center for Nanoscale Materials, Argonne Nat. Lab.



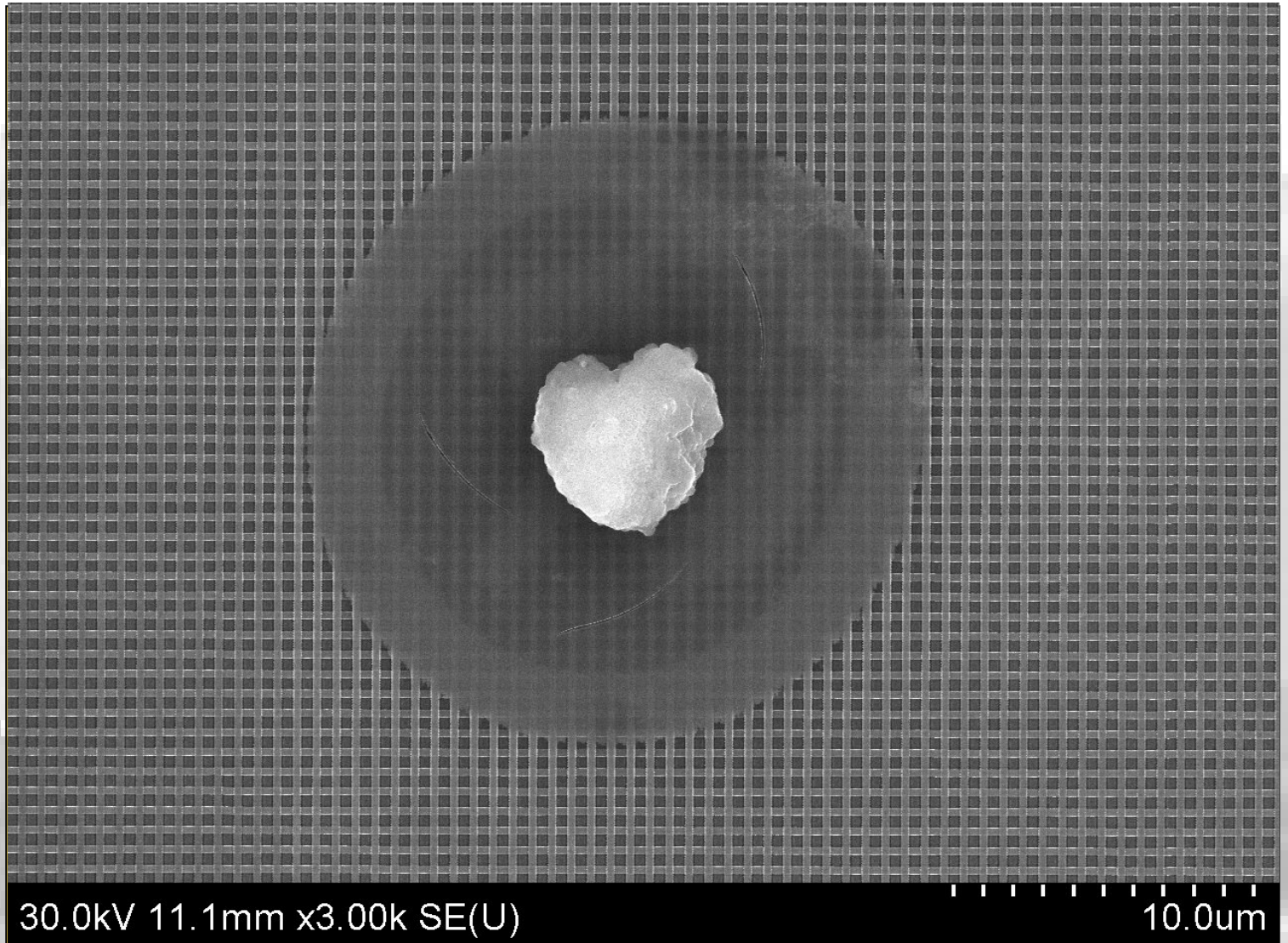
2010 EIPBN MicroGraph Contest

Micrograph Title:

Trapped Heart

Description:

A heart-shaped dust particle randomly fell on the top of the Si 3D woodpile Photonic Crystal Structure.



Magnification (3"x4" image): 30,000X
Submitted by: Li Fan, Leo T. Varghese

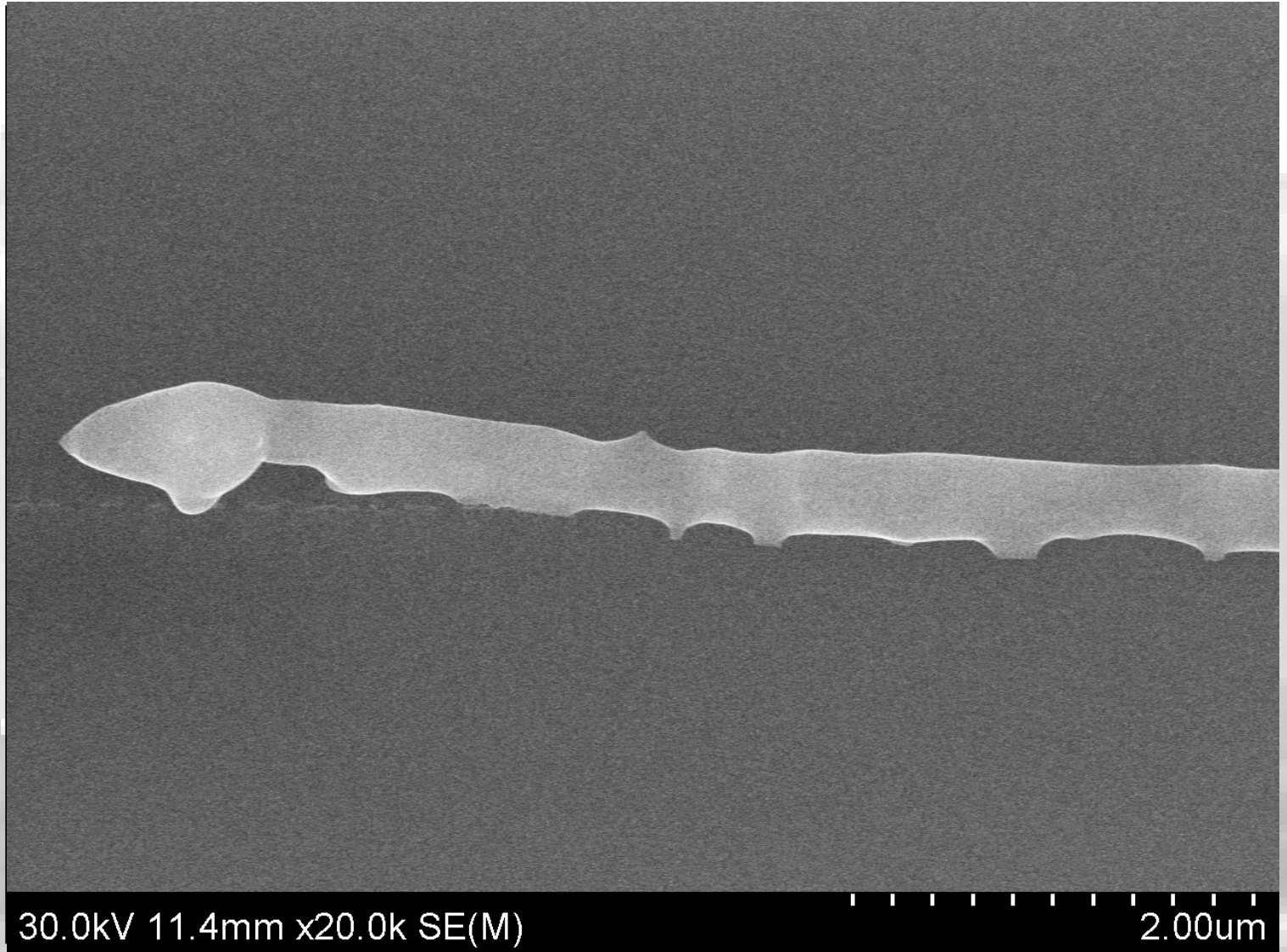
Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Caterpillar
Looking for
Food**

**Description:
This is a SEM
picture of the
broken edge of
a Si beam. The
beam was
fabricated to
be suspended
above the Si
substrate but
melted under
high energy
during
experiments.**



**Magnification (3"x4" image): 20,000X
Submitted by: Li Fan, Leo T. Varghese**

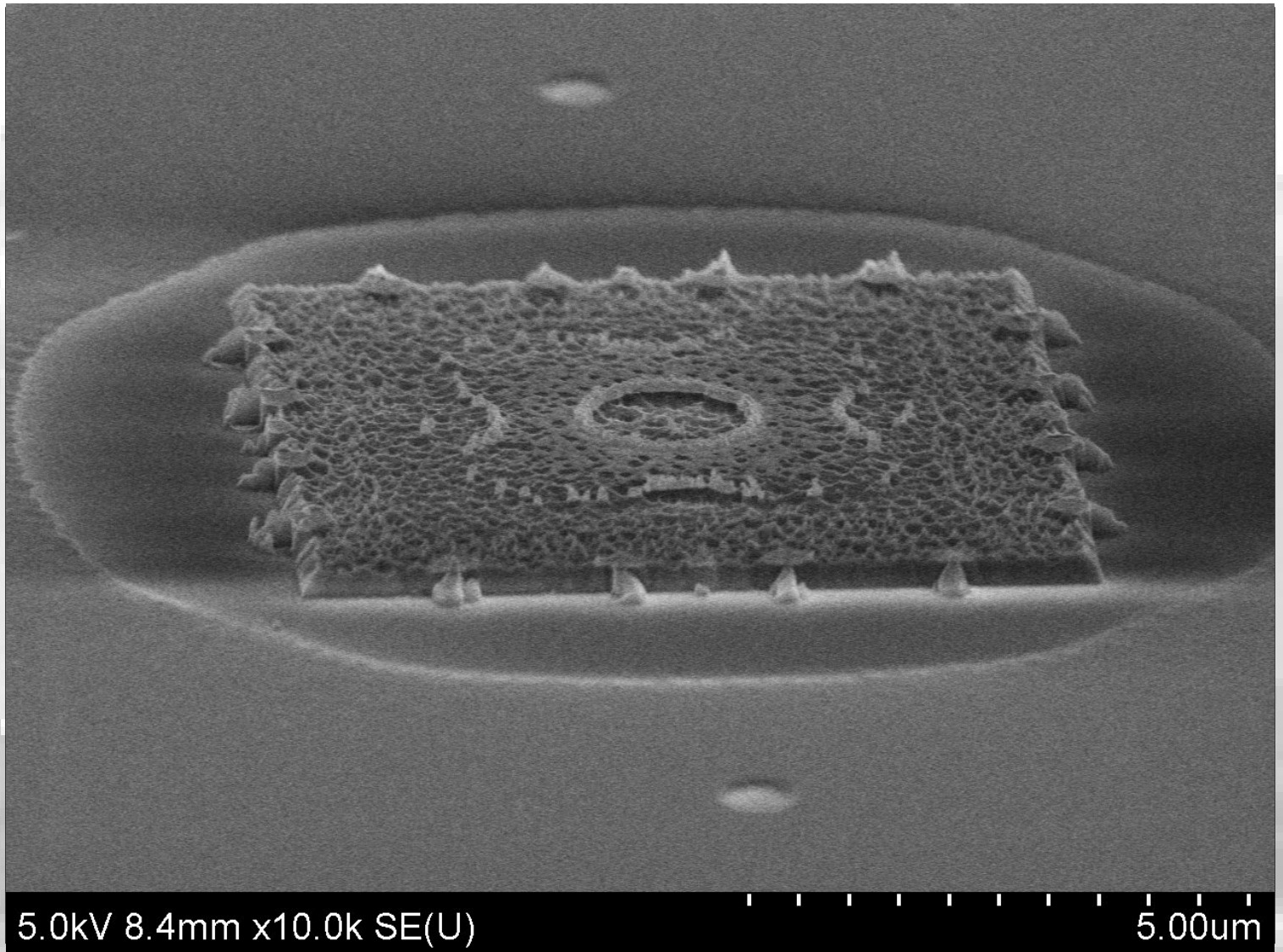
**Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University**



2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Relics of Old
Civilization**

Description:
The square is a Au alignment mark and the circle is e-beam resist which is exposed during e-beam lithography. The whole pattern is formed after 2min etch in Cl_2 plasma.



Magnification (3"x4" image): 10,000X

Submitted by: Li Fan, Leo T. Varghese

Instrument: Hitachi S-4800 Field Emission SEM

Affiliation: Birck Nanotechnology Center, Purdue University

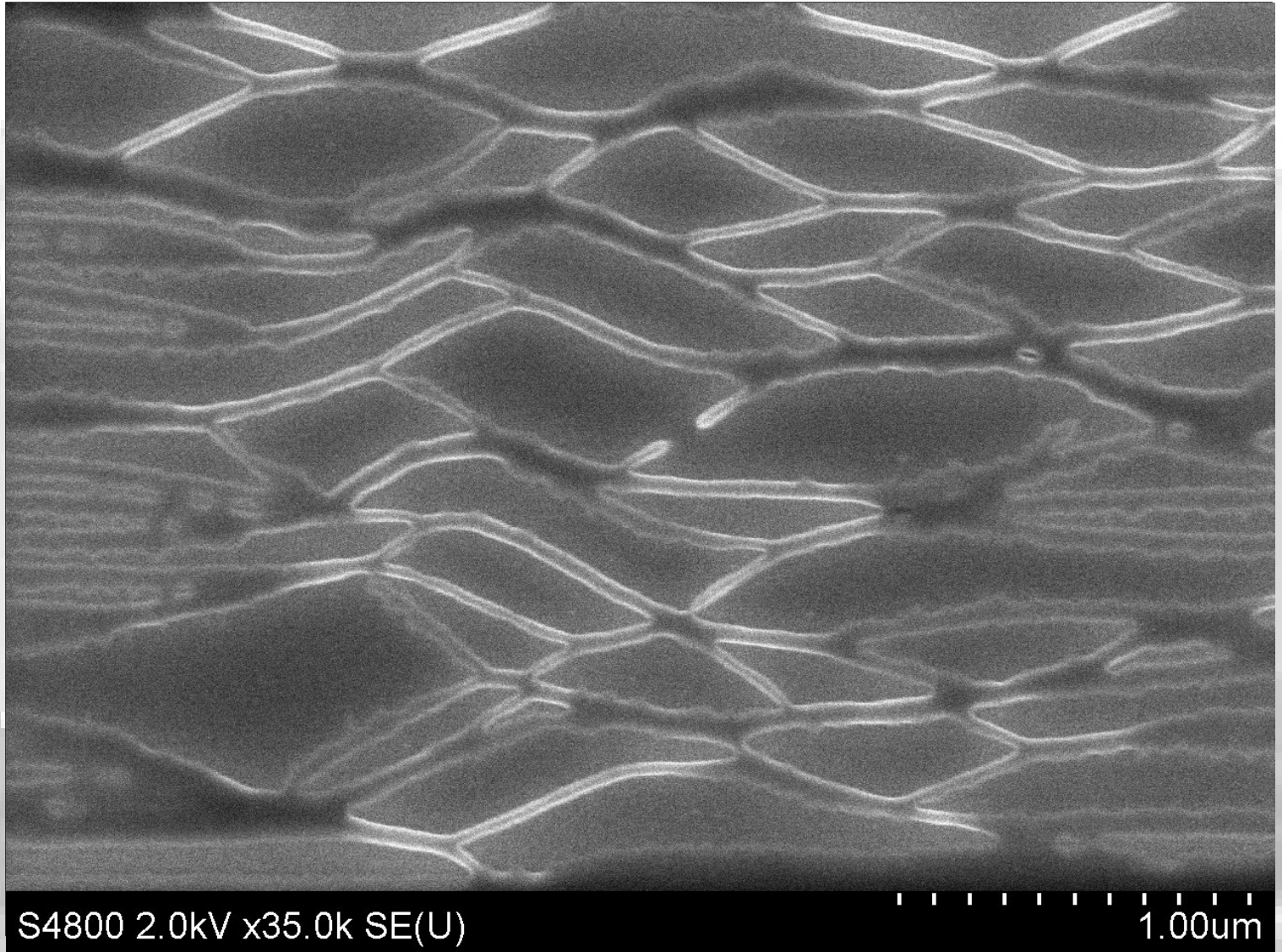


2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Broken Net**

Description:

The PMMA resist collapsed on the Si substrate after development. The light and shadow creates an interesting scenery. How big were the fish escaping through the net?



**Magnification (3"x4" image): 35,000X
Submitted by: Li Fan, Leo T. Varghese**

**Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University**



2010 EIPBN MicroGraph Contest

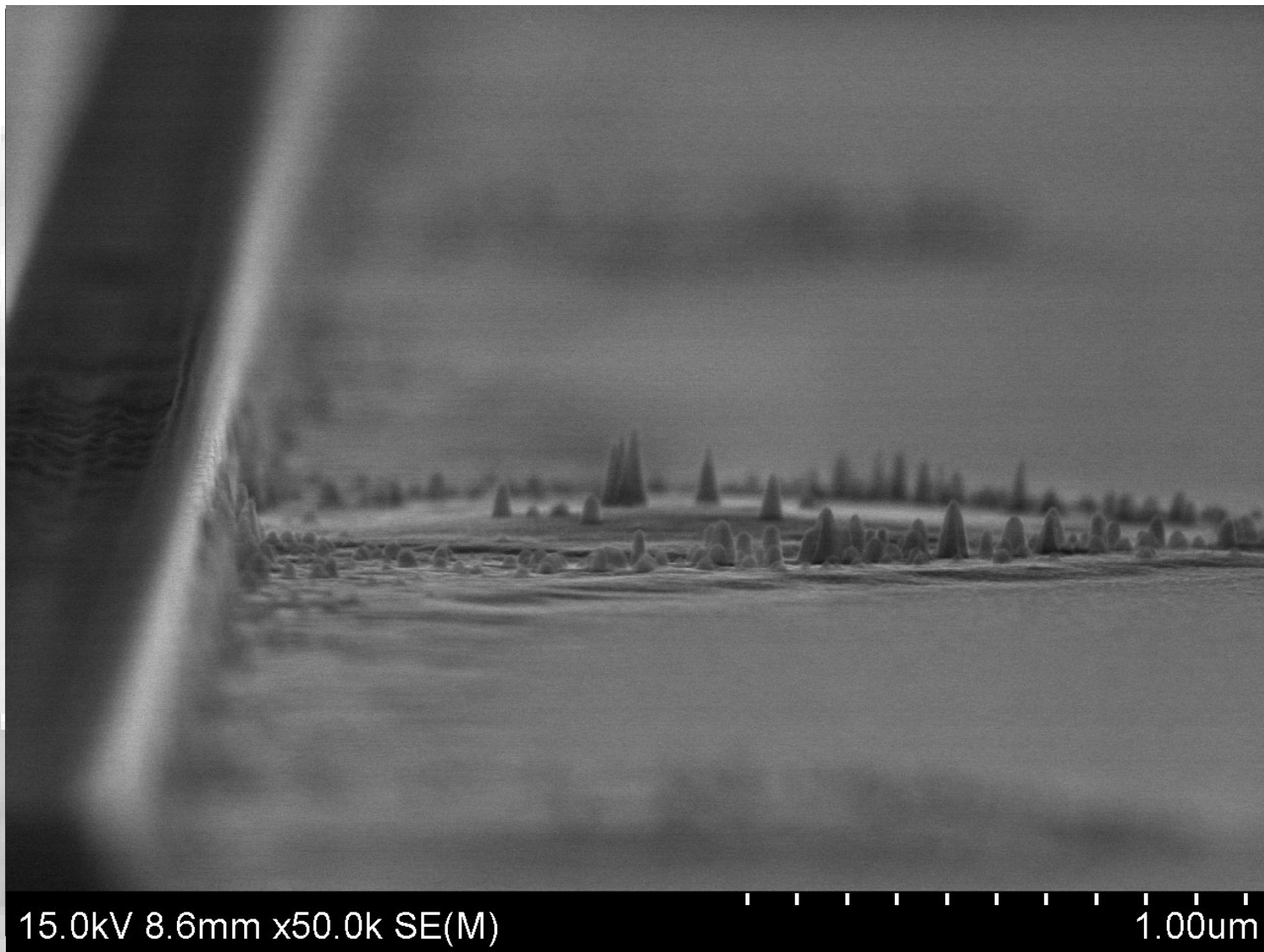
Micrograph Title:

City skyline from the bridge

Description:

A prosperous city is developing beside the giant bridge.

Actually it is a Si structure after etching. The surface was slightly contaminated and therefore formed some interesting scenario.



Magnification (3"x4" image): 50,000X
Submitted by: Li Fan, Leo T. Varghese

Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University

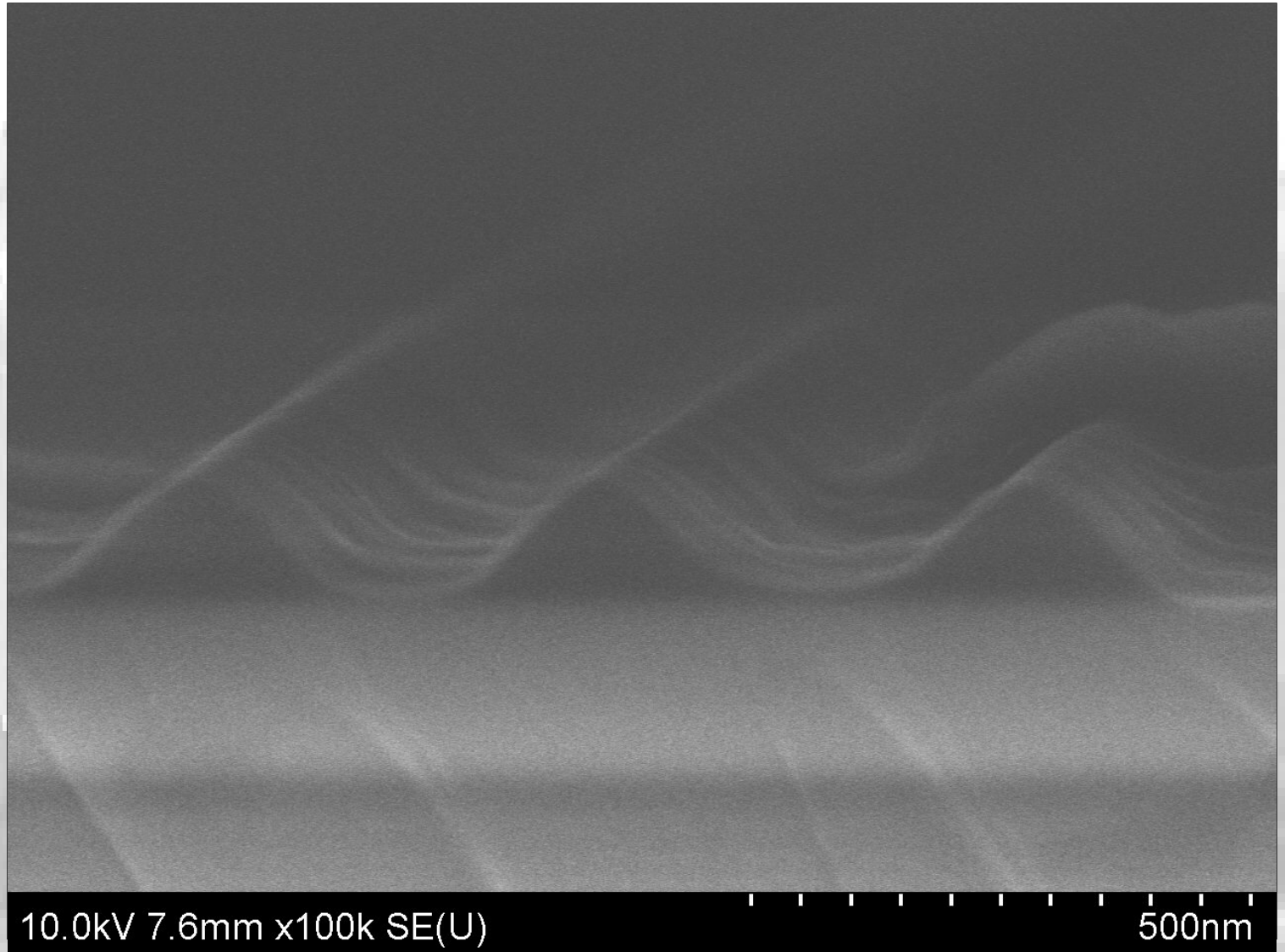


2010 EIPBN MicroGraph Contest

Micrograph

Title:
Smoky
Mountain
Ridges

Description:
Three parallel
mountains and
valleys are formed
on the Si chip. The
triangle shape is
because the
Reactive Ion
Etching conditions
are not correct. You
can even see the
clouds gathering on
the peak, which is
actually the
remaining resist.

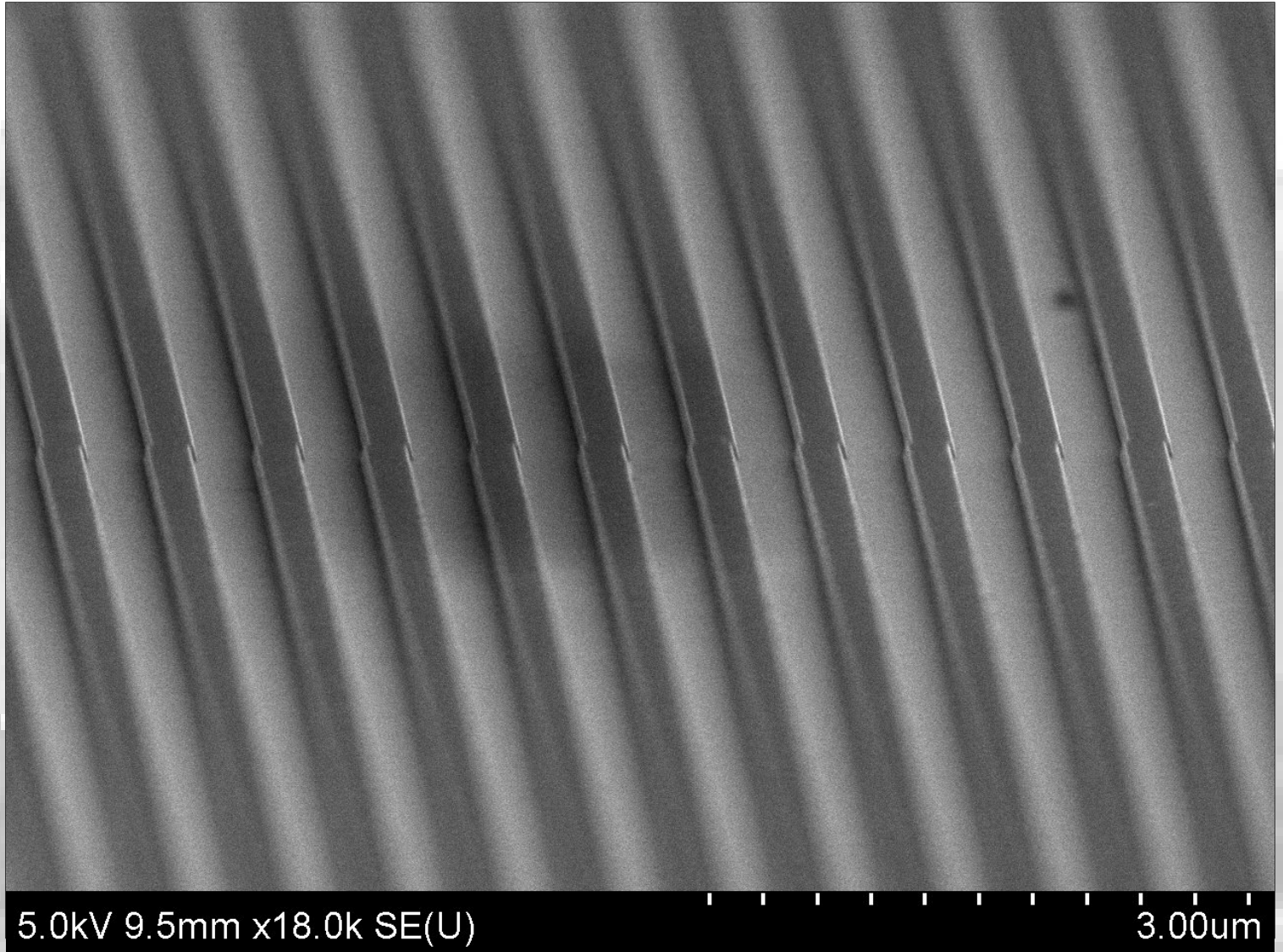


Magnification (3"x4" image): 100,000X
Submitted by: Li Fan, Leo T. Varghese

Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



**Micrograph
Title:
Shifted
Roads**

**Description:
All the Si lines
are broken into
two parts with
a slight shift of
less than
50nm, caused
by the
stitching of the
electron-beam
lithography.**

**Magnification (3"x4" image): 18,000X
Submitted by: Li Fan, Leo T. Varghese**

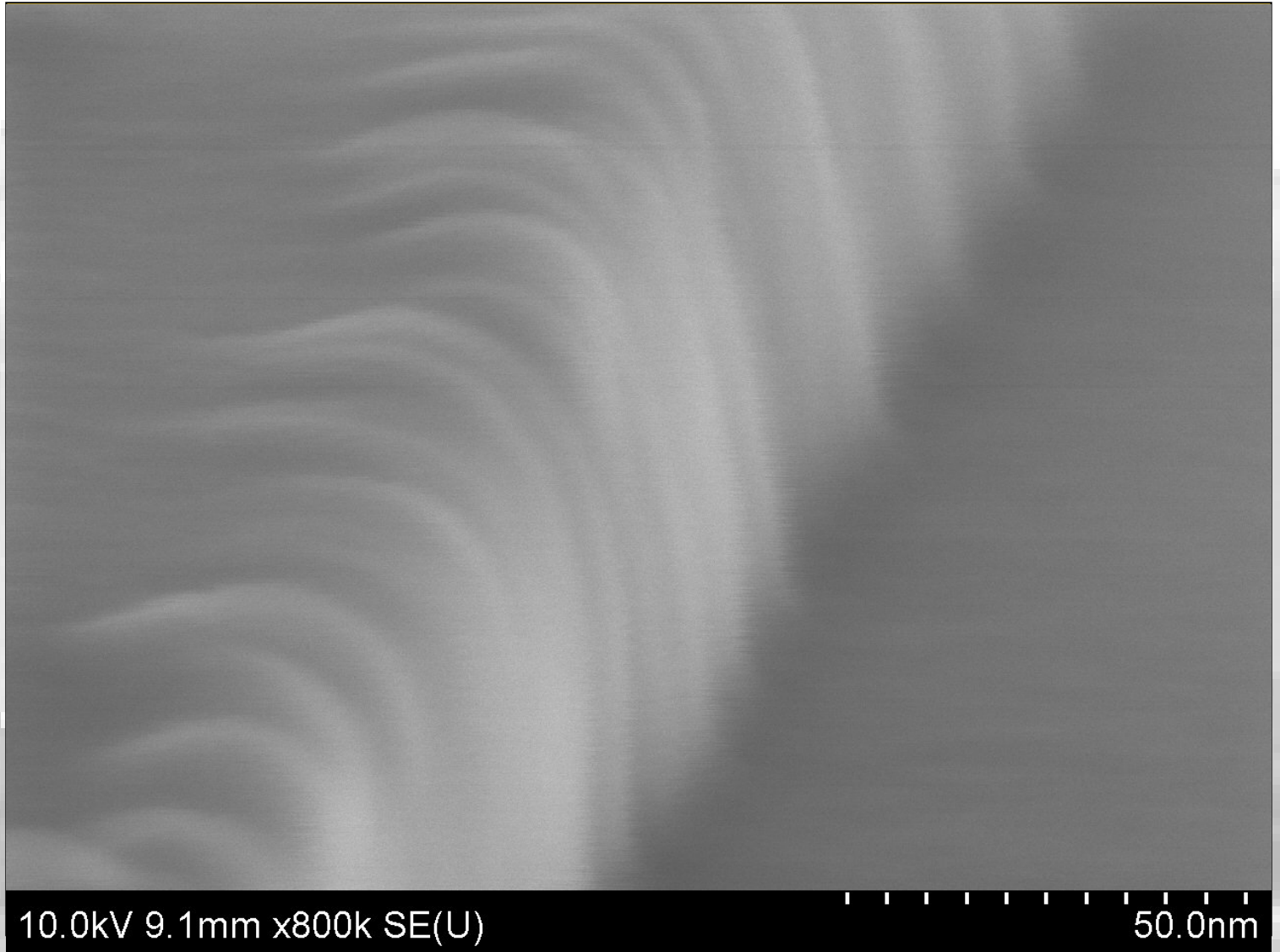
**Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University**



2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Niagara Falls**

Description:
The SEM picture shows the remaining resist on the edge and side wall of a Si structure after development. The resist looks like giant water streams falling rapidly down the slope.



Magnification (3"x4" image): 800,000X
Submitted by: Li Fan, Leo T. Varghese

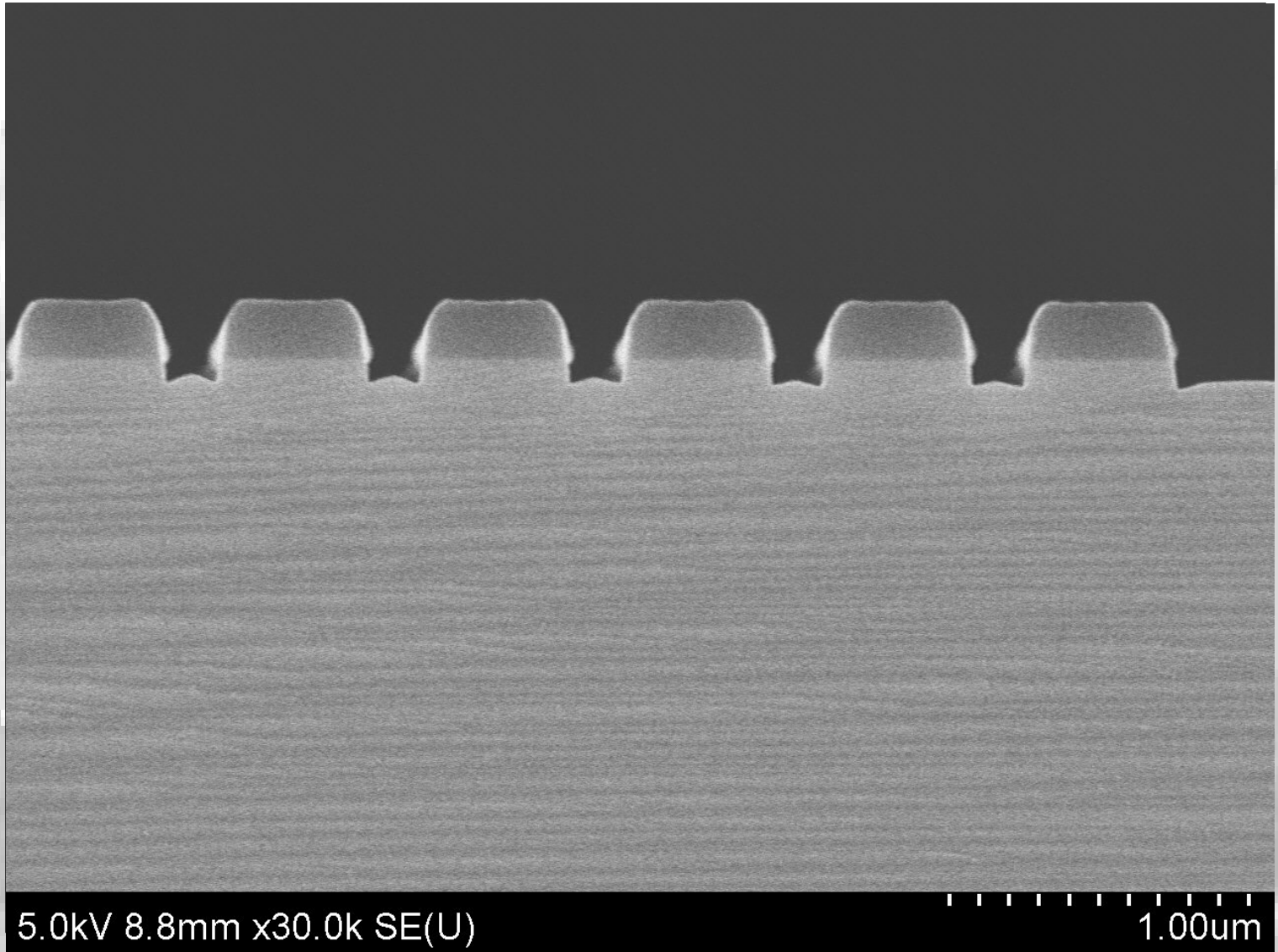
Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Mini Mushrooms**

Description:
The cross-sections
of these Si gratings
look like
mushrooms
popping out from
the soil. The shape
is because of not
optimized etching
conditions. The dark
areas are resist and
the light areas are
Si.



Magnification (3"x4" image): 30,000X
Submitted by: Li Fan, Leo T. Varghese

Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University



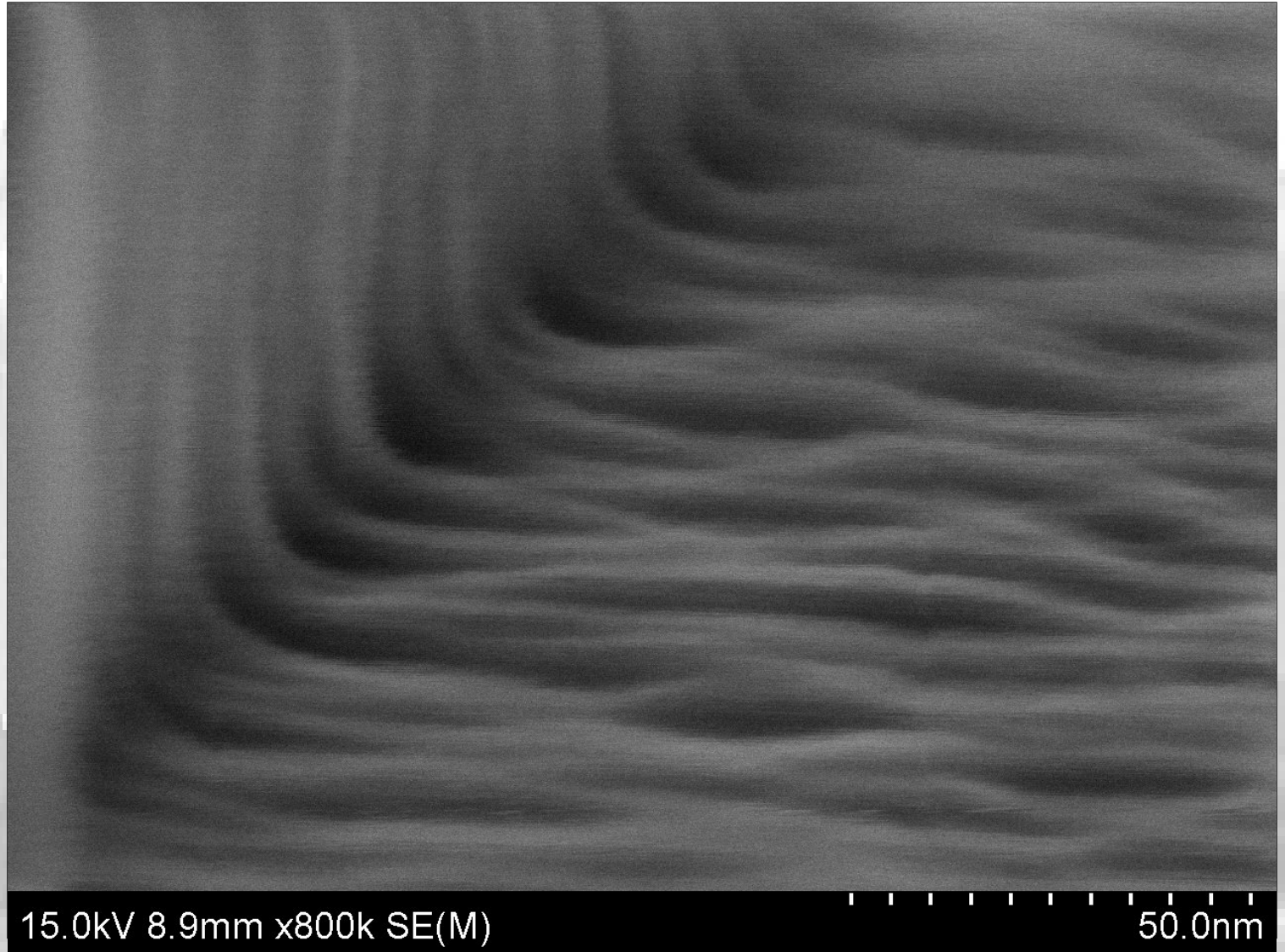
2010 EIPBN MicroGraph Contest

**Micrograph
Title:**

Water Flow

Description:

Water gathering from the water fall forms river. You can feel the ripples on the surface as if it is flowing. Both sidewall and bottom textures are photoresist on the Si structure after development.



Magnification (3"x4" image): 800,000X
Submitted by: Li Fan, Leo T. Varghese

Instrument (Make and Model): Hitachi S-4800 Field Emission SEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest

**Micrograph
Title: Hedge
Maze**

**Description: :
Unknown
source of
contamination
on silicon
wafer after
PMMA resist
strip.**



**Magnification (3"x4" image): 70x
Submitted by: Steven Hickman**

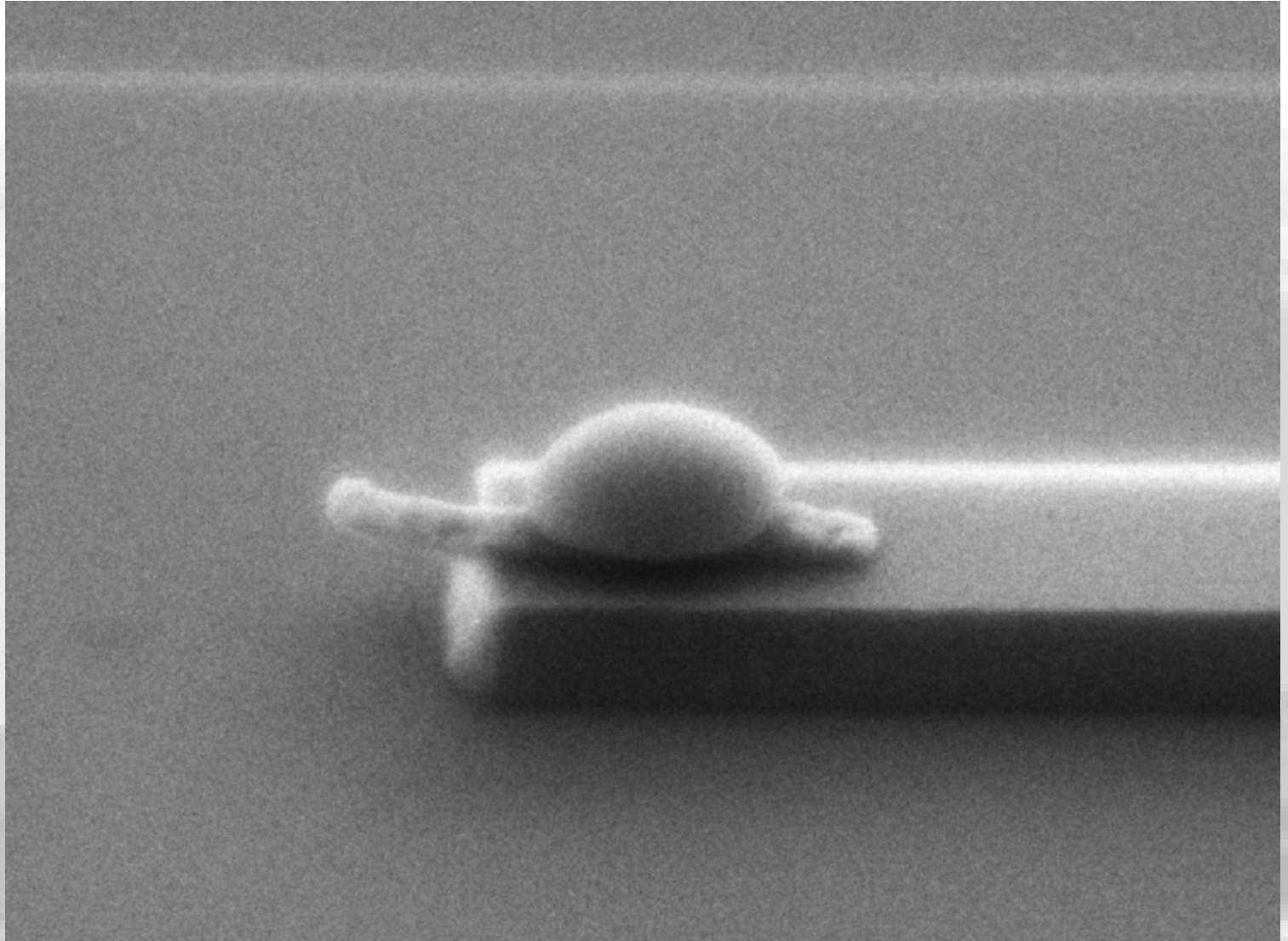
**Instrument (Make and Model): Zeiss Ultra55
Affiliation: Cornell University**



2010 EIPBN MicroGraph Contest

**Micrograph
Title: Snail**

**Description: :
Rod of cobalt
overhanging a
larger silicon
rod, with the
"shell" formed
by cobalt
chloride.**



**Magnification (3"x4" image): 29000x
Submitted by: Steven Hickman**

**Instrument (Make and Model): Zeiss Ultra55
Affiliation: Cornell University**



2010 EIPBN MicroGraph Contest

**Micrograph
Title: Natural
Bridge**

**Description: :
Ridge of
silicon
transformed
into bridge
after
potassium
hydroxide
etch. Top
roughness
caused by
silicon oxide
micromasking**

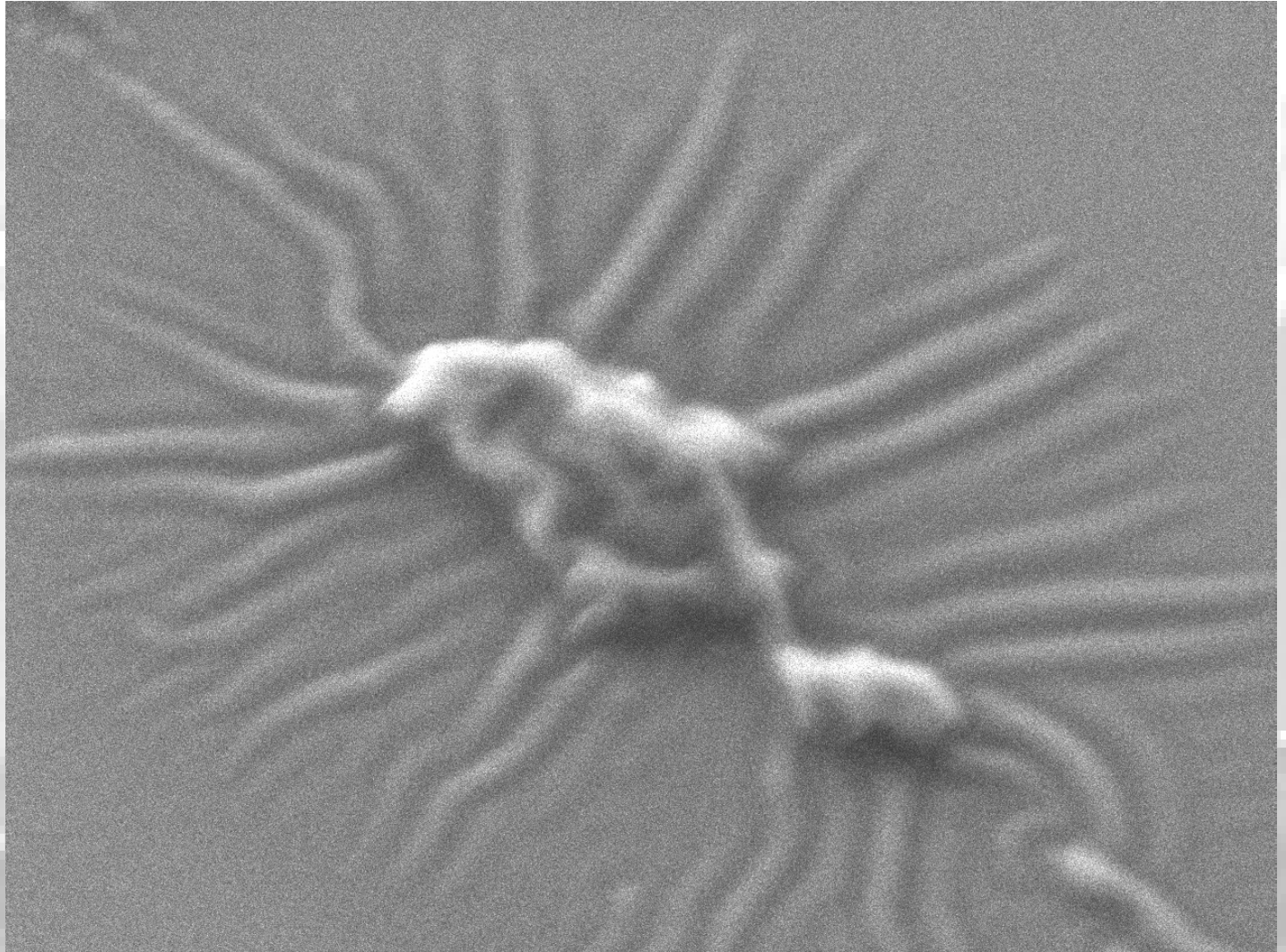


**Magnification (3"x4" image): 124x
Submitted by: Steven Hickman**

**Instrument (Make and Model): Zeiss Ultra55
Affiliation: Cornell University**



2010 EIPBN MicroGraph Contest



**Micrograph
Title:
Flagellated
Protozoan**

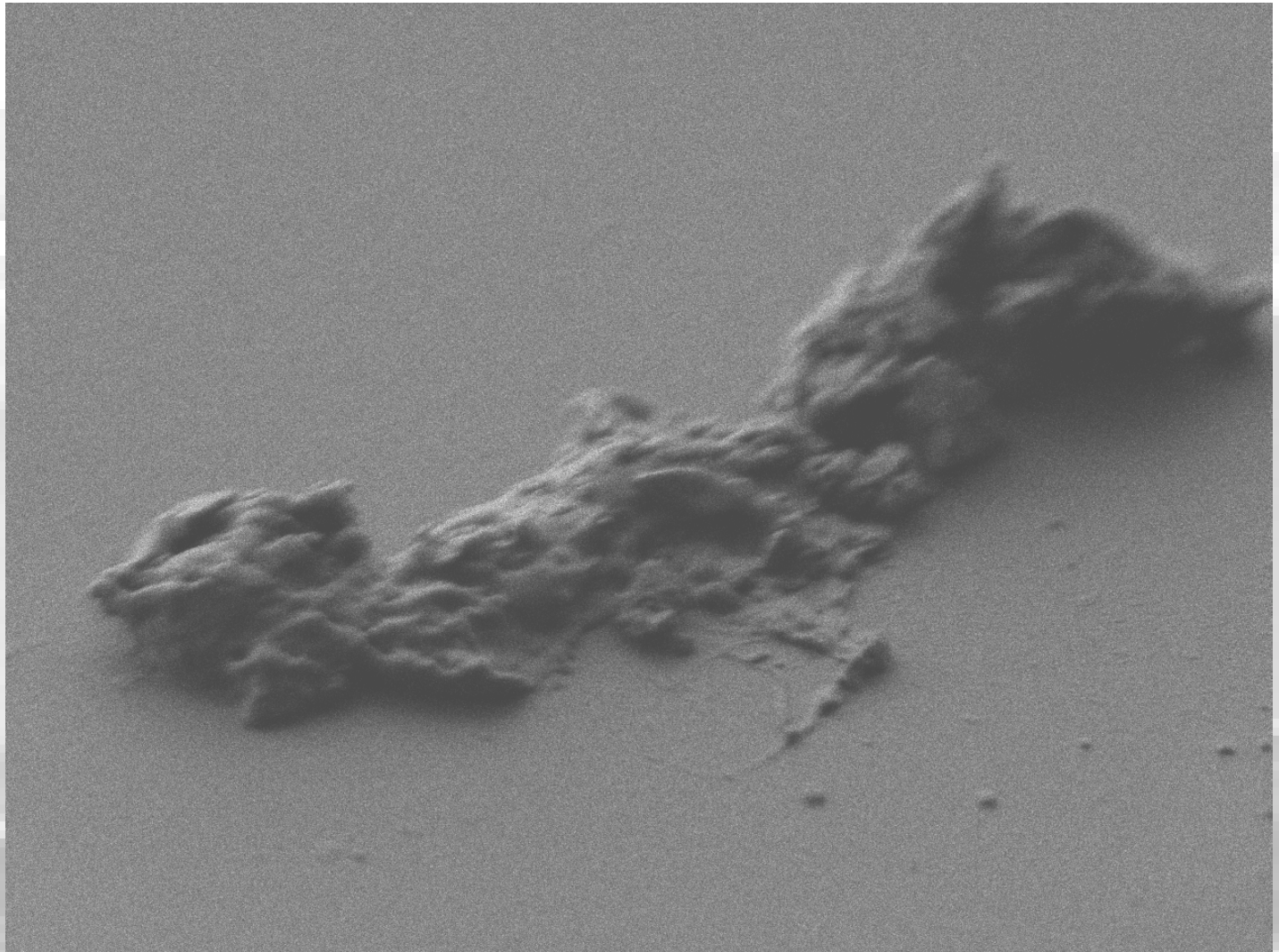
**Description:
There seem to be
some polymeric
residues on the
surface.**

**Magnification : x12,000
Submitted by: Kontziampasis Dimitrios**

**Instrument (Make and Model): JEOL JSM-7401F SEM
Affiliation: N.C.S.R. "Demokritos"**



2010 EIPBN MicroGraph Contest



**Micrograph
Title: Silicon
Fox**

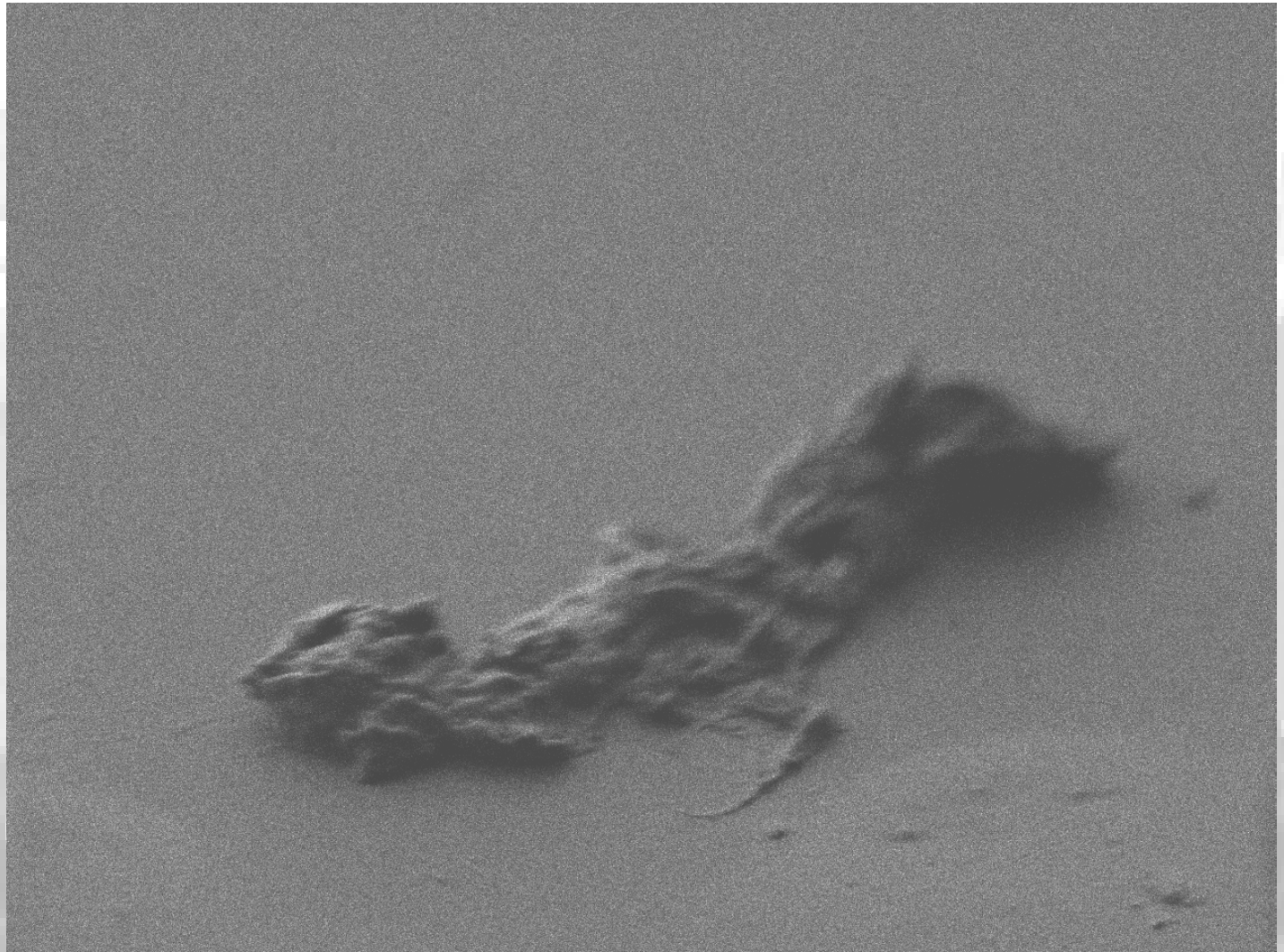
**Description:
Fox-like dust on
sample**

**Magnification : x9,500
Submitted by: Kontziampasis Dimitrios**

**Instrument (Make and Model): JEOL JSM-7401F SEM
Affiliation: N.C.S.R. "Demokritos"**



2010 EIPBN MicroGraph Contest



**Micrograph
Title: Silicon
Fox II**

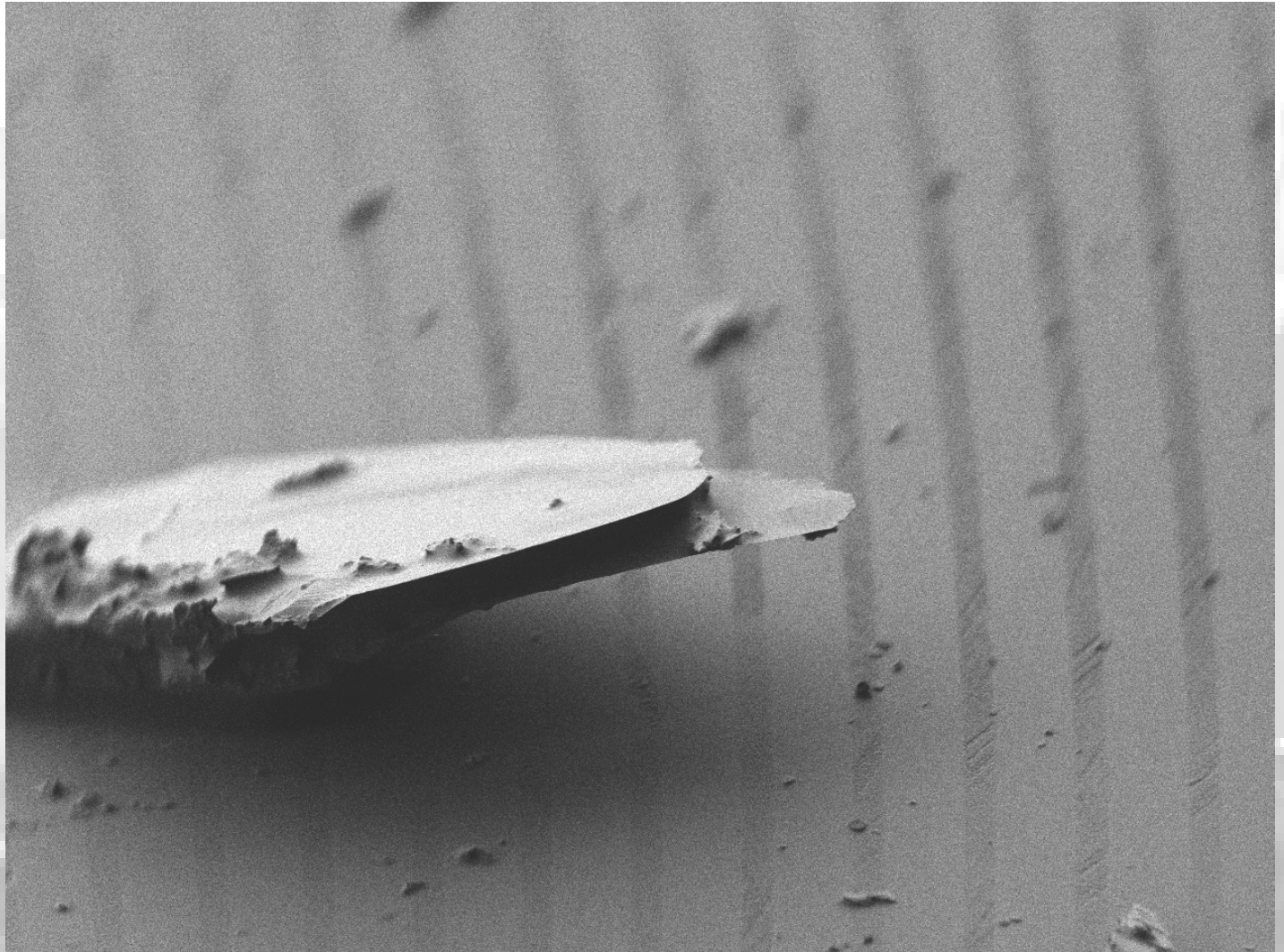
**Description:
Fox-like dust on
sample (Wider
View)**

**Magnification : x7,000
Submitted by: Kontziampasis Dimitrios**

**Instrument (Make and Model): JEOL JSM-7401F SEM
Affiliation: N.C.S.R. "Demokritos"**



2010 EIPBN MicroGraph Contest



**Micrograph
Title: The
Rock**

**Description:
Dust or not?**

**Magnification : x1,200
Submitted by: Kontziampasis Dimitrios**

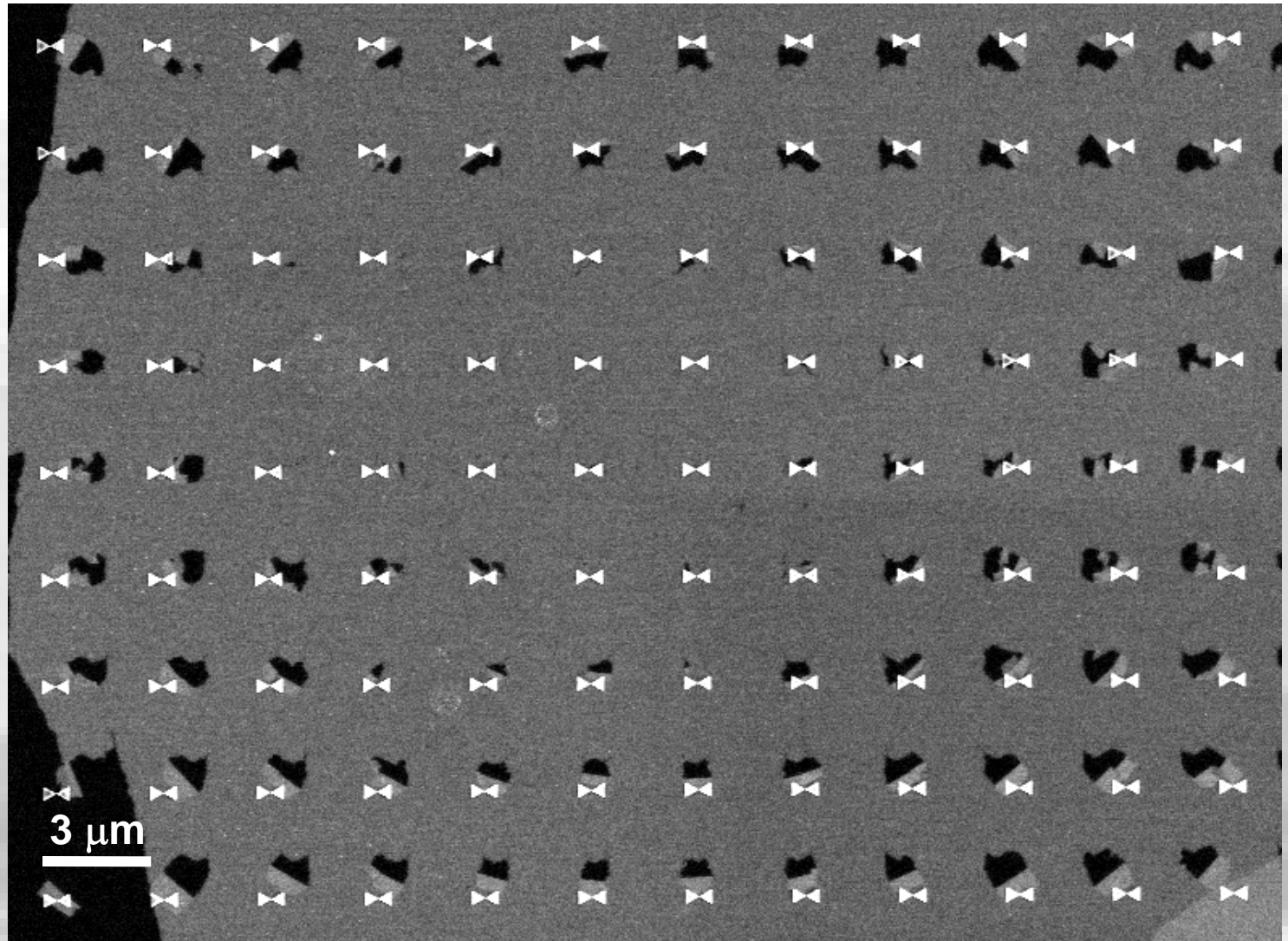
**Instrument (Make and Model): JEOL JSM-7401F SEM
Affiliation: N.C.S.R. "Demokritos"**



2010 EIPBN MicroGraph Contest

Micrograph Title:
Communication
over a nano-
landscape

Description:
At an extreme
zoom in Google
Earth over
Nanoland, they
discovered
nano-bowtie
arrays are being
employed for
surveillance into
the macro-world

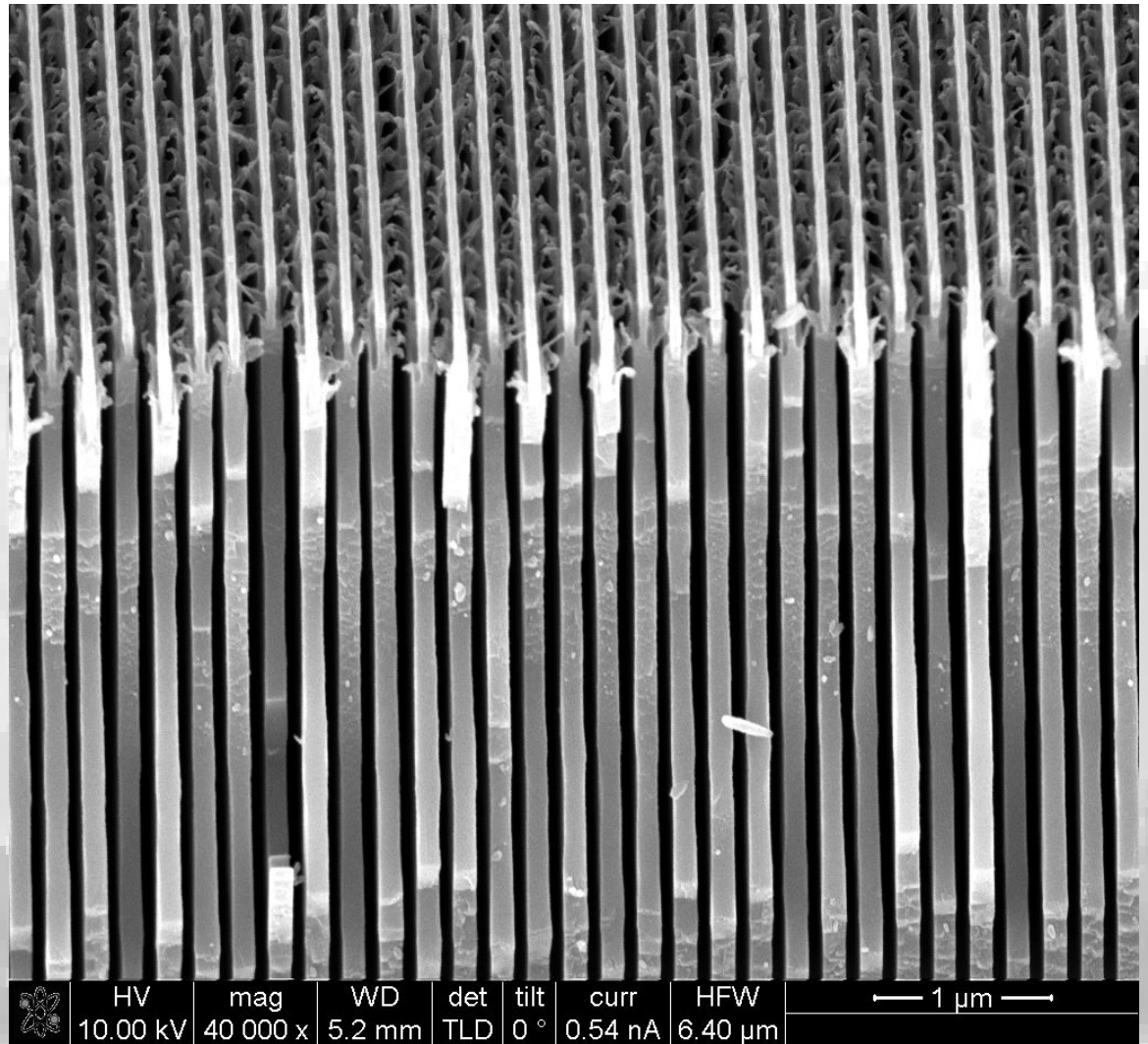


Magnification (3"x4" image): 2.2k
Submitted by: Anil Kumar

Instrument (Make and Model): Hitachi 4800 SEM
Affiliation: University of Illinois at Urbana-Champaign, IL, USA



2010 EIPBN MicroGraph Contest



Micrograph Title: Fields of Silicorn

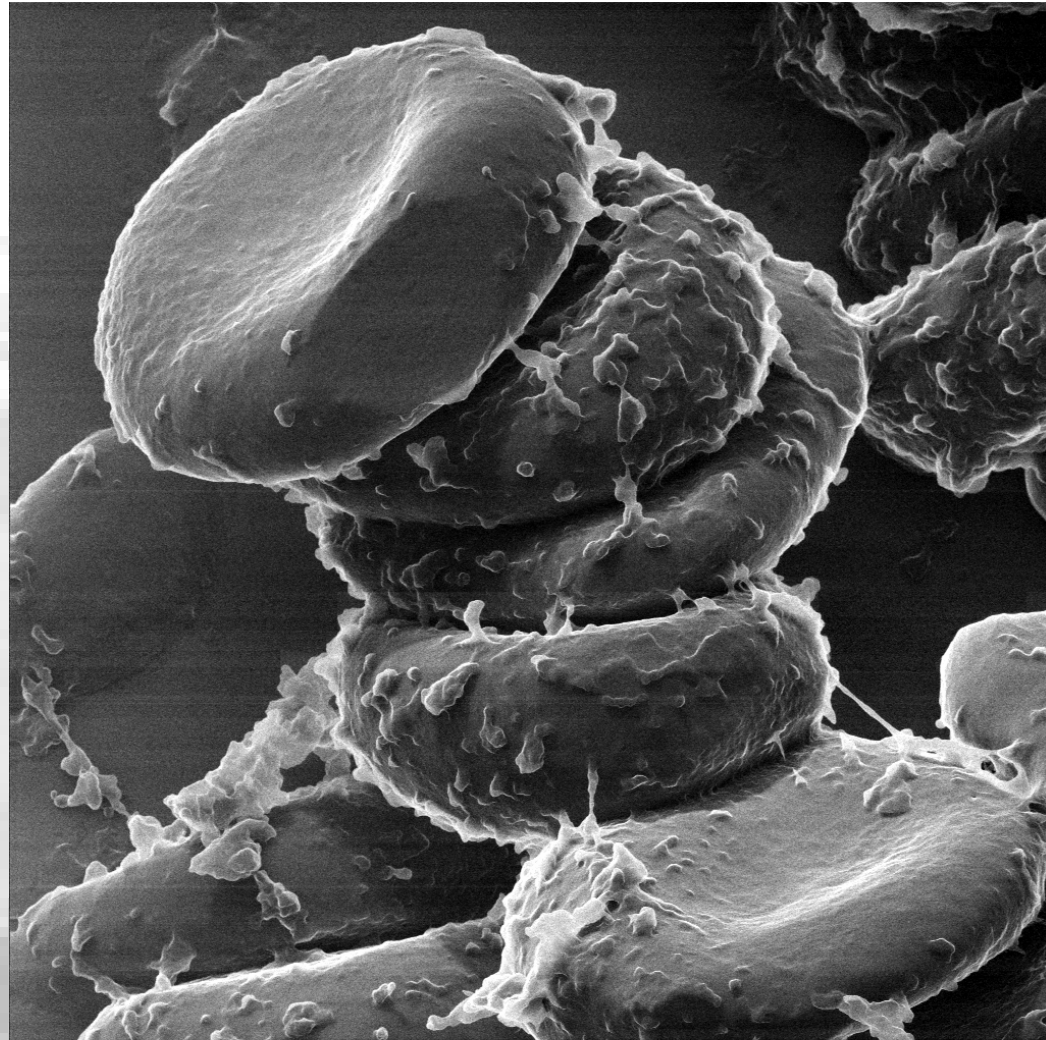
Description: When the nanogratings are fertilized by high bias SF₆, they flower into fields of silicorn, ready for harvest.


Magnification (3"x4" image): 40,000
Submitted by: Pran Mukherjee

Instrument (Make and Model): FEI Nova Nanolab
Affiliation: Massachusetts Institute of Technology



2010 EIPBN MicroGraph Contest



 CARL ZEISS SMT	Field Of View 9.50 um	1.00 um	Dwell Time 0.3 us	Date: 5/18/2010 Time: 4:09 PM
	Mag (4x5 Polaroid) 12,031.58 X	Blanker Current 0.9 pA	Line Averaging 128	Acceleration V 40.0 kV

Micrograph Title:
REALLY Short Stack

Description:
Platelets observed
stacked up inside a
blood vessel in a
section of bone

Magnification (3"x4" image): 10kX
Submitted by: Larry Scipioni

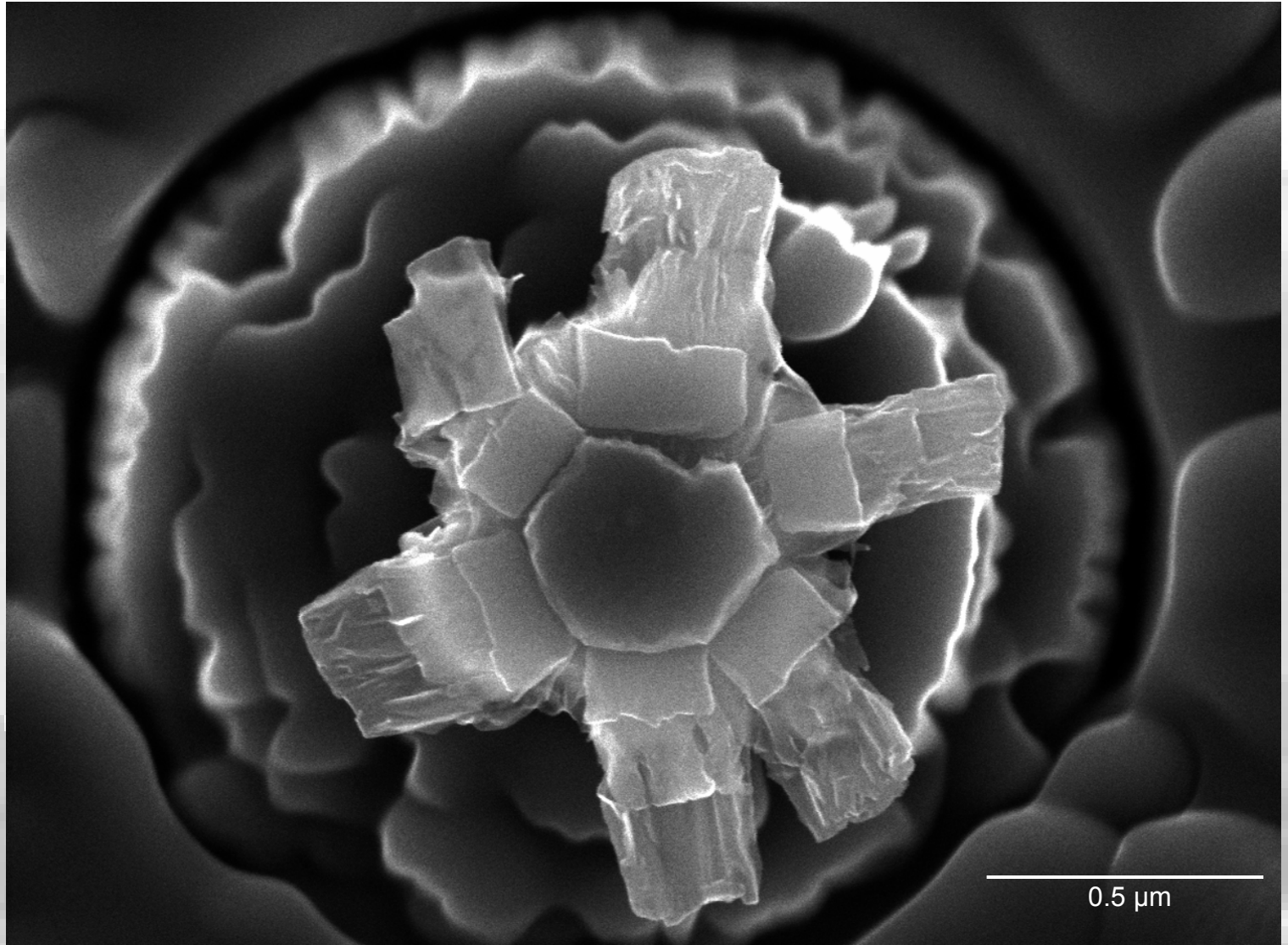
Instrument (Make and Model):
Affiliation: Carl Zeiss SMT, Inc.



2010 EIPBN MicroGraph Contest

Micrograph Title:
In-situ fracture of a carbon nanotube micro-pillar

Description:
Top-down view of a carbon-nanotube micro-pillar after failure at ~1 GPa stress.



Magnification (3"x4" image): 45000X

Instrument (Make and Model): Hitachi S4800 SEM

Submitted by: Siddhartha Pathak and William M. Mook

Affiliation: EMPA, Switzerland



2010 EIPBN MicroGraph Contest

Micrograph Title:
A fractal pine tree

Description: SU-8 residues after insufficient O₂ plasma on surface of Aluminum layer

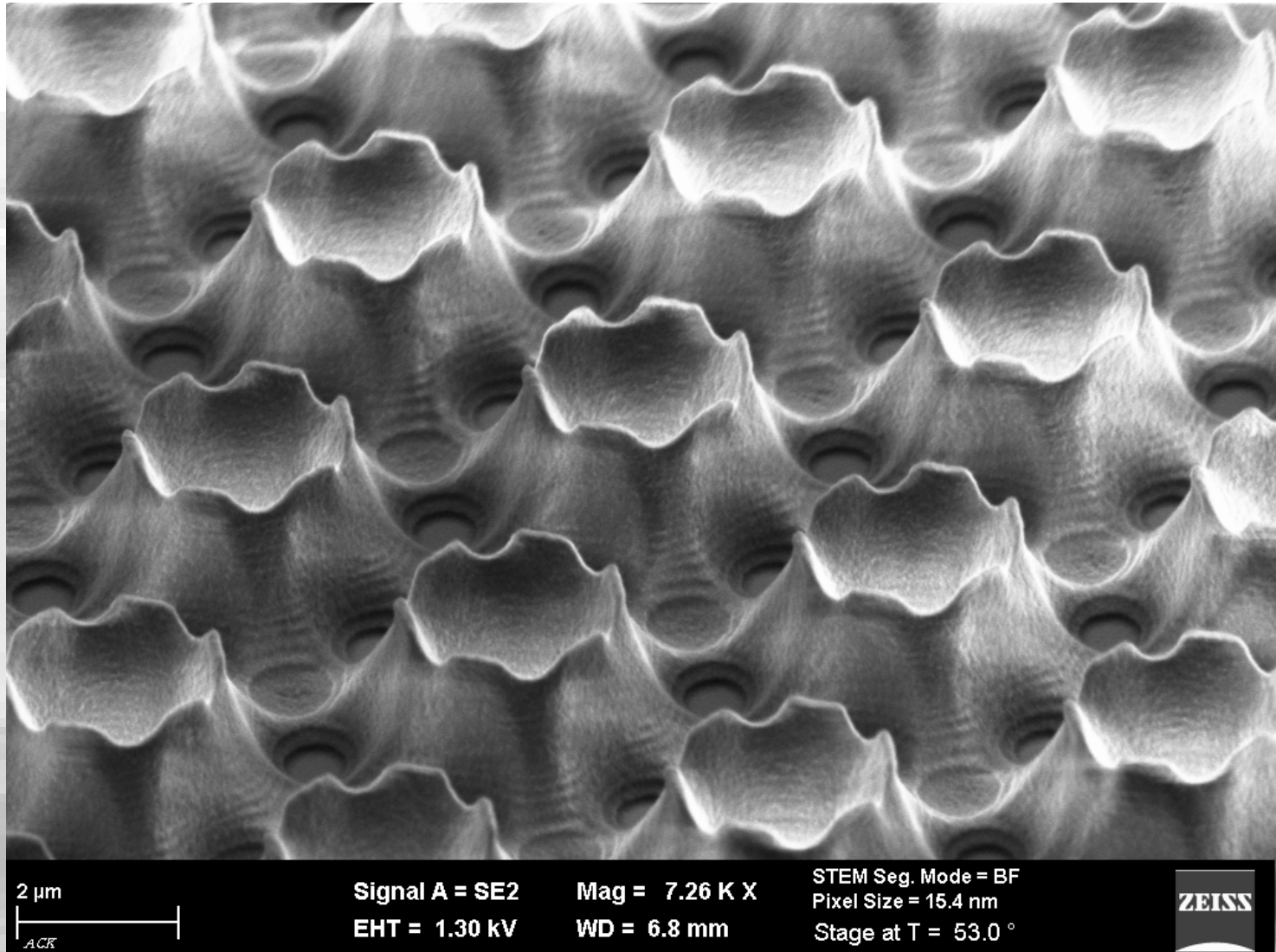


Magnification (3"x4" image): 143.4K X
Submitted by: Kyung-Hak Choi

Instrument (Make and Model): ZEISS SUPRA-40
Affiliation: The University of Texas at Dallas



2010 EIPBN MicroGraph Contest



**Micrograph
Title: Micro
Volcanoes**

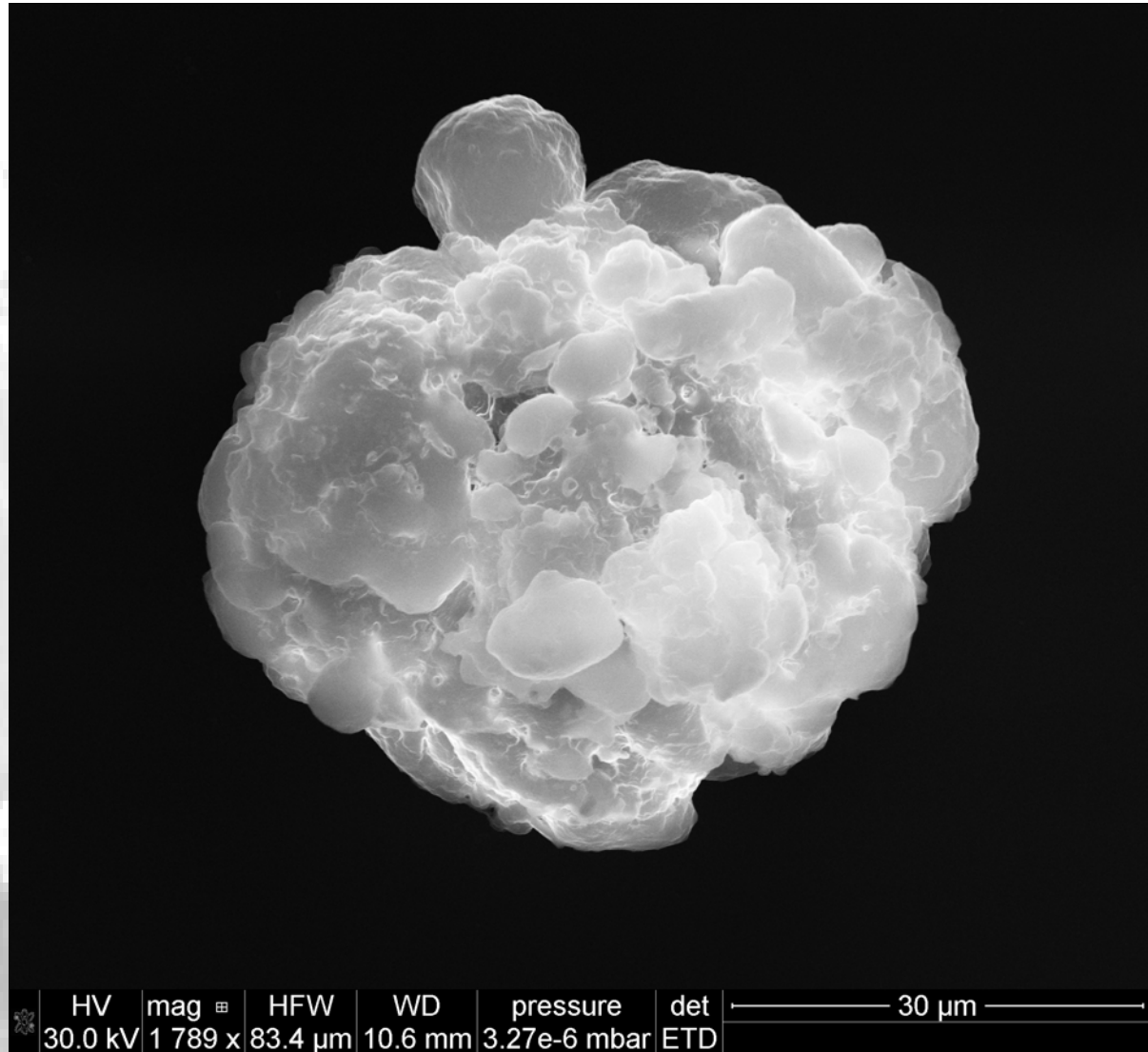
**Description:
Talbot lithography
using 1x full field
mask aligner with
100 μm exposure
gap**

**Magnification (3"x4" image): 7260x
Submitted by: Michael Hornung & Uwe Vogler**

**Instrument (Make and Model): ZEISS Ultra Plus
Affiliation: SUSS MicroTec**



2010 EIPBN MicroGraph Contest



Micrograph

Title:

New micro
asteroid
discovered!

Description:

Scouring the
surface of our
silicon world
we detect an
unknown
asteroid

Magnification (3"x4" image): 1789X

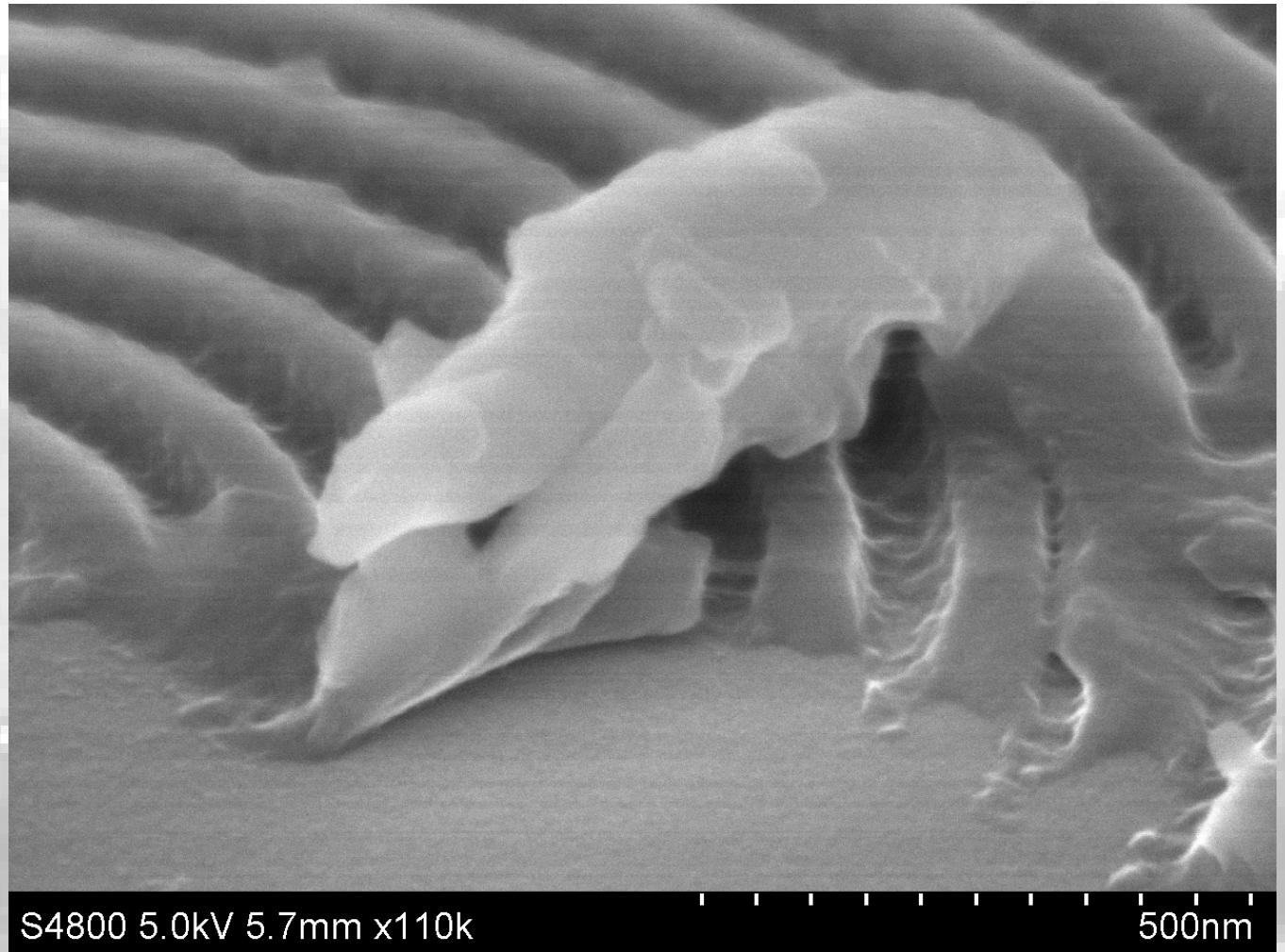
Submitted by: V.G. Kutshoukov and P. Kruit

Instrument (Make and Model): FEI Quanta 3D FEG

Affiliation: Delft University of Technology, The Netherlands



2010 EIPBN MicroGraph Contest



S4800 5.0kV 5.7mm x110k

500nm

Micrograph

Title:

Mice ate my
zoneplate

Description:

EUV lithography
100nm zoneplate
resist pattern or
what's left of it

Magnification (3"x4" image):

Submitted by: Simi George

Instrument (Make and Model): Hitachi FE-SEM S-4800

Affiliation: Lawrence Berkeley National Laboratory, Berkeley, CA, USA



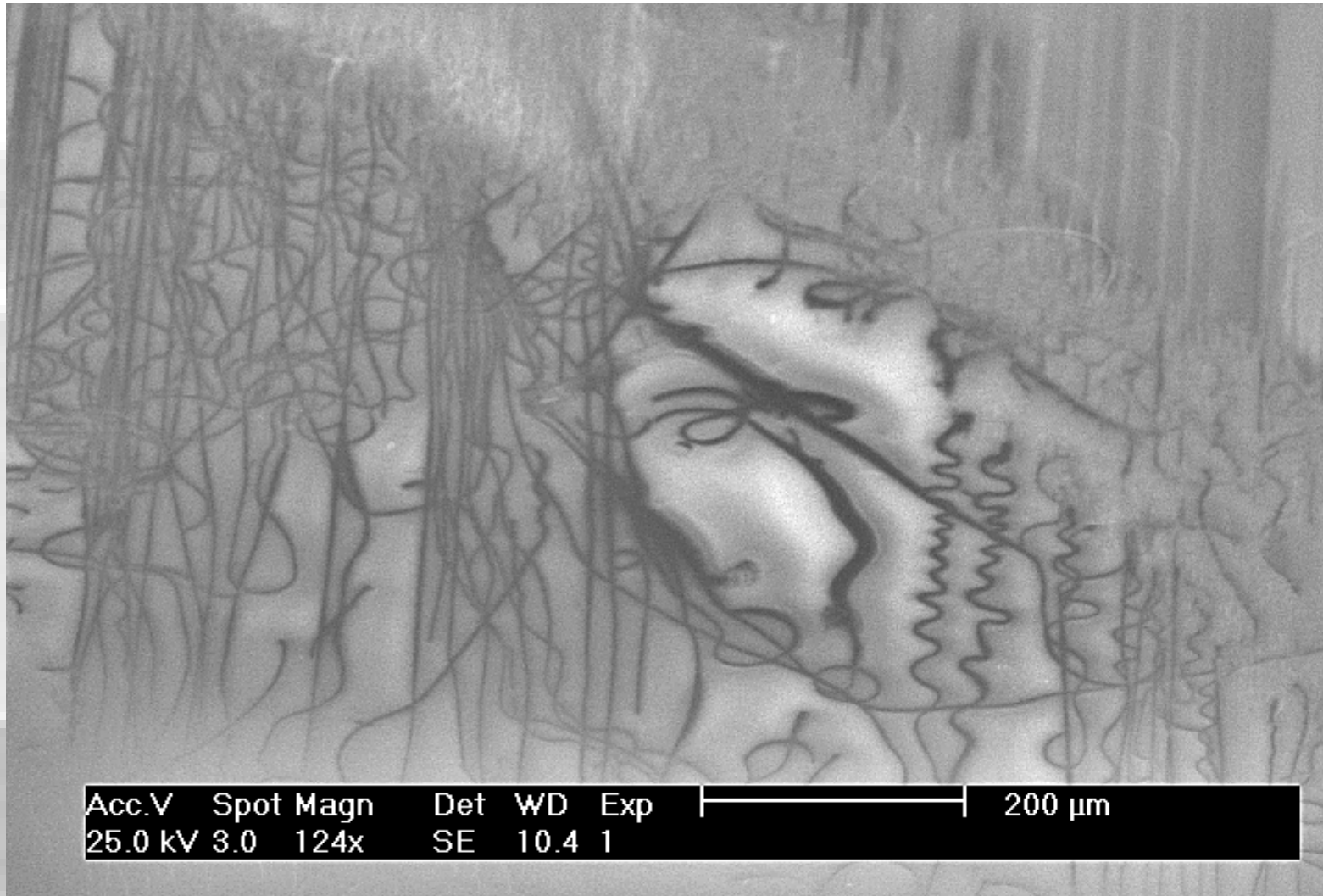
2010 EIPBN MicroGraph Contest

**Micrograph
Title:**

**A Woman in
Mourning**

Description:

A failed pattern transfer of MIM stacks from a grating mold onto a PMMA-coated glass substrate.

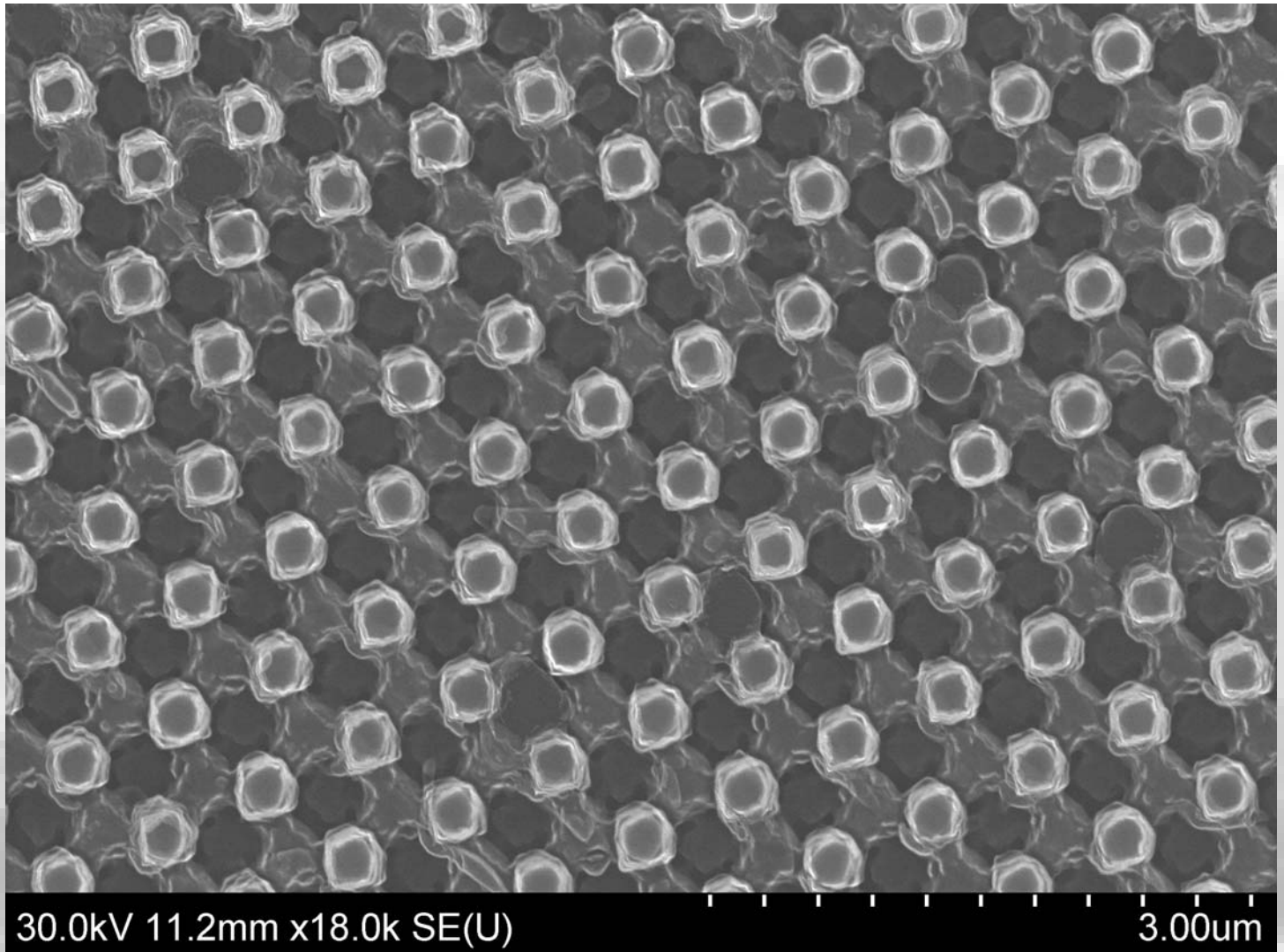


Magnification (3"x4" image): 124x
Submitted by: Alex Kaplan

Instrument (Make and Model): Philips XL30 FEG SEM
Affiliation: University of Michigan



2010 EIPBN MicroGraph Contest



30.0kV 11.2mm x18.0k SE(U)

3.00um

Micrograph Title:
Rose Garden

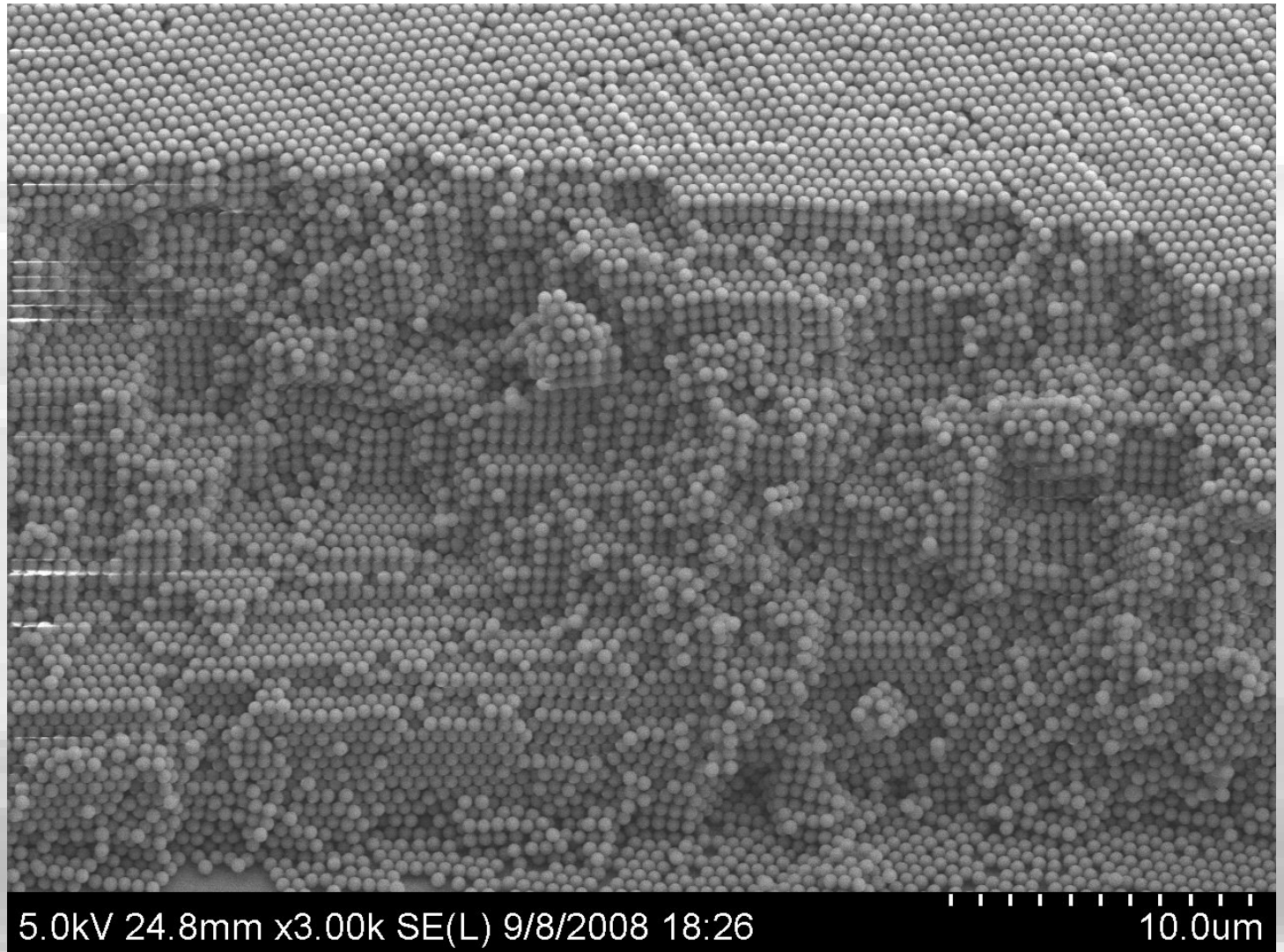
Description: Silicon rods in a rod and hole photonic crystal which has been over etched

Magnification (3"x4" image): 18000X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



5.0kV 24.8mm x3.00k SE(L) 9/8/2008 18:26

10.0um

Micrograph Title:
LEGO City

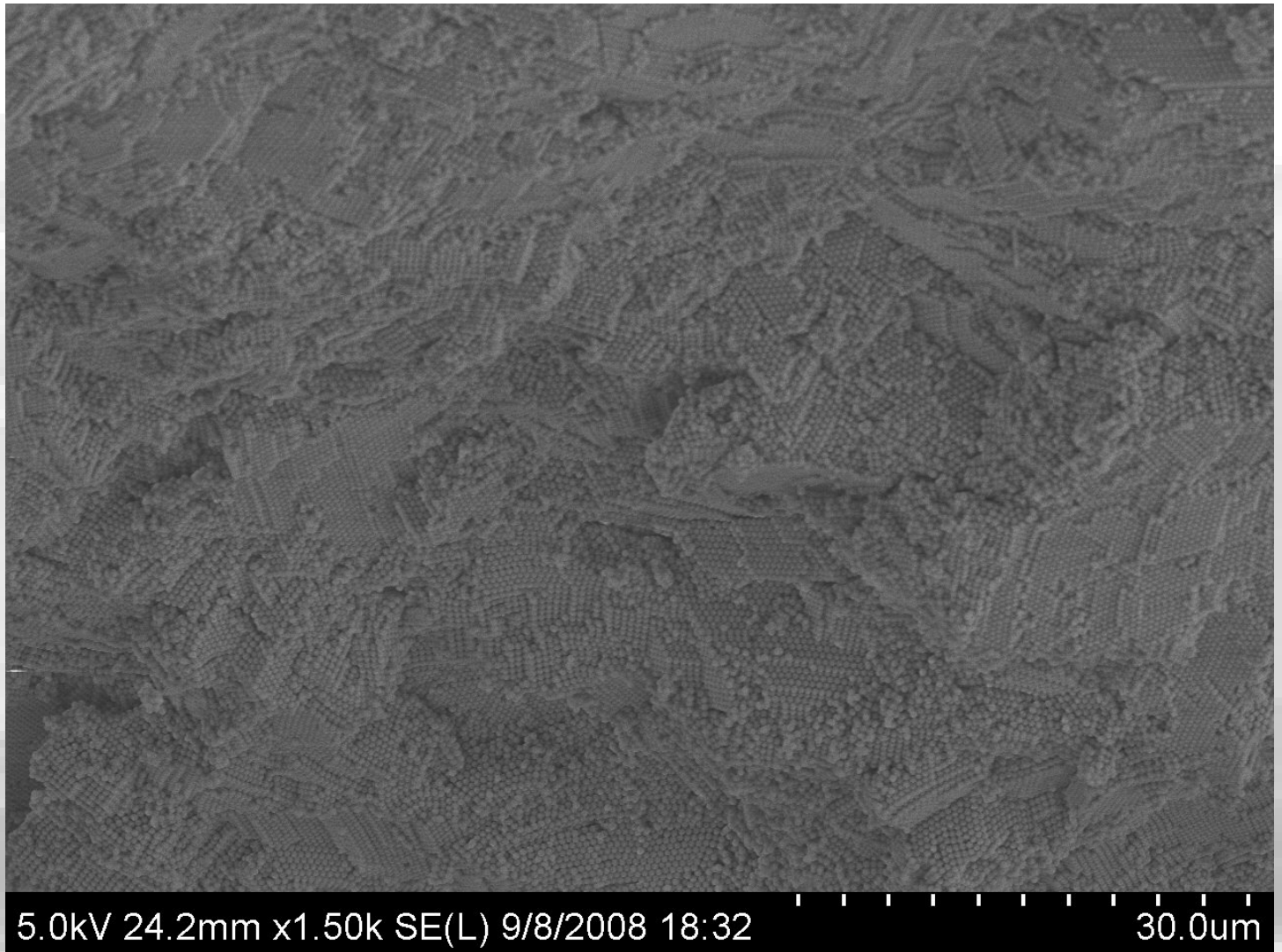
Description: Side view
of self assembled silica
particles showing 100
crystal orientation

Magnification (3"x4" image): 3000X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Opal Quarry

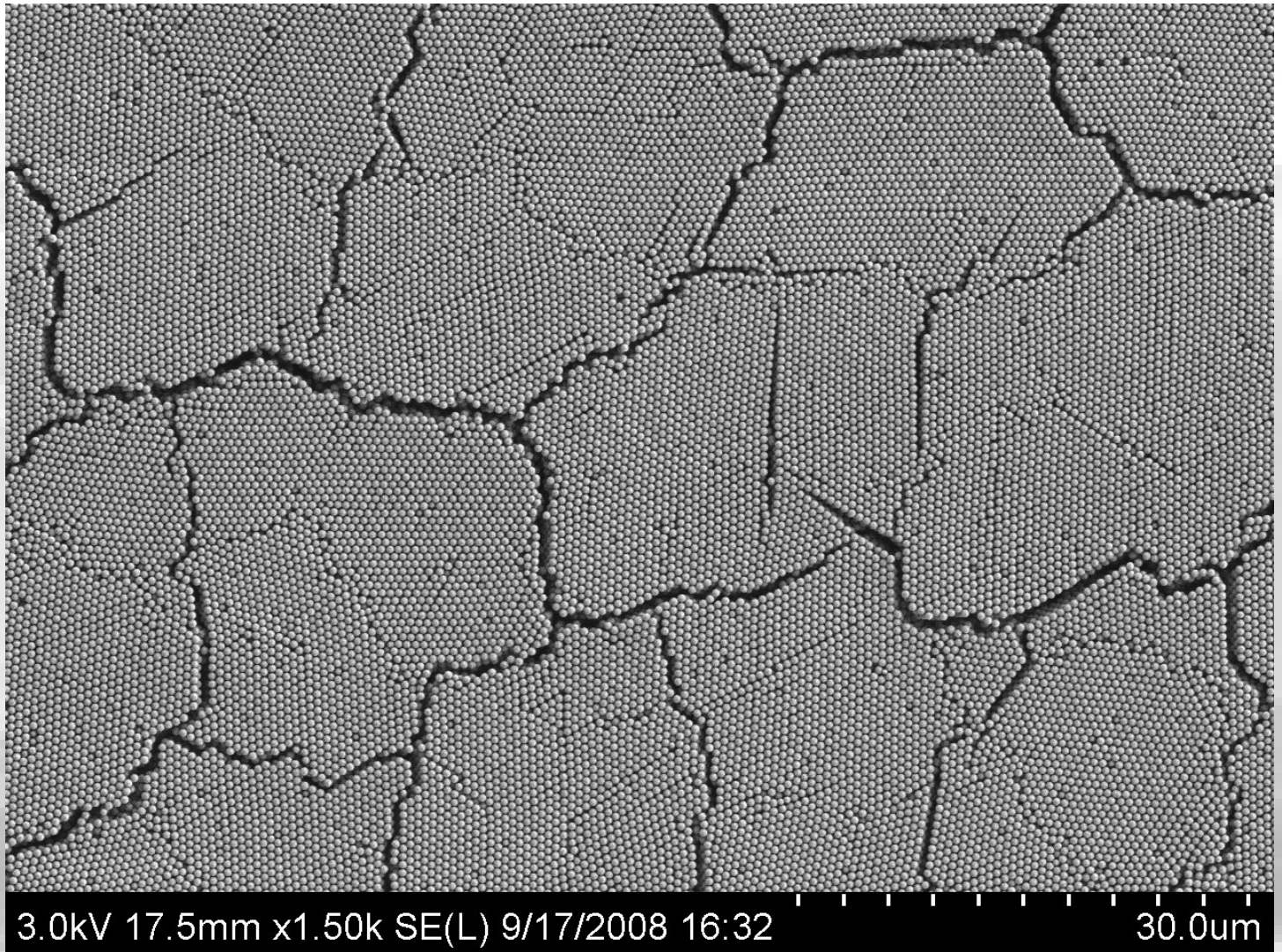
Description: Side view
of silica particles

Magnification (3"x4" image): 1500X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Opal Death Valley

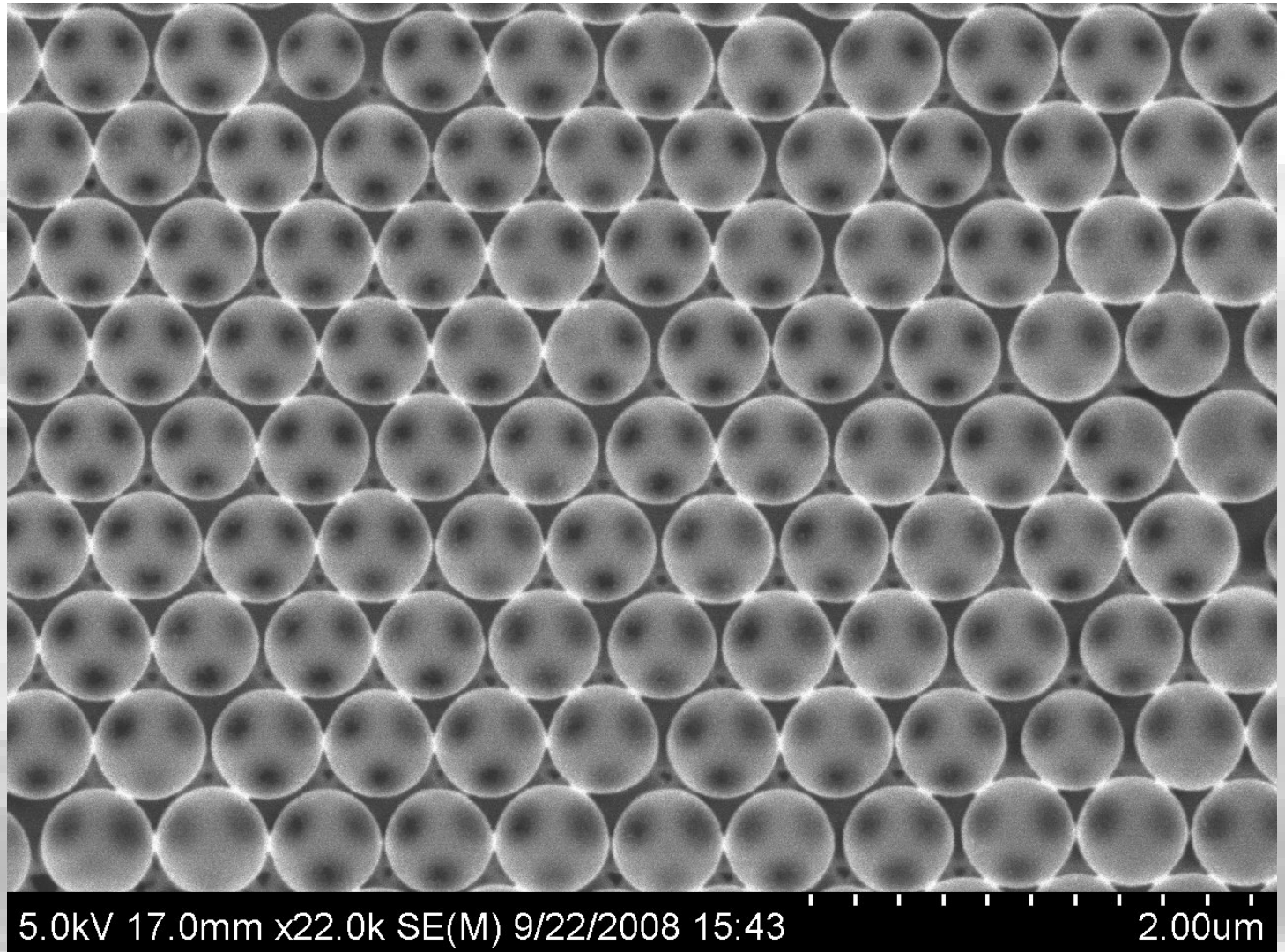
Description: Top view
of self assembled silica
particles showing
cracks due to the drying
process

Magnification (3"x4" image): 1500X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Stars of David

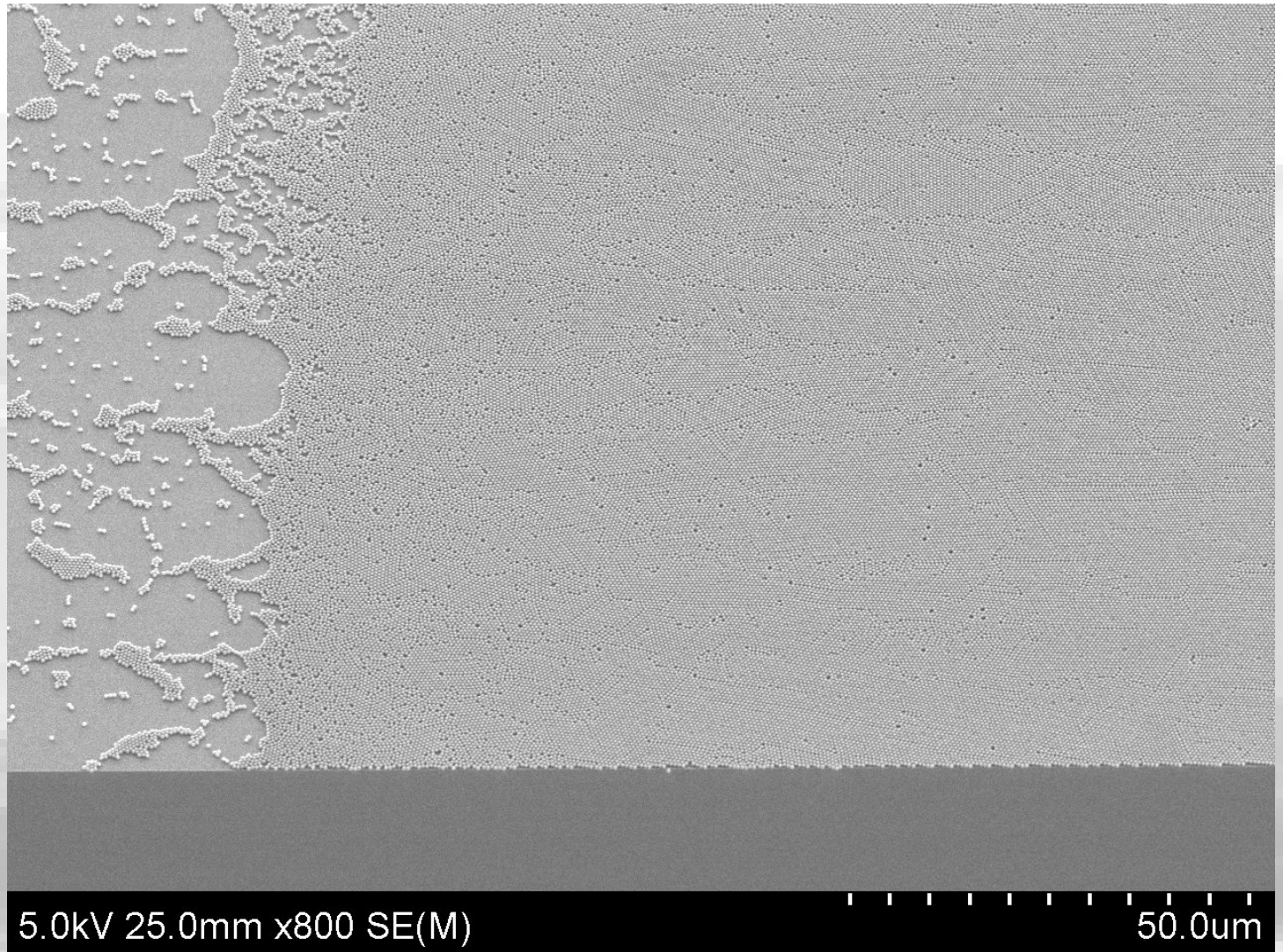
Description: Top view
of inverted opals made
from silicon

Magnification (3"x4" image): 22000X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Chaos to Order, The
Beauty of Life

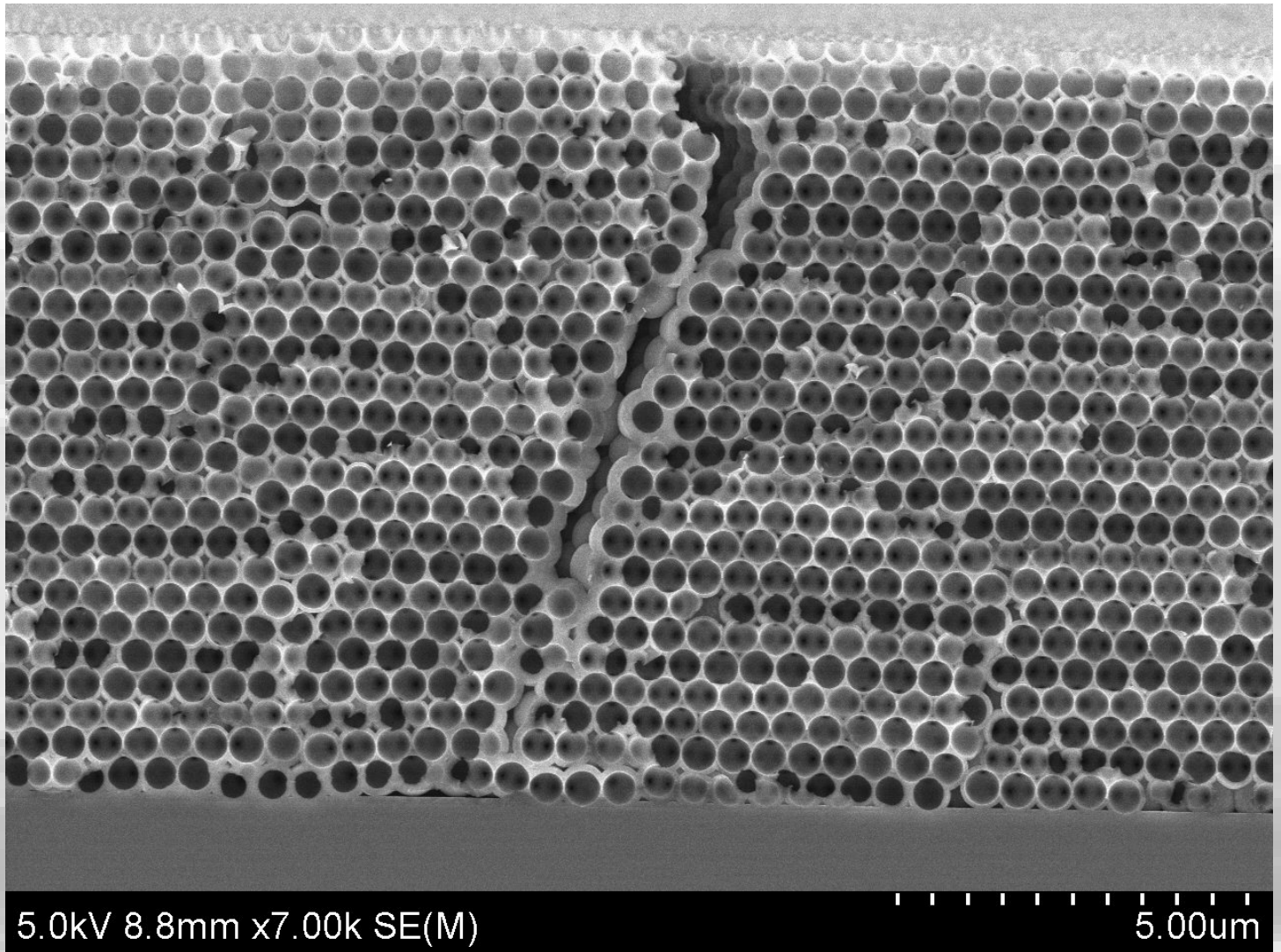
Description: The
starting point of
periodically assembled
silica opals

Magnification (3"x4" image): 800X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Micro Fissure

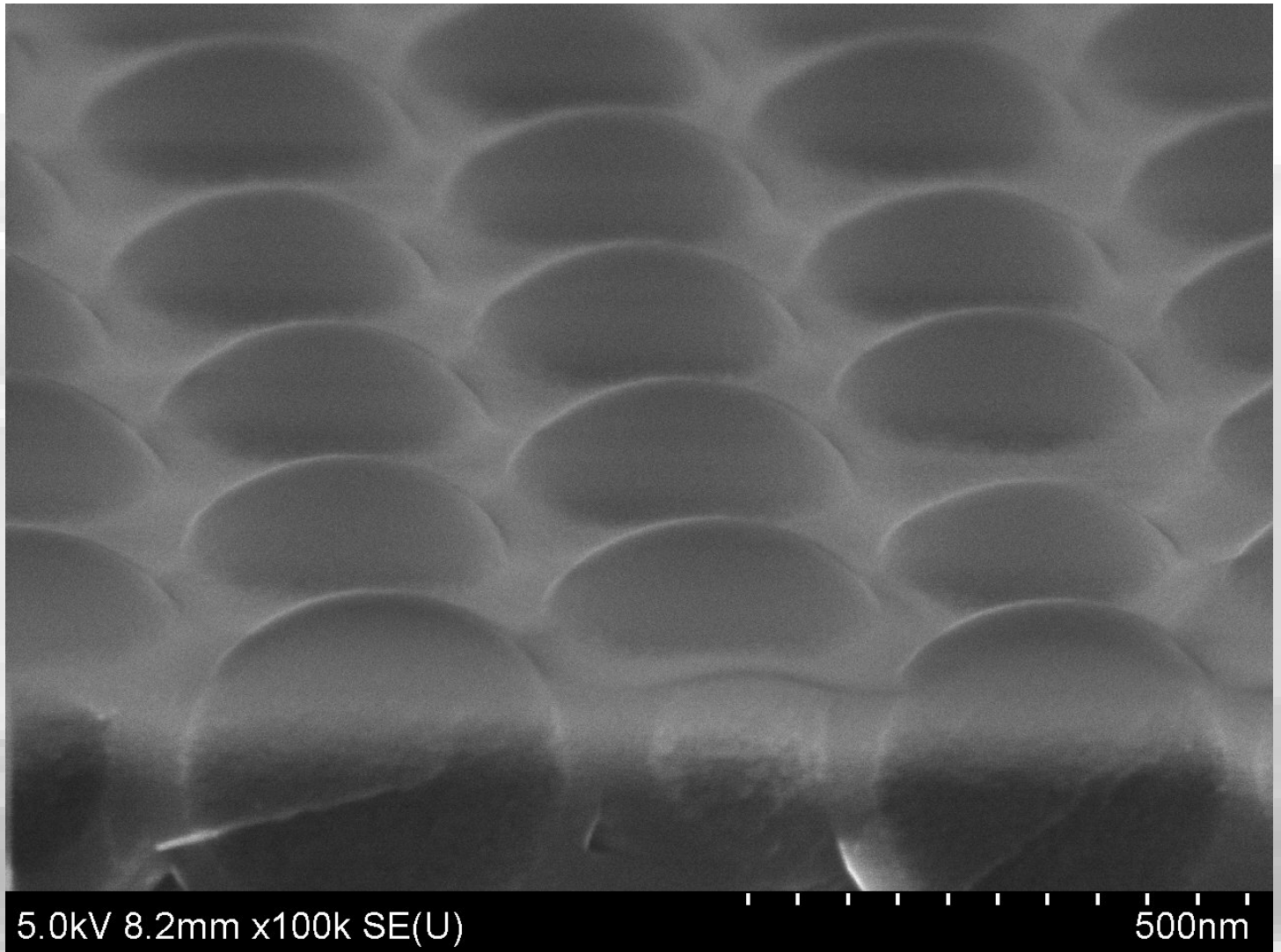
Description: Side view
of inverted opals made
from silicon cracked
due to elevated
temperatures

Magnification (3"x4" image): 7000X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Sunny side up eggs

Description: Angled
view of opals filled with
silicon with the top
opened up by Reactive
Ion Etch

Magnification (3"x4" image): 100,000X
Submitted by: Leo Tom Varghese, Li Fan

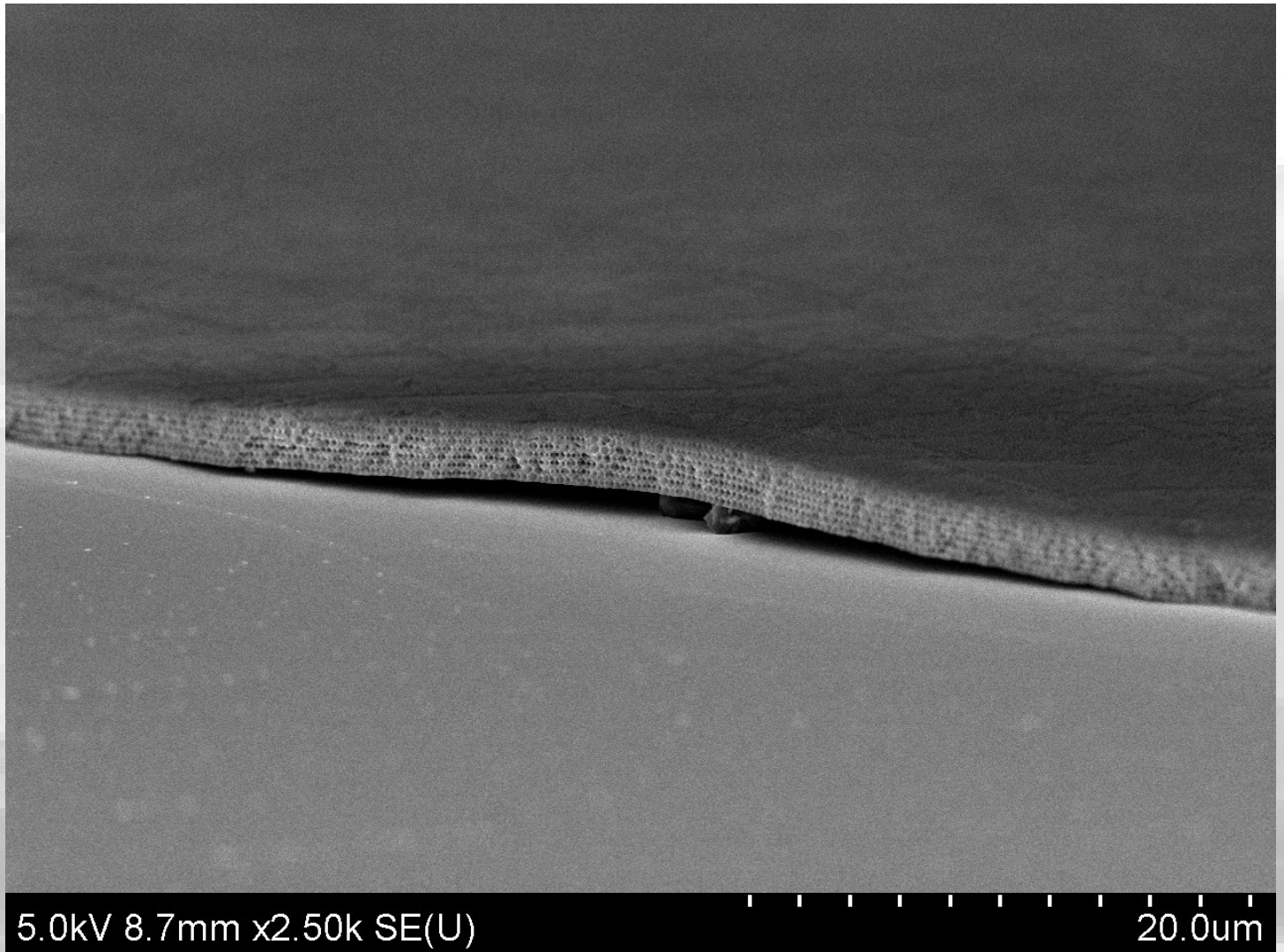
Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest

Micrograph Title:
Photonic Ripple

Description: Inverse
opal photonic crystal
bending over some
particles

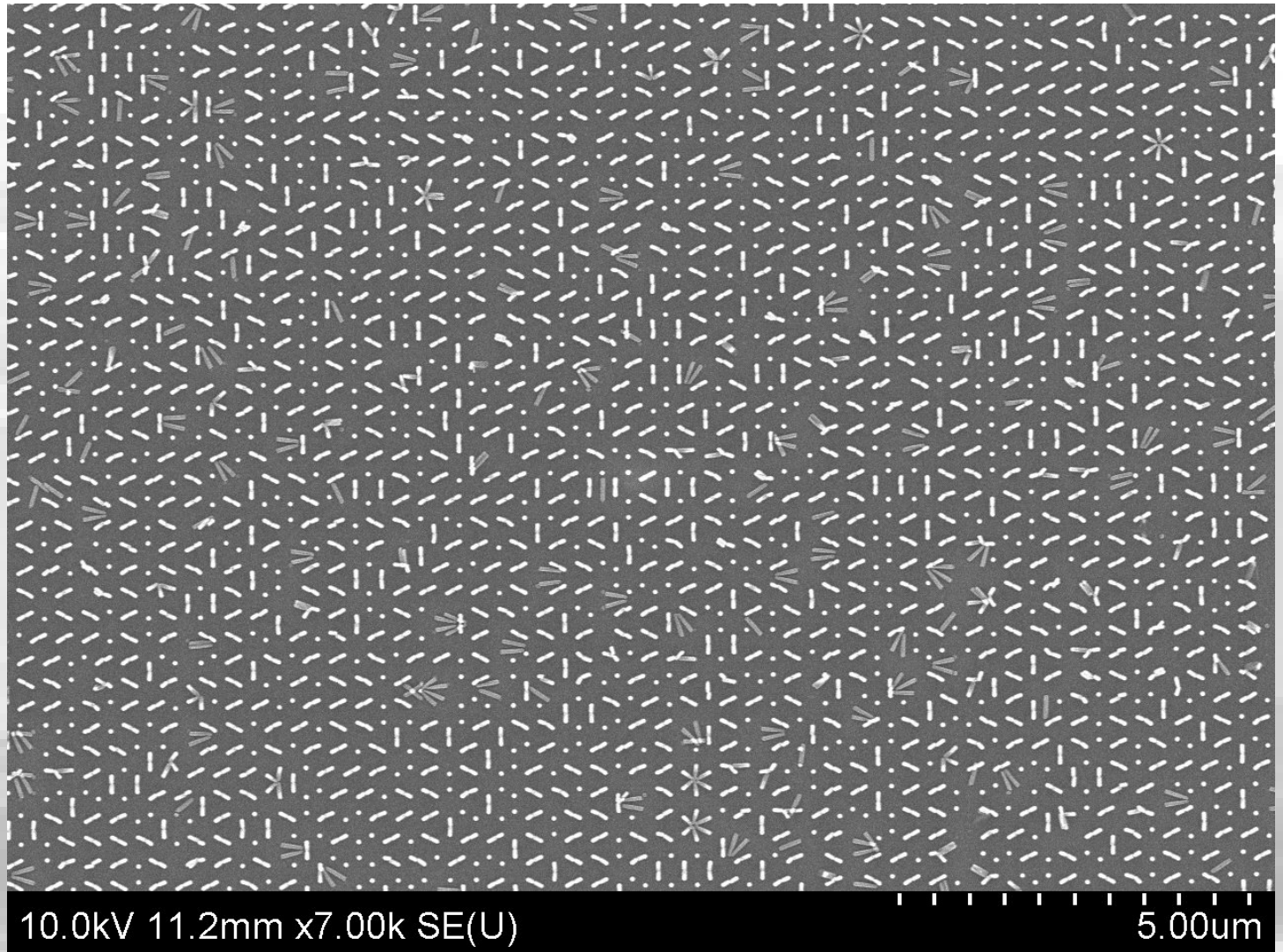


Magnification (3"x4" image): 2500X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



Micrograph Title:
Cell maze

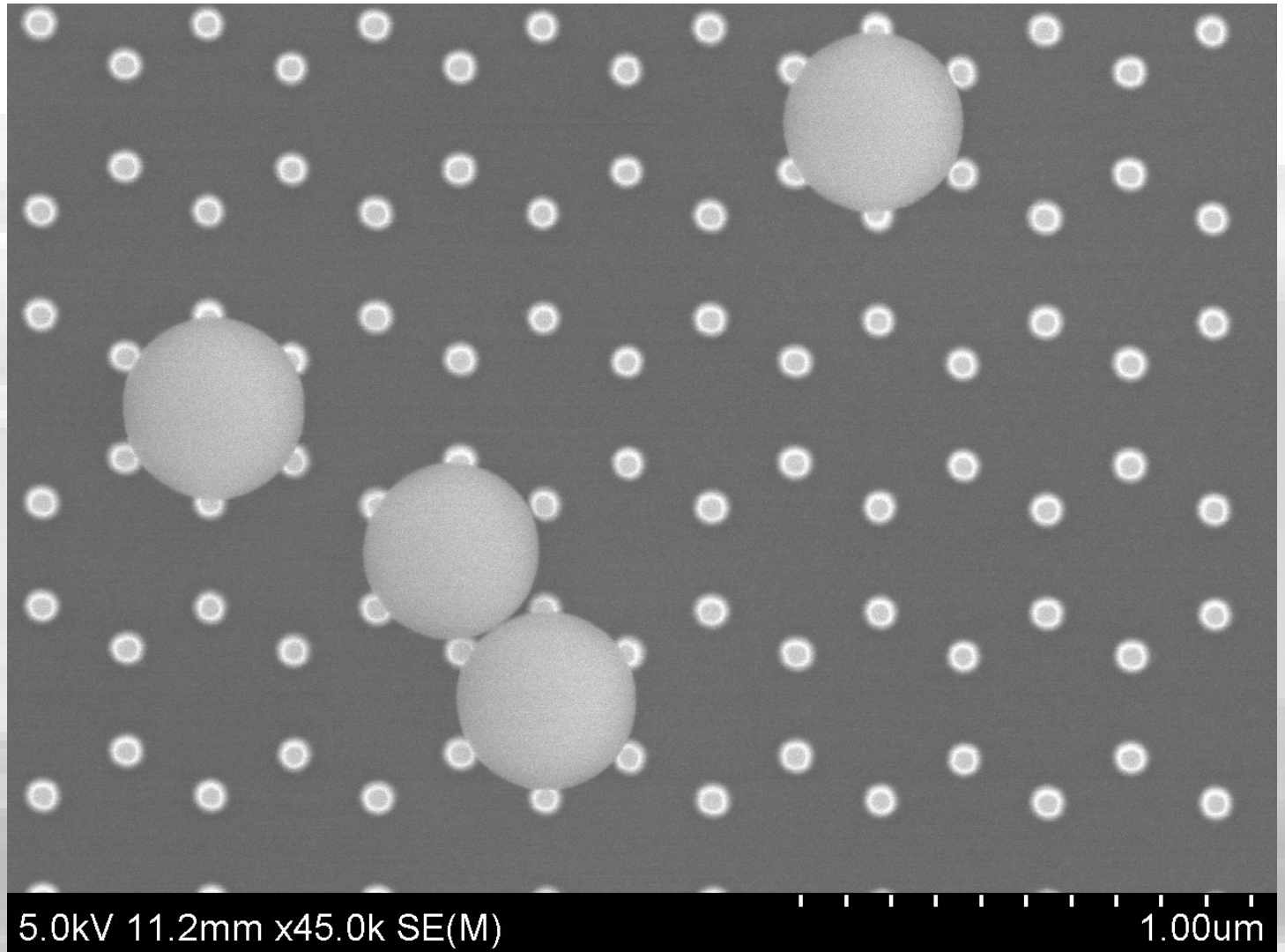
Description: HSQ rods
after development
joined together because
of overdosing

Magnification (3"x4" image): 7000X
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



5.0kV 11.2mm x45.0k SE(M)

1.00um

Micrograph Title:
Balcony seating

Description: Silicon pedestal for silica particles made by ebeam lithography and etching. The silica particles were dried on this structure

Magnification (3"x4" image): 45000X
Submitted by: Leo Tom Varghese, Li Fan

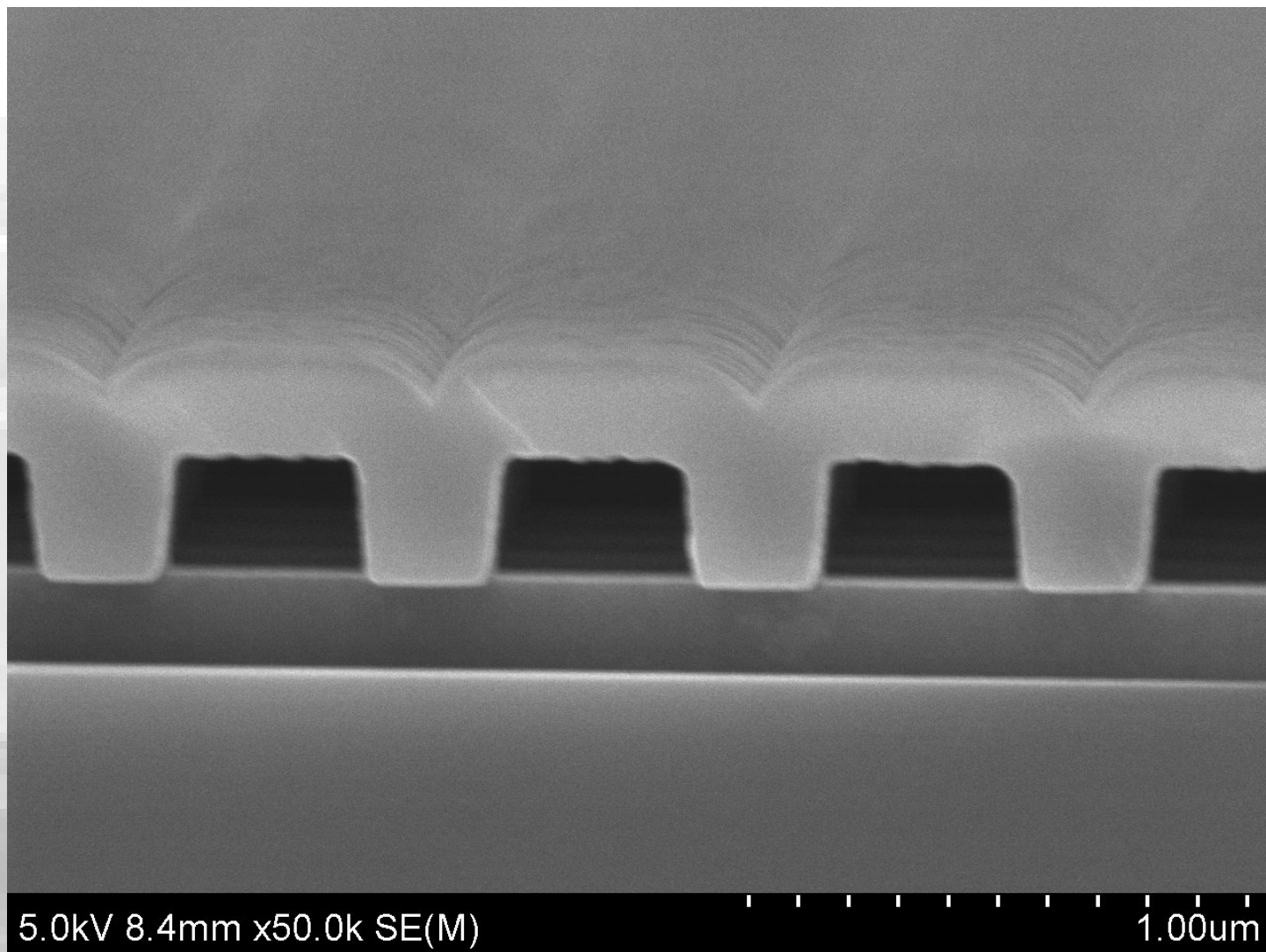
Instrument (Make and Model): Hitachi S4800 FESEM
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest

Micrograph Title:
Igloo colony

Description: Inverted
woodpile made from
LPCVD infiltrated
silicon



5.0kV 8.4mm x50.0k SE(M)

1.00um

Magnification (3"x4" image): 50000X

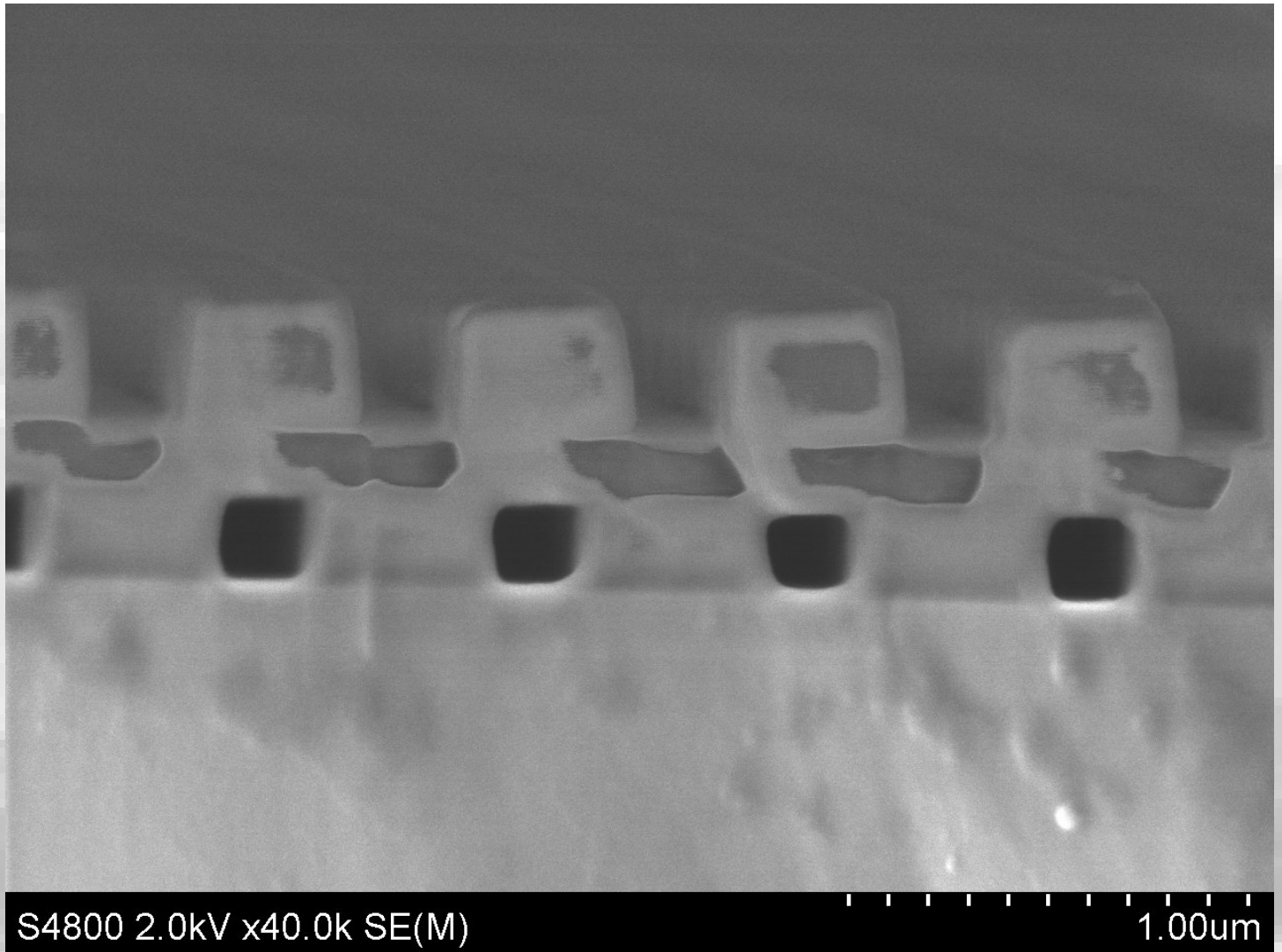
Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM

Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest



S4800 2.0kV x40.0k SE(M)

1.00um

Micrograph Title:

Ooey Gooey
Kit Kat stacks

Description: Angled
view of a 3 layer HSQ
woodpiles made from
electron beam
lithography

Magnification (3"x4" image): 40000X

Submitted by: Leo Tom Varghese, Li Fan

Instrument (Make and Model): Hitachi S4800 FESEM

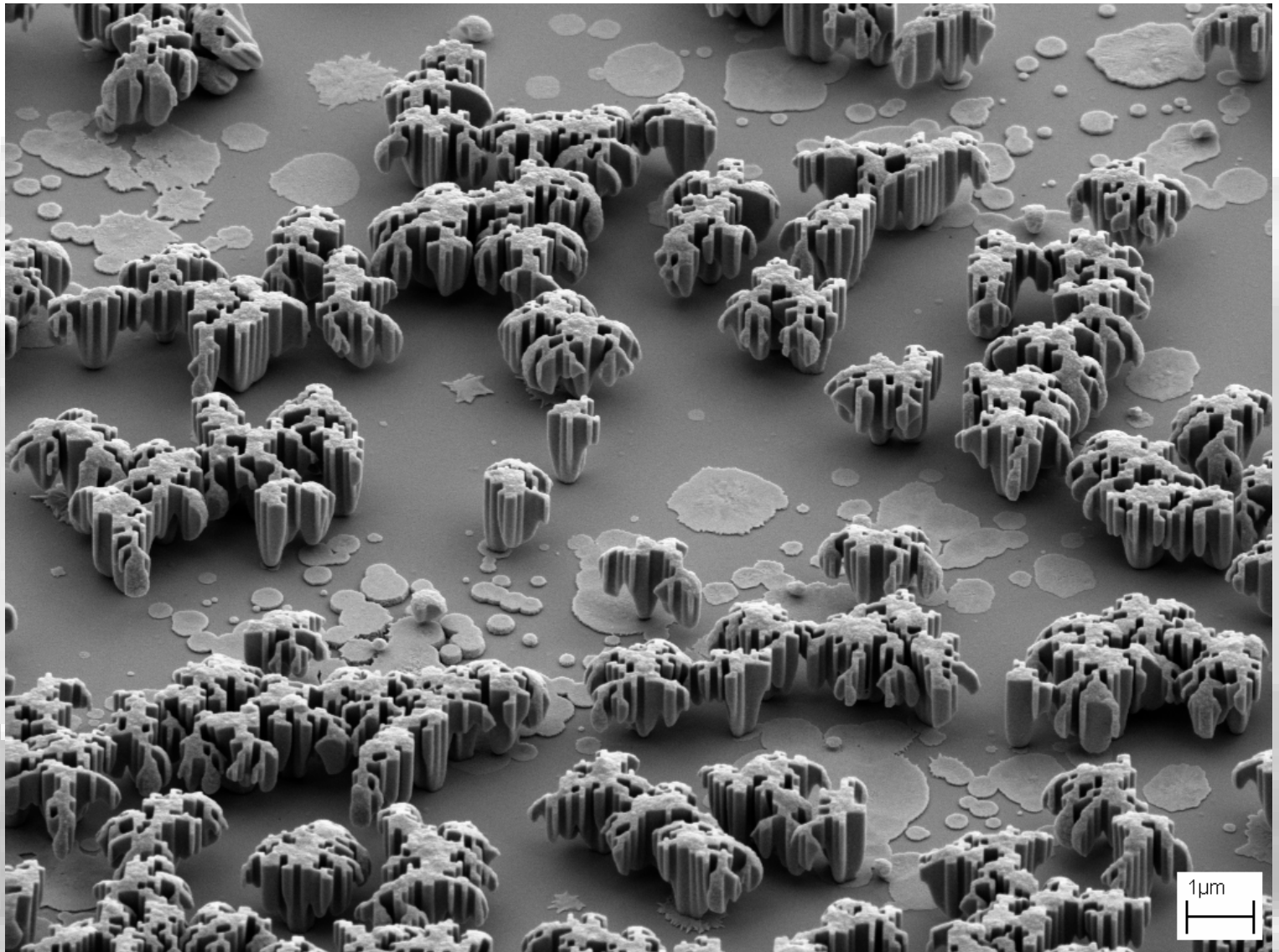
Affiliation: Birck Nanotechnology Center, Purdue University



2010 EIPBN MicroGraph Contest

Micrograph Title:
Avatar's Pandora
Nano Forest

Description:
Au electroplated
structures in
defective PMMA
mold



Magnification (3"x4" image): 20 kx
Submitted by: Joan Vila-Comamala

Instrument (Make and Model): SEM Zeiss Supra 55VP
Affiliation: Paul Scherrer Institut (Switzerland)



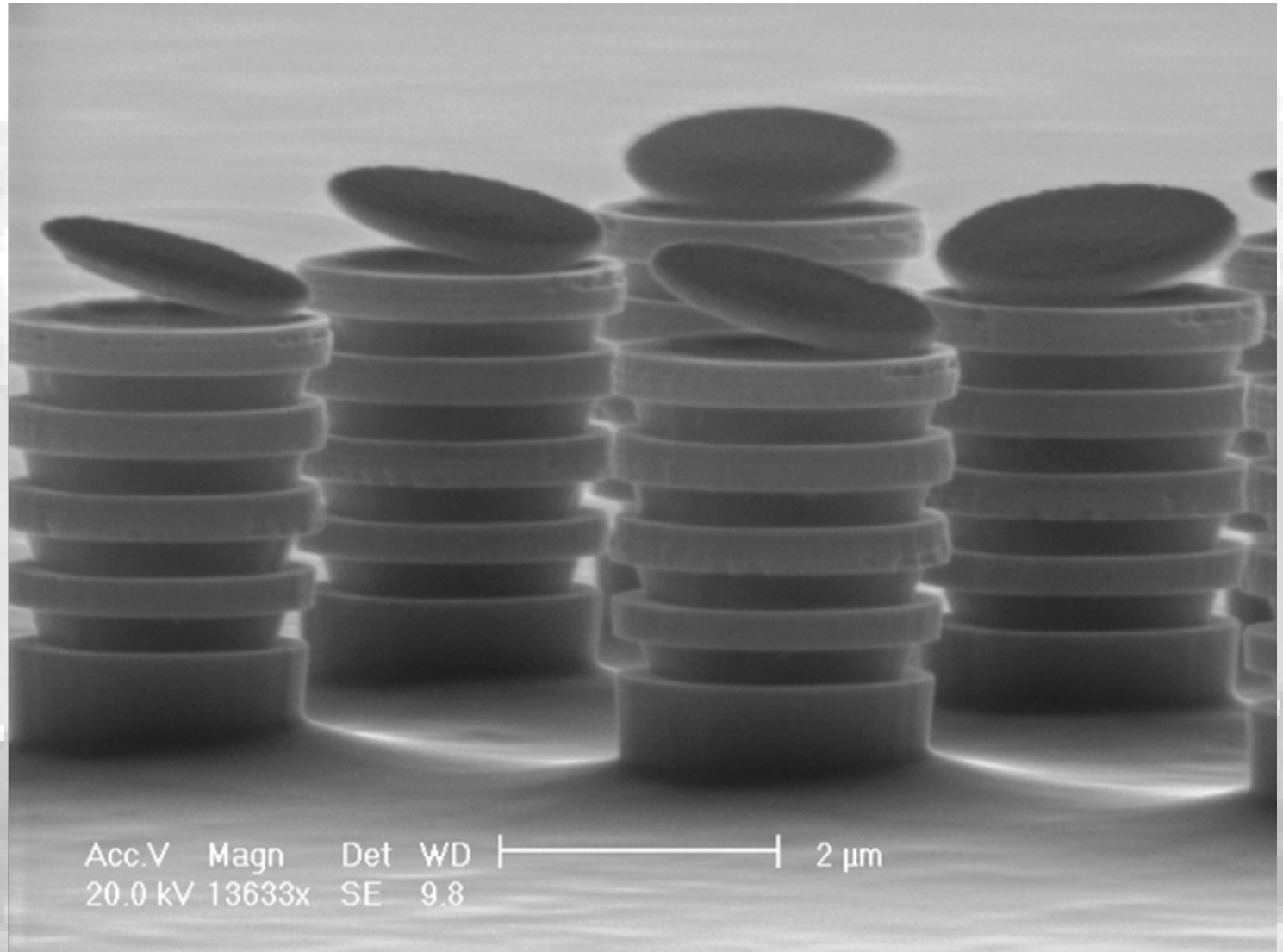
2010 EIPBN MicroGraph Contest

Micrograph Title:

Micro-town

Description:

Selective etching of GaAs/AlGaAs stacks on the GaAs substrate with hard mask residue



Magnification (3"x4" image): 13KX
Submitted by: Yi-Kuei Wu

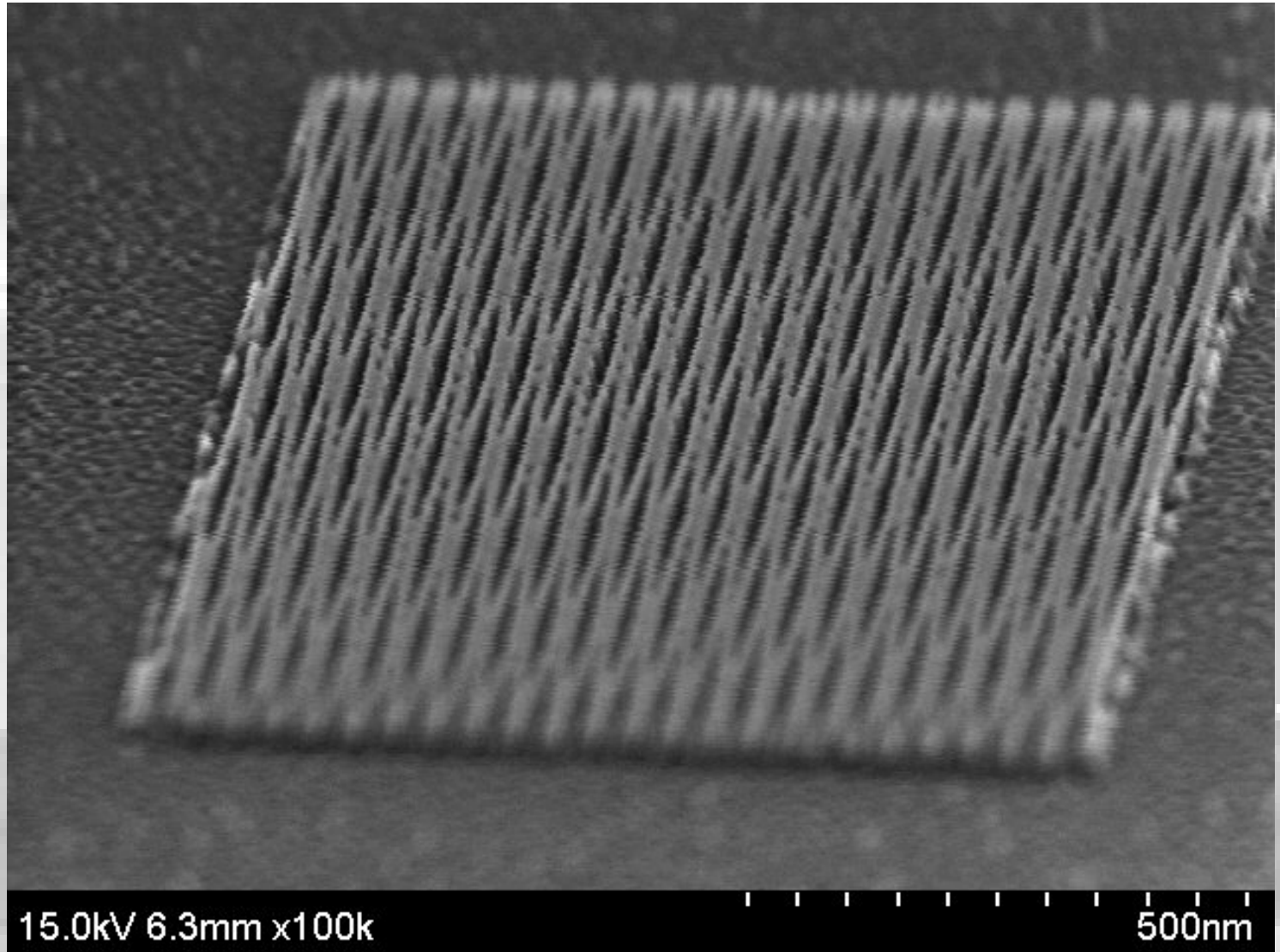
Instrument (Make and Model): Philips XL30 FEG
Affiliation: EECS, University of Michigan, Ann Arbor



2010 EIPBN MicroGraph Contest

**Micrograph
Title: silicon
ultra-fine
Marilyn veil**

**Description:
ICP-RIE
pattern
transfer of 20-
nm-pitch HSQ
gratings (area
of 1 μm by 2
 μm) into
silicon**



**Magnification (3"x4" image): 100k
Submitted by: Minjun Yan
at Urbana-Champaign**

**Instrument (Make and Model): Hitachi S-4800 SEM
Affiliation: Micro and Nanotechnology Lab, University of Illinois**



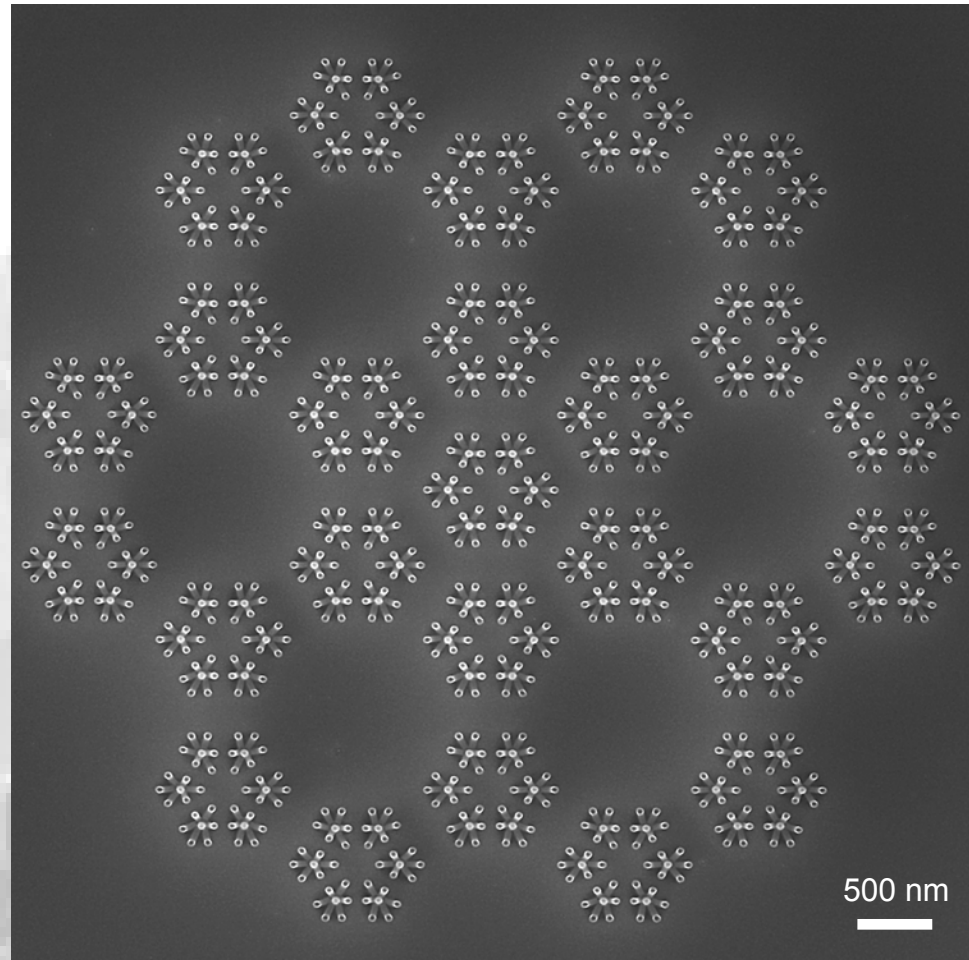
2010 EIPBN MicroGraph Contest

**Micrograph
Title:**
Nanosnowflakes

Description:

SEM image of self-assembled nanosnowflakes from electron-beam-lithography-defined PMMA nanopillars due to the capillary force during the post-development rinse and drying process.

The original thickness of PMMA was 240 nm, and PMMA was used as a negative resist. Electron-beam lithography was done by Raith 150 with an accelerating voltage of 30 kV, beam current of ~400 pA.

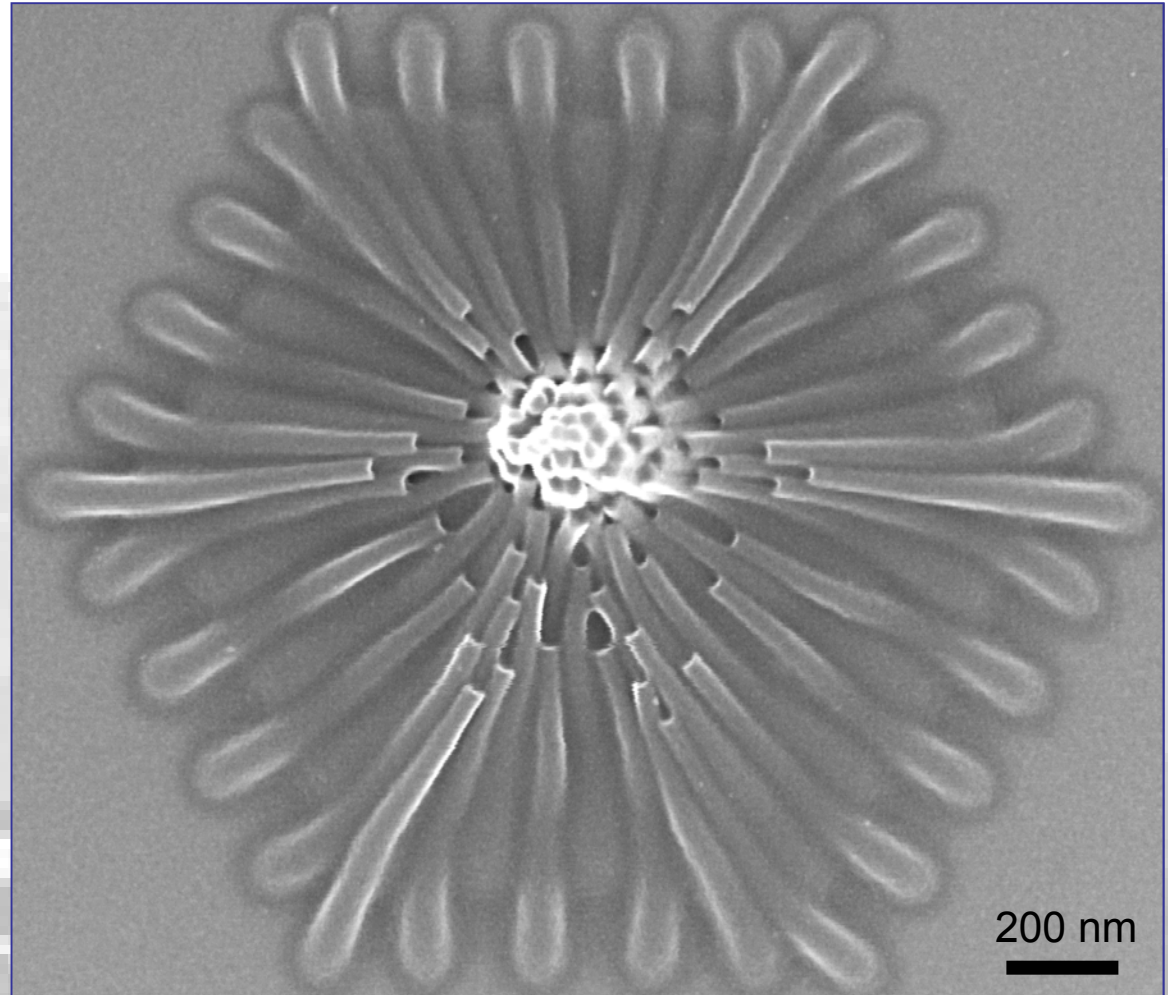


Magnification (5"x 5" image): 20, 000
Submitted by: Huigao Duan

Instrument (Make and Model): Raith 150
Affiliation: Massachusetts Institute of Technology



2010 EIPBN MicroGraph Contest



Micrograph Title:
Self-assembled
“chrysanthemum”

Description:

SEM image of a chrysanthemum self-assembled from electron-beam-lithography-defined PMMA nanopillars due to the capillary force during the post-development rinse and drying process.

The original thickness of PMMA was ~550 nm, and PMMA was used as a negative resist. Electron-beam lithography was done by Raith 150 with an accelerating voltage of 30 kV, beam current of ~400 pA.

Magnification (5.18" x 6" image): 75,000
Submitted by: Huigao Duan

Instrument (Make and Model): Raith 150
Affiliation: Massachusetts Institute of Technology



2010 EIPBN MicroGraph Contest

Micrograph

Title:

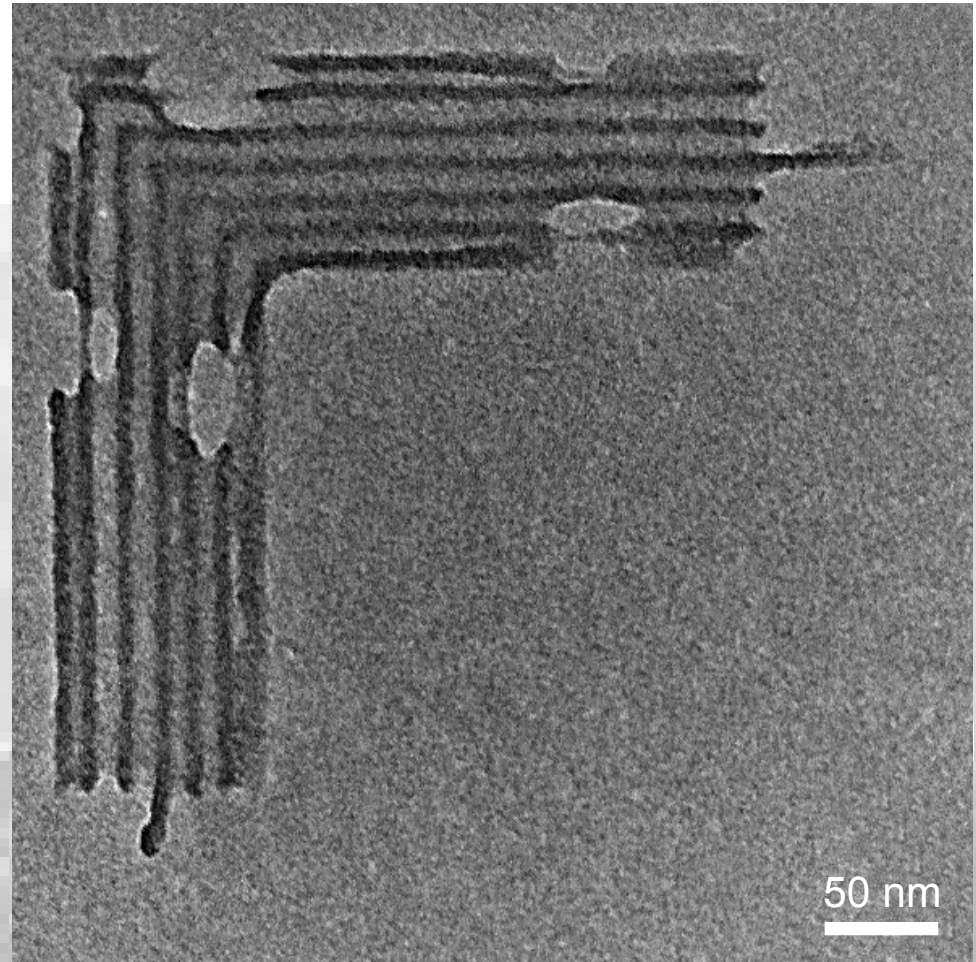
Nested-Ls

“eaten by mice”

Description:

Bright-field TEM micrograph of electron-beam-lithography-defined 14-nm-pitch HSQ nested-Ls. The defects in nested Ls enhanced the image contrast during TEM metrology, which also proved that there were residues between our designed lines.

We still don't know how the defects formed in nested Ls. Considering there were many mice in our buildings at MIT, we think the defects might be caused by crazy hungry mice. ☺



Magnification (5 "x 5" image): 300, 000

Submitted by: Huigao Duan

Instrument (Make and Model): JEOL JEM 2010F

Affiliation: Massachusetts Institute of Technology



2010 EIPBN MicroGraph Contest

Micrograph

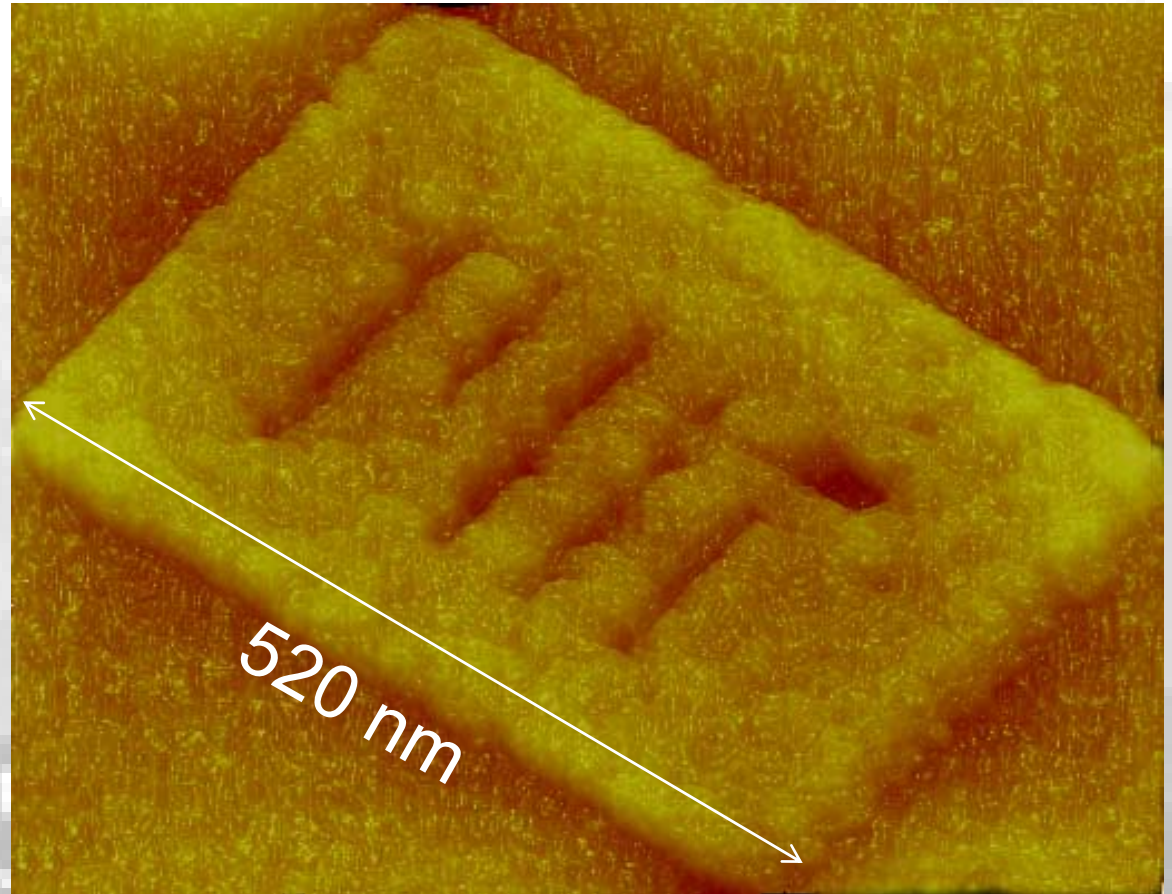
Title:

Gold MIT
nanologo

Description:

AFM image of a 20-nm- pitch PMMA nanopillar array with deliberately-designed defects.

The original thickness of PMMA was 22 nm and PMMA was used as a negative resist. Electron-beam lithography was done by Raith 150 with an accelerating voltage of 30 kV, beam current of ~400 pA.



Magnification (4.65 "x 6" image): 200, 000

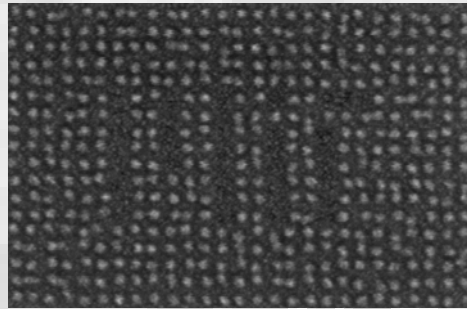
Submitted by: Huigao Duan

Instrument (Make and Model): DI Dimension-3000

Affiliation: Massachusetts Institute of Technology



2010 EIPBN MicroGraph Contest



The SEM image corresponding to the AFM image.



2010 EIPBN MicroGraph Contest



Micrograph Title:
Positive-Tone or
Negative-Tone Resist?

Description:

SEM Micrograph of a pattern spelling "EFRC", exposed at 2 keV, by using 15-nm-thick hydrogen silsesquioxane (HSQ) as the resist and silicon as the substrate.

The letters were the unexposed area and the background was the exposed HSQ. This gives the impression of positive-tone pattern in a negative-tone resist (i.e., HSQ).

Magnification (3"x4" image): 61,640
Submitted by: Vitor R. Manfrinato

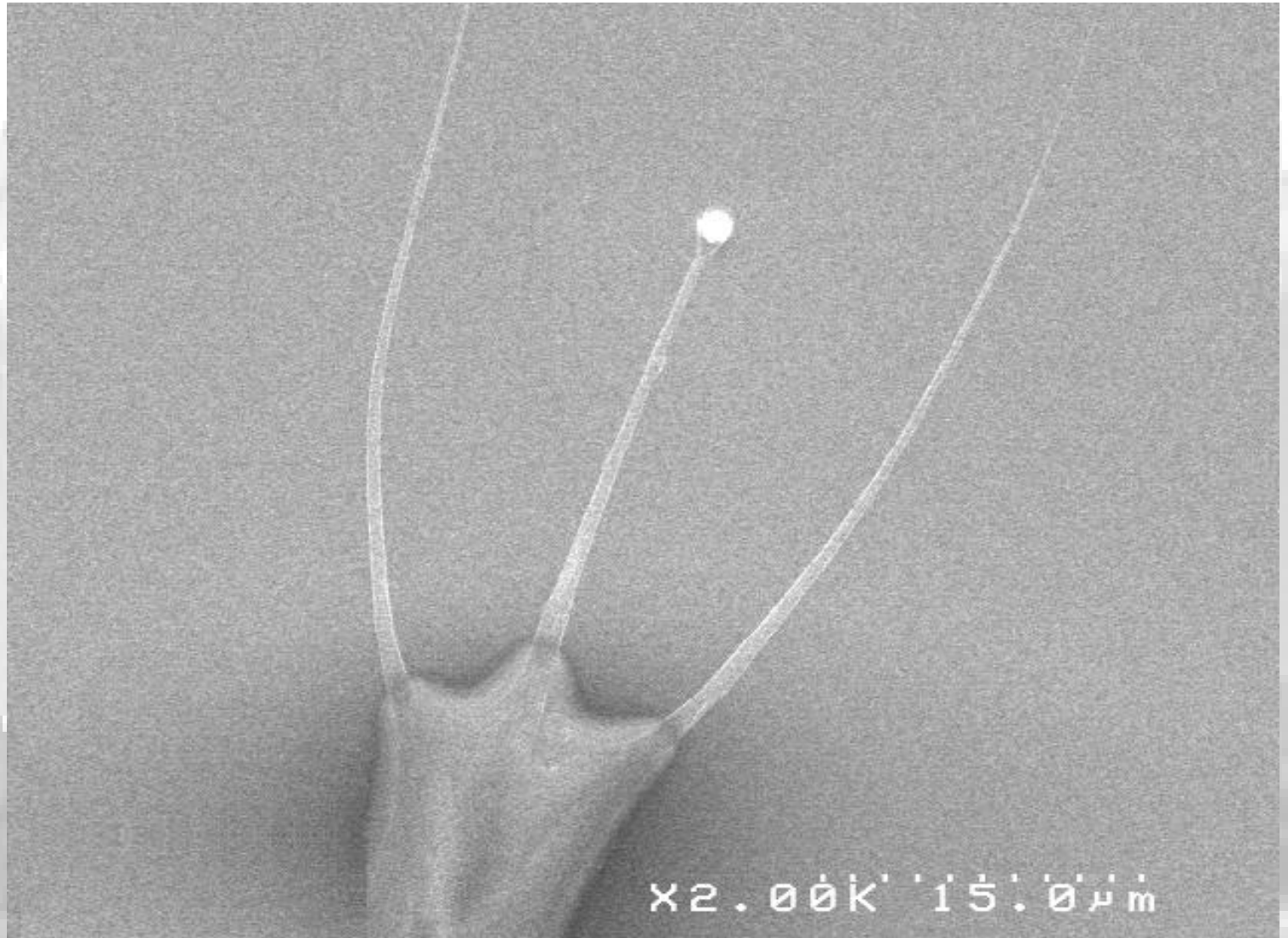
Instrument (Make and Model): Raith 150
Affiliation: Massachusetts Institute of Technology



2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Microcat paw**

**Description:
SEM picture of
a DNA fork
fomed on
PDMS after
evaporation of
a DNA solution
containing
Triton**

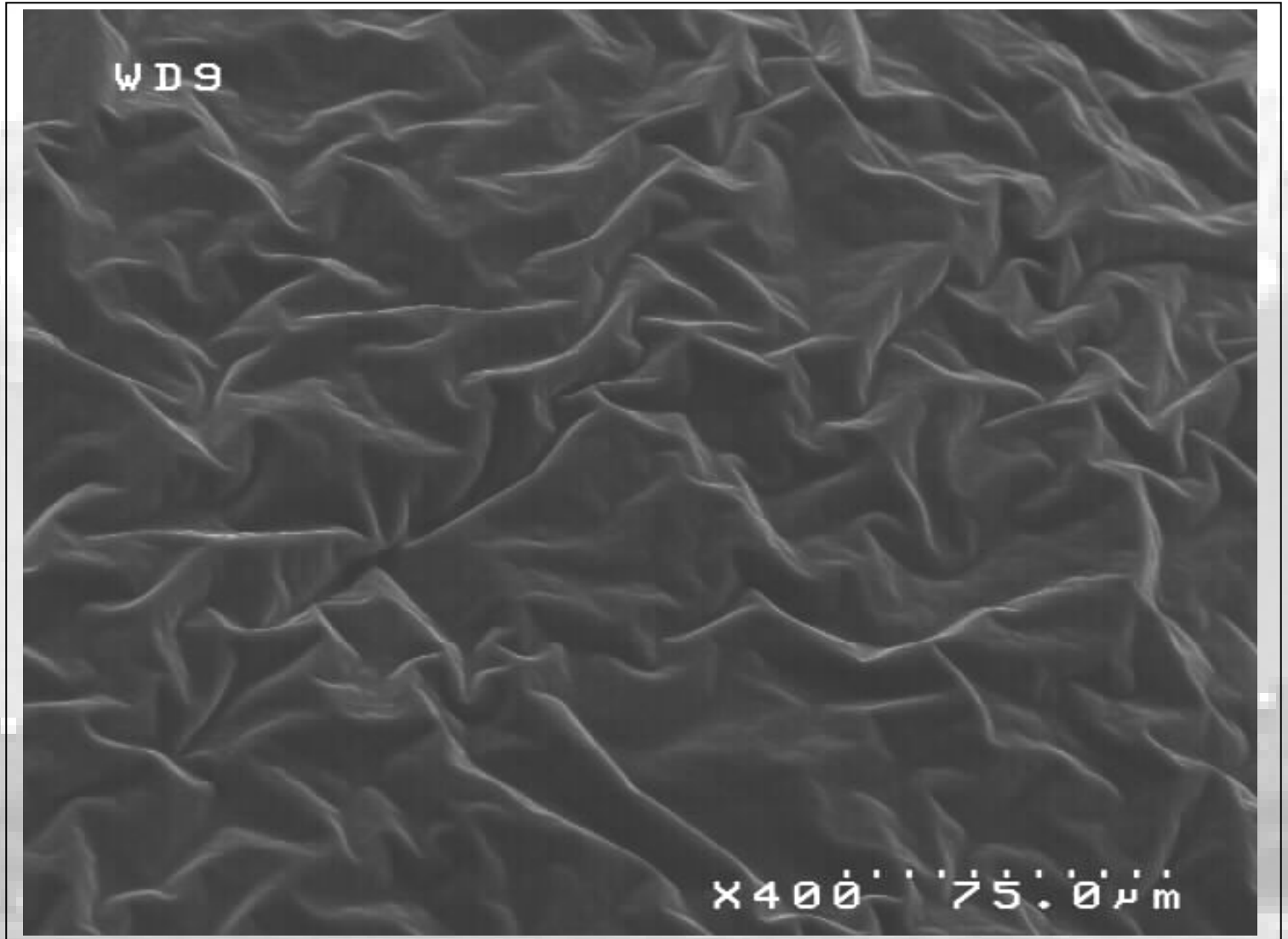


**Magnification (3"x4" image): X2000
Submitted by: J. Cordeiro**

**Instrument (Make and Model): SEM Hitachi 4000
Affiliation: BioColloNa LTM CNRS**



2010 EIPBN MicroGraph Contest



Micrograph Title:
Rough sea

Description:
Dried photoresist
drop

Magnification (3"x4" image): x400
Submitted by: O. Lecarme

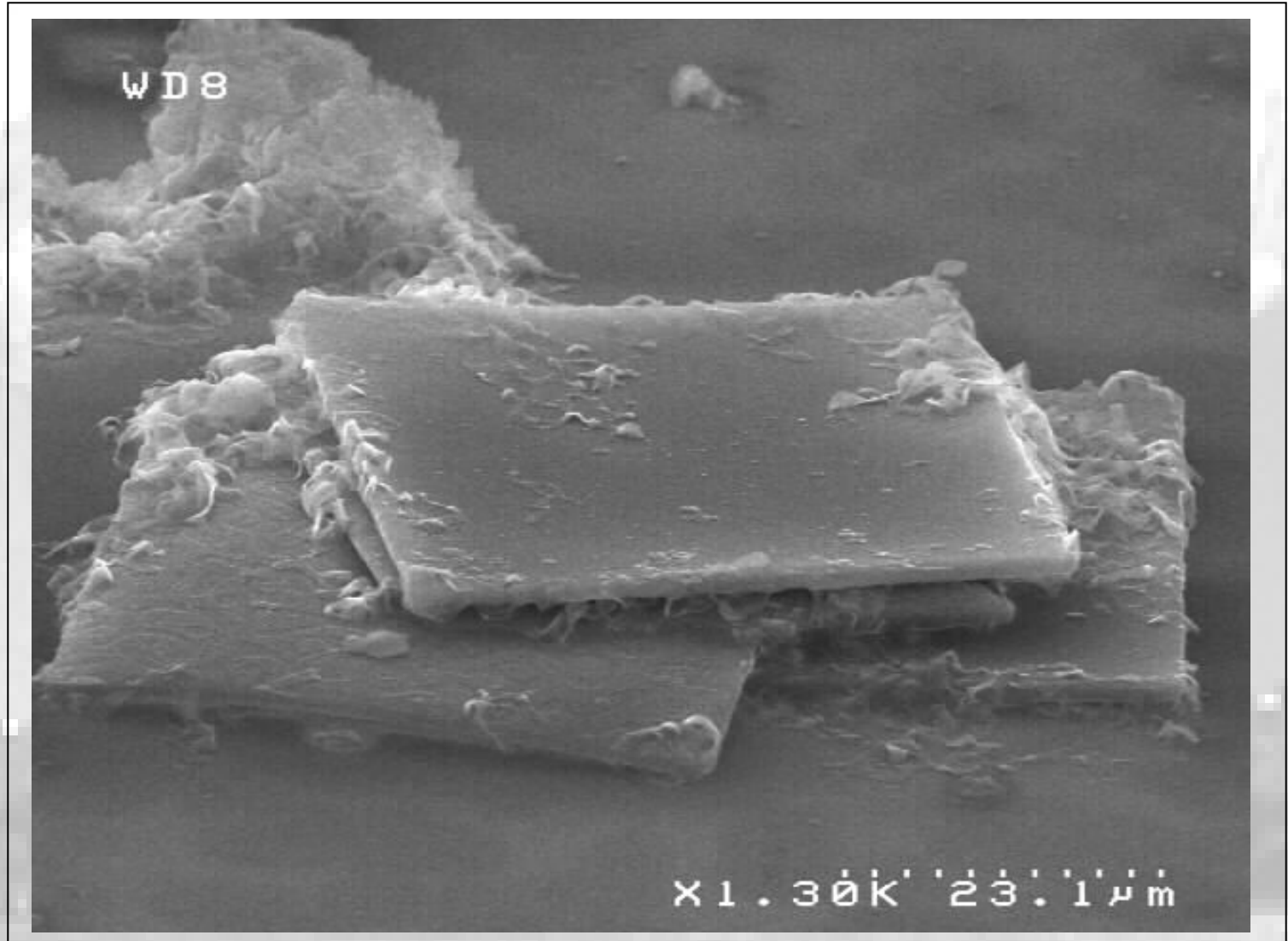
Instrument (Make and Model): HITACHI S4000
Affiliation: BioColloNa team LTM-CNRS



2010 EIPBN MicroGraph Contest

Micrograph Title:
Cheese Club
sandwich

Description:
Photoresist squares
put in solution and
dried



Magnification (3"x4" image): x1300
Submitted by: O. Lecarme

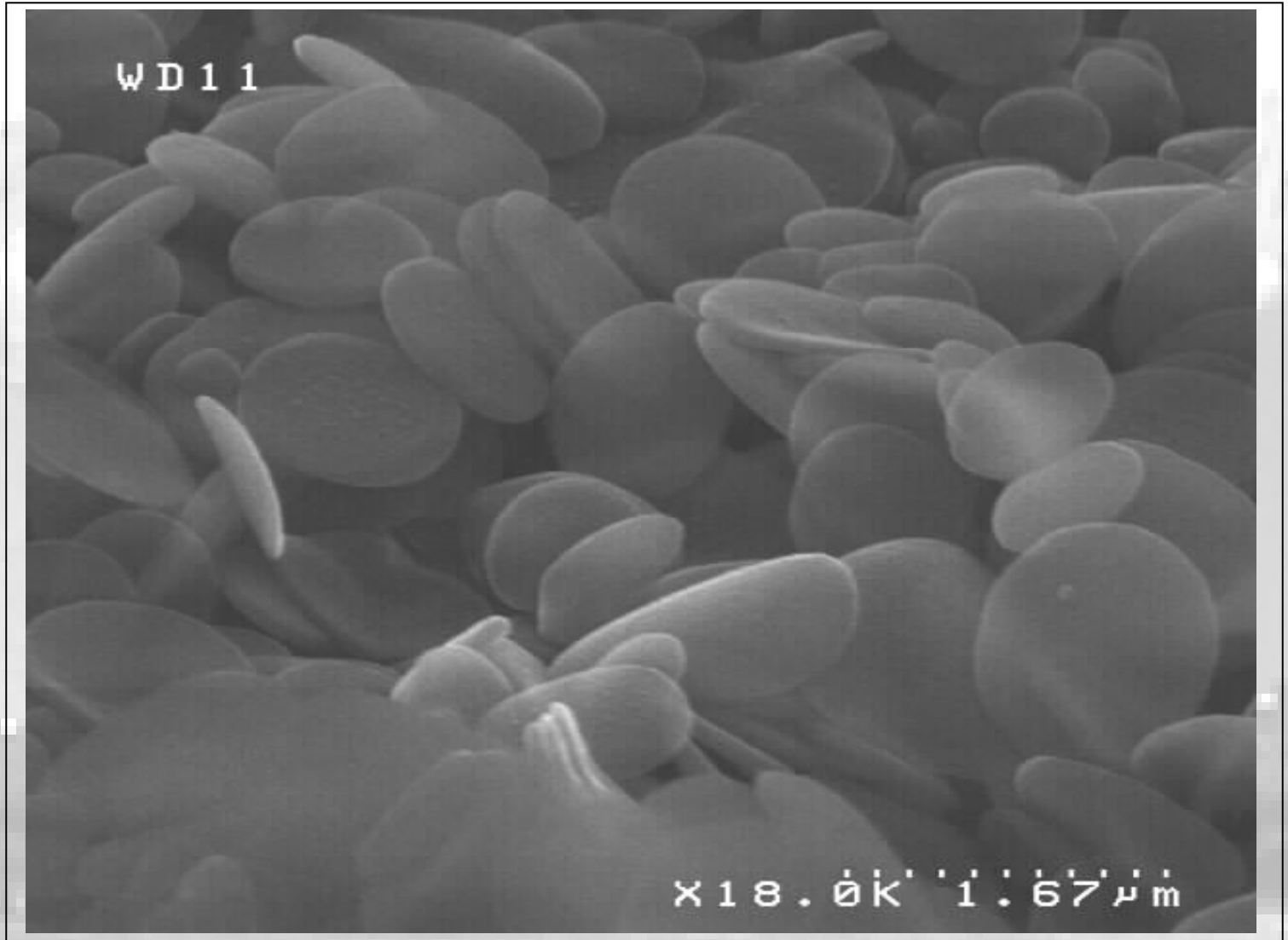
Instrument (Make and Model): HITACHI S4000
Affiliation: BioColloNa team, LTM-CNRS



2010 EIPBN MicroGraph Contest

Micrograph Title:
Transparent
wedding confetti

Description:
PMMA disks



Magnification (3"x4" image): x18k
Submitted by: O. Lecarme

Instrument (Make and Model): HITACHI S4000
Affiliation: BioColloNa team, LTM-CNRS



2010 EIPBN MicroGraph Contest

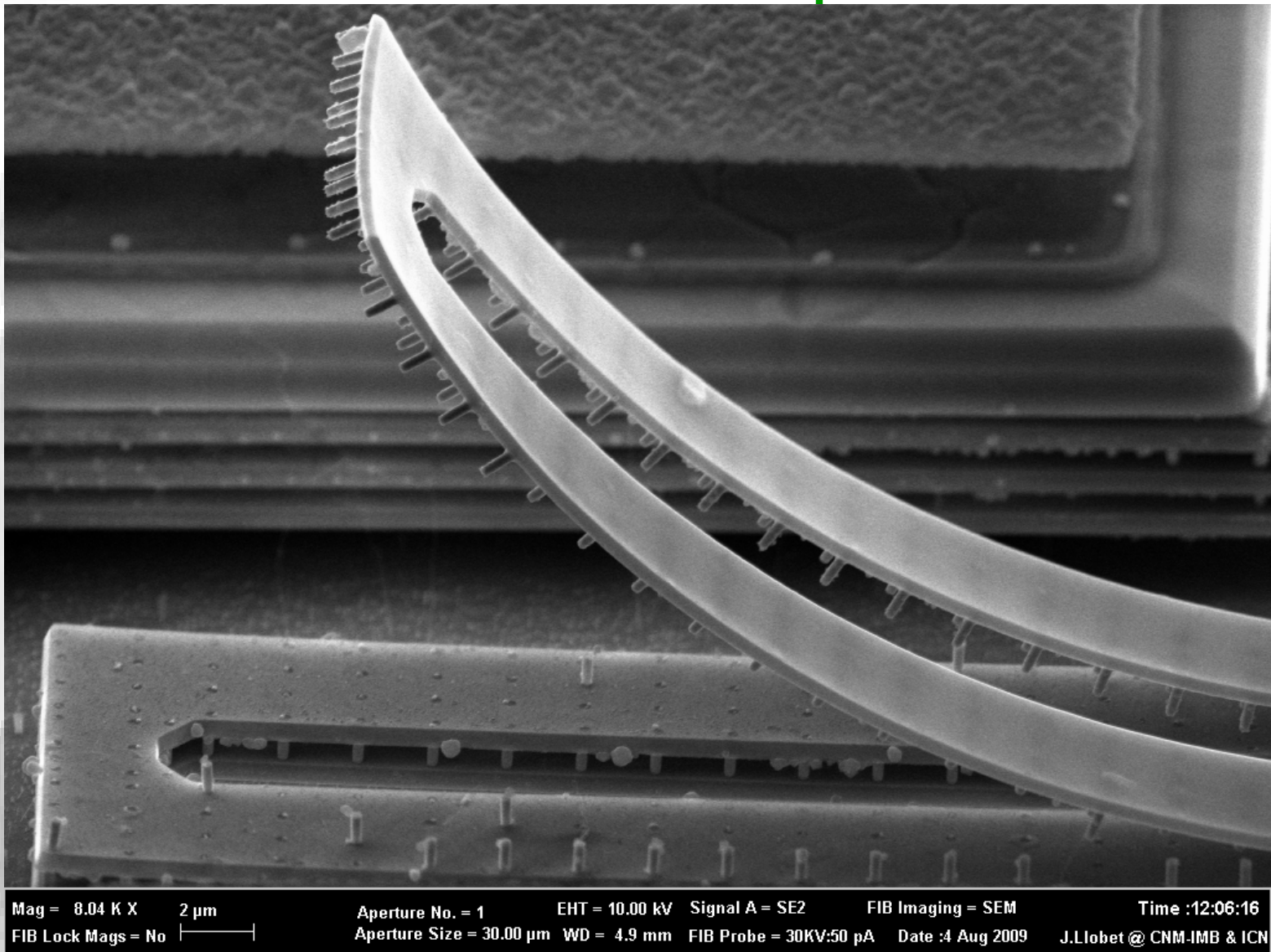
Micrograph

Title:

See you later,
alligator

Description:

These are test structures created with a standard CMOS process, which have been released with a chemical postprocess. The structures have bended due to the high stress of the metal layers.



Mag = 8.04 K X 2 μm Aperture No. = 1 EHT = 10.00 kV Signal A = SE2 FIB Imaging = SEM Time :12:06:16
FIB Lock Mags = No Aperture Size = 30.00 μm WD = 4.9 mm FIB Probe = 30KV:50 pA Date :4 Aug 2009 J.Llobet @ CNM-IMB & ICN

Magnification (3"x4" image): 8 Kx

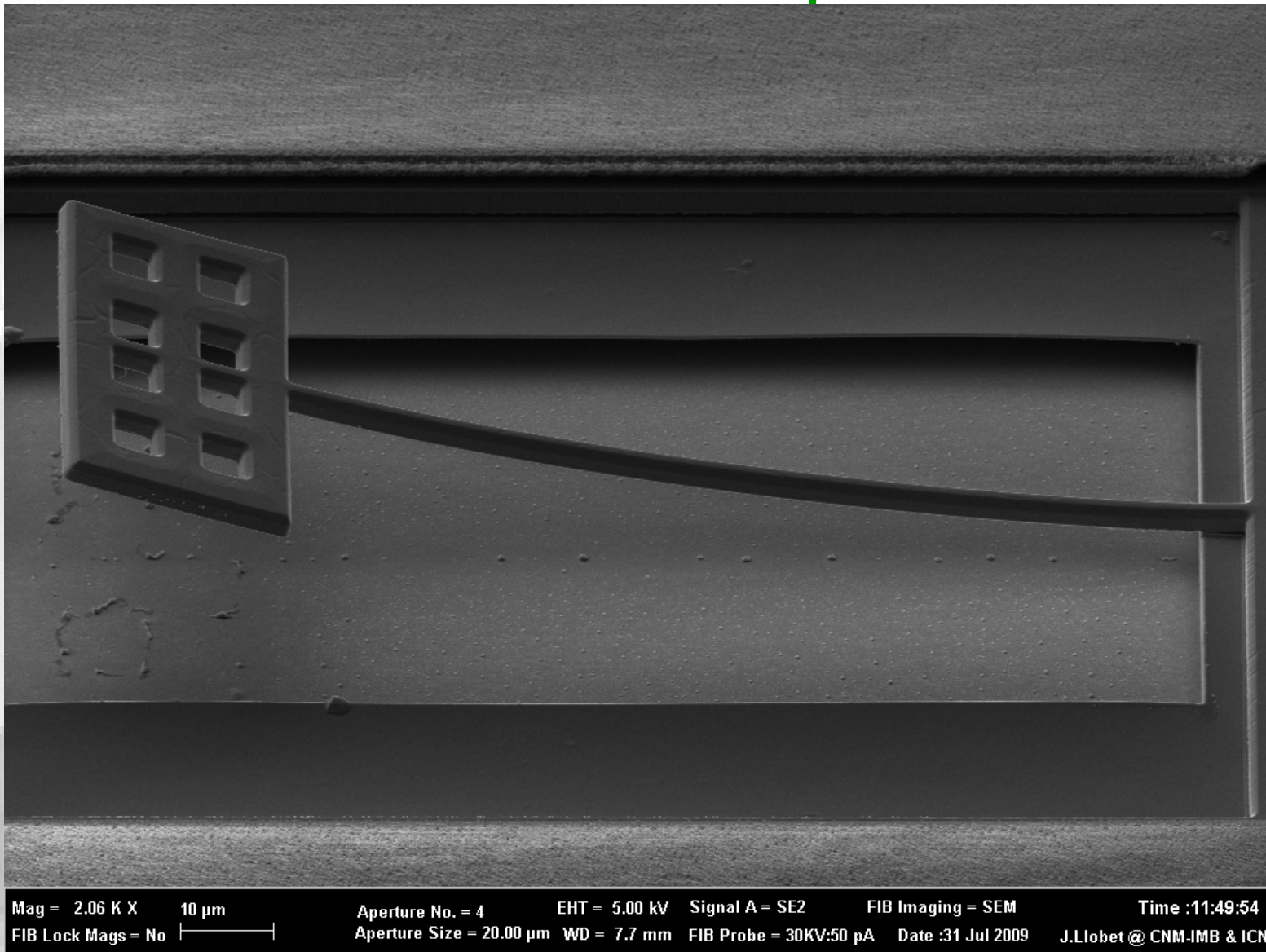
Submitted by: Jordi Llobet¹ & Juan J. Valle²

Instrument (Make and Model): CrossBeam 1560xB (Carl Zeiss)

Affiliation: ¹IMB-CNM (CSIC) & ²Baolab - Barcelona



2010 EIPBN MicroGraph Contest



Mag = 2.06 K X 10 μ m Aperture No. = 4 EHT = 5.00 kV Signal A = SE2 FIB Imaging = SEM Time :11:49:54
FIB Lock Mags = No Aperture Size = 20.00 μ m WD = 7.7 mm FIB Probe = 30KV:50 pA Date :31 Jul 2009 J.Llobet @ CNM-IMB & ICN

Magnification (3"x4" image): 2 Kx

Submitted by: Jordi Llobet¹ & Juan J. Valle²

Instrument (Make and Model): CrossBeam 1560xB (Carl Zeiss)

Affiliation: ¹IMB-CNM (CSIC) & ²Baolab - Barcelona

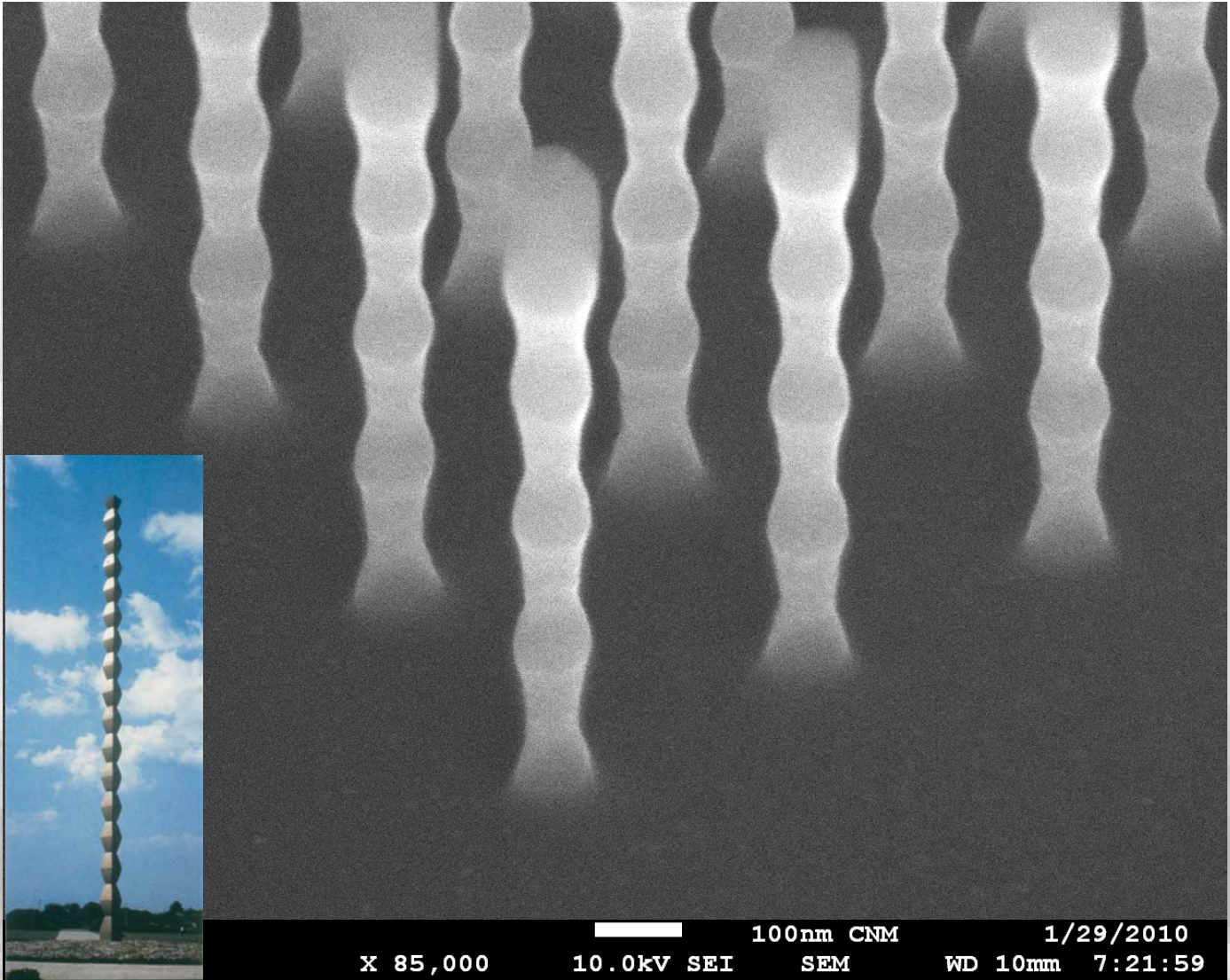


2010 EIPBN MicroGraph Contest

**Micrograph
Title: Endless
Columns of
Brancusi**

**Description: Endless
Column of Brancusi, a
famous Romanian
sculpture, the initiator
of modern sculpture
(some sculptures are in
Chicago Art Institute).
He was Aguste Rodin's
student.**

**These are nano
Brancusi's done by
Bosch-like cryo Si etch**



**Magnification (3"x4" image):
Submitted by:**

**Instrument (Make and Model):
Affiliation:**



2010 EIPBN MicroGraph Contest



Micrograph Title:
Nanoscale Indian Hut

Description: This is a bright field TEM image of poly(styrene-block-ferrocenyldimethylsilane) (PS-b-PFS) block copolymer thin film. The PS was etched off prior to imaging the fibrous PFS structure.

Magnification: 900X **Instrument:** Tecnai G2 TEM

Submitted by: Muruganathan Ramanathan and Seth Darling

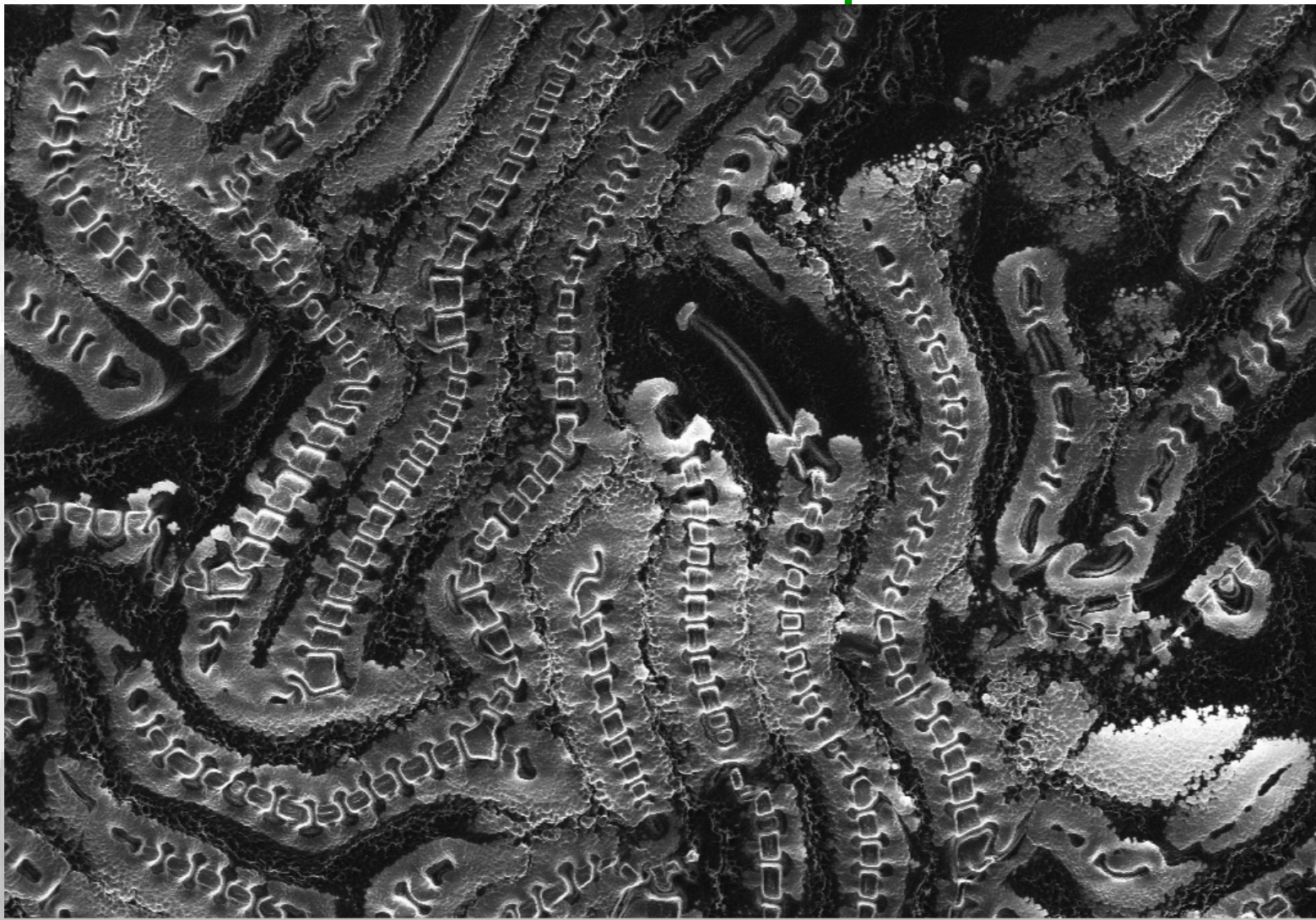
Affiliation: Center for Nanoscale Materials, Argonne National Laboratory



2010 EIPBN MicroGraph Contest

**Micrograph
Title:**
MicroSaur

Description:
FIB image
(Focused Ion
Beam, Ga+) that
shows a RIE
(Reactive Ion
Etching) result of
an attack over an
organic resist.



Mag = 606 X 20 µm Aperture No. = 1 EHT = 3.00 kV Signal A = SE2 FIB Imaging = FIB Time :10:29:33
FIB Lock Mags = No Aperture Size = 30.00 µm WD = 5.0 mm FIB Probe = 30KV:50 pA Date :4 Nov 2009 J.Llobet @ CNM-IMB & ICN

Magnification (3"x4" image): 600 x

Submitted by: Jordi Llobet¹ & Aïda Varea²

Instrument (Make and Model): CrossBeam 1560xB (Carl Zeiss)

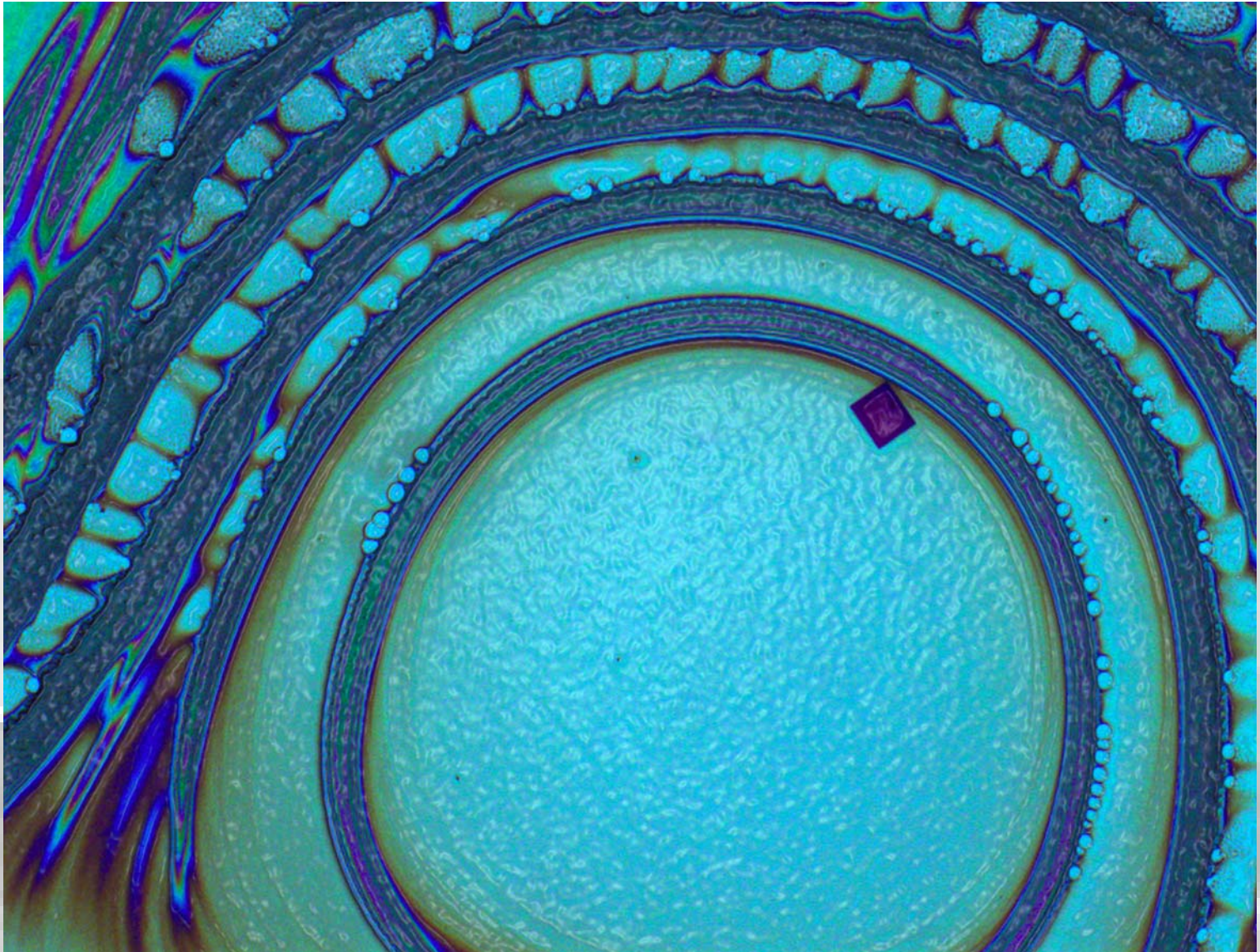
Affiliation: ¹IMB-CNM (CSIC) & ² UAB - Barcelona



2010 EIPBN MicroGraph Contest

Micrograph Title:
Polymer Art Glass

Description: This is a bright field optical micrograph of poly(styrene-block-ferrocenyldimethylsilane) (PS-b-PFS) block copolymer thin film. The polymer was spin coated on a thin TEM membrane subjected to hybrid thermal/solvent annealing. This artistic structure appears due to the selective dewetting of the polymer from the thin TEM window (seen in the middle) which oscillates during the spin coating.



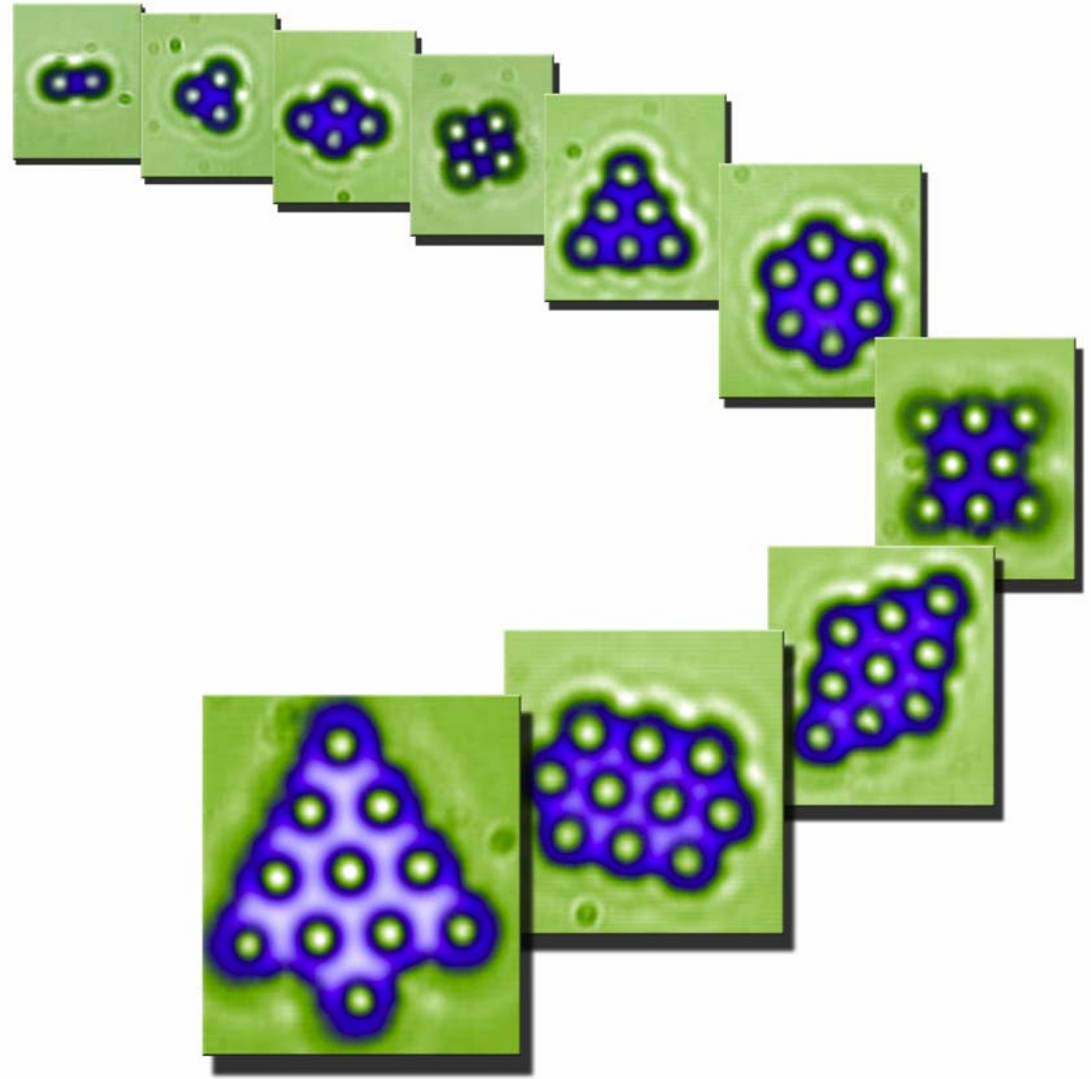
Magnification: 100X **Instrument:** Zeiss optical microscope

Submitted by: Muruganathan Ramanathan and Seth Darling

Affiliation: Center for Nanoscale Materials, Argonne National Laboratory



2010 EIPBN MicroGraph Contest



Micrograph Title:
Dynamic Tree

Description: Dynamic self-assembly of super paramagnetic particles under a rotating magnetic field. Rotational frequency and bead density determines the shape which is stable as long as the external magnetic field is applied.

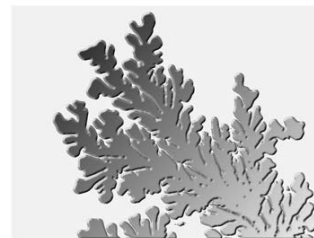
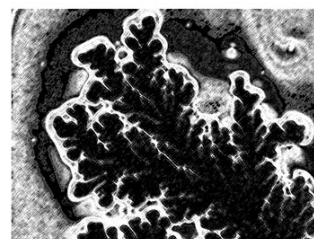
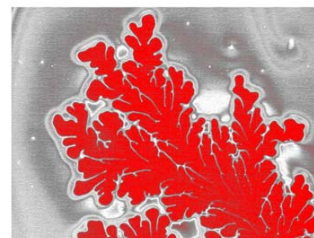
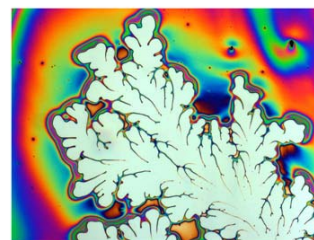
Magnification: 2 μ m beads imaged with 100X objective **Instrument:** Zeiss optical microscope
Submitted by: Muruganathan Ramanathan, Seth Darling, Thomas Fischer
Affiliation: Argonne National Laboratory and University of Bayreuth



2010 EIPBN MicroGraph Contest

Micrograph Title:
Natural Palate

Description: The top image is a bright field optical micrograph of silicon nitride patterned using a poly(styrene-*block*-ferrocenyldimethylsilane) (PS-*b*-PFS) block copolymer thin film as an etch mask. The large, fractal-like structure is formed by hybrid thermal/solvent annealing of the polymer. Crystallization of the PFS block competes with self-assembly of various nanoscale morphologies in a complex balance to produce these structures. The pattern is transferred to the substrate using reactive ion etching. The lower images are digitally edited artistic representations of the micrograph.



Magnification: 1mm wide **Instrument:** Zeiss optical microscope (cross-polarization mode)
Submitted by: Muruganathan Ramanathan and Seth Darling
Affiliation: Center for Nanoscale Materials, Argonne National Laboratory



2010 EIPBN MicroGraph Contest

Micrograph Title:
Polymer Brain

Description: This is a bright field optical micrograph of poly(styrene-block-ferrocenyldimethylsilane) (PS-b-PFS) block copolymer thin film. Polymer film thickness and the mode of annealing brings out a variety of structures which is currently being explored as an etch mask for mesoscale lithography.



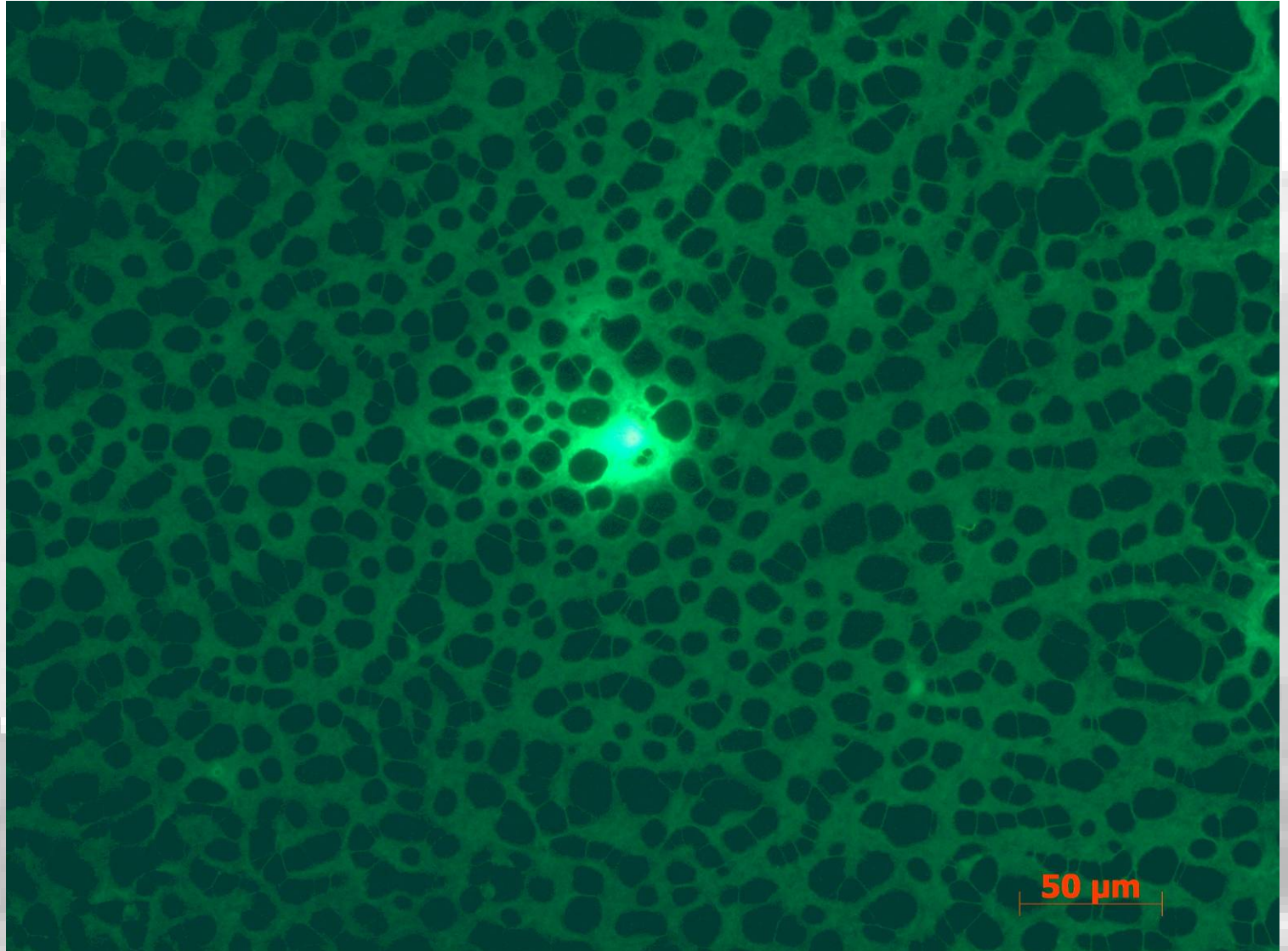
Magnification: 100X **Instrument:** Zeiss optical microscope (cross-polarization mode)
Submitted by: Muruganathan Ramanathan and Seth Darling
Affiliation: Center for Nanoscale Materials, Argonne National Laboratory



2010 EIPBN MicroGraph Contest

**Micrograph
Title: A
glimmer of
hope**

**Description:
Evaporation on
a glass slide of
a DNA droplet
containing 1
per 100 of
Triton**



**Magnification (3"x4" image): X20
Submitted by: J. Cordeiro**

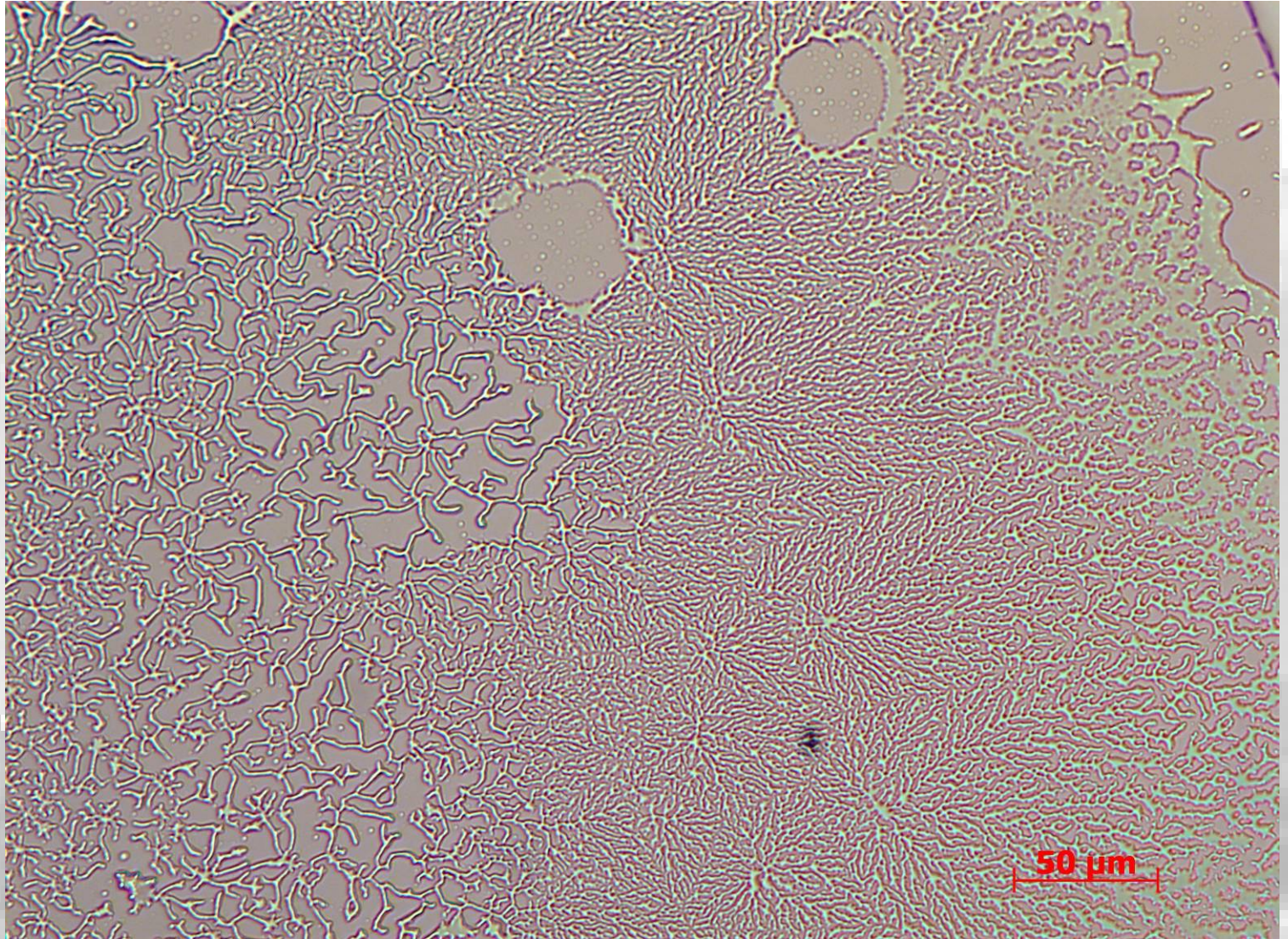
**Instrument (Make and Model): Zeiss Axio Obs. Z1M
Affiliation: BioColloNa LTM-CNRS**



2010 EIPBN MicroGraph Contest

**Micrograph
Title: DNA
coral**

**Description:
Network
formed on
glass slide
after
evaporation of
a DNA solution
containing 1
per 10000 of
Triton**

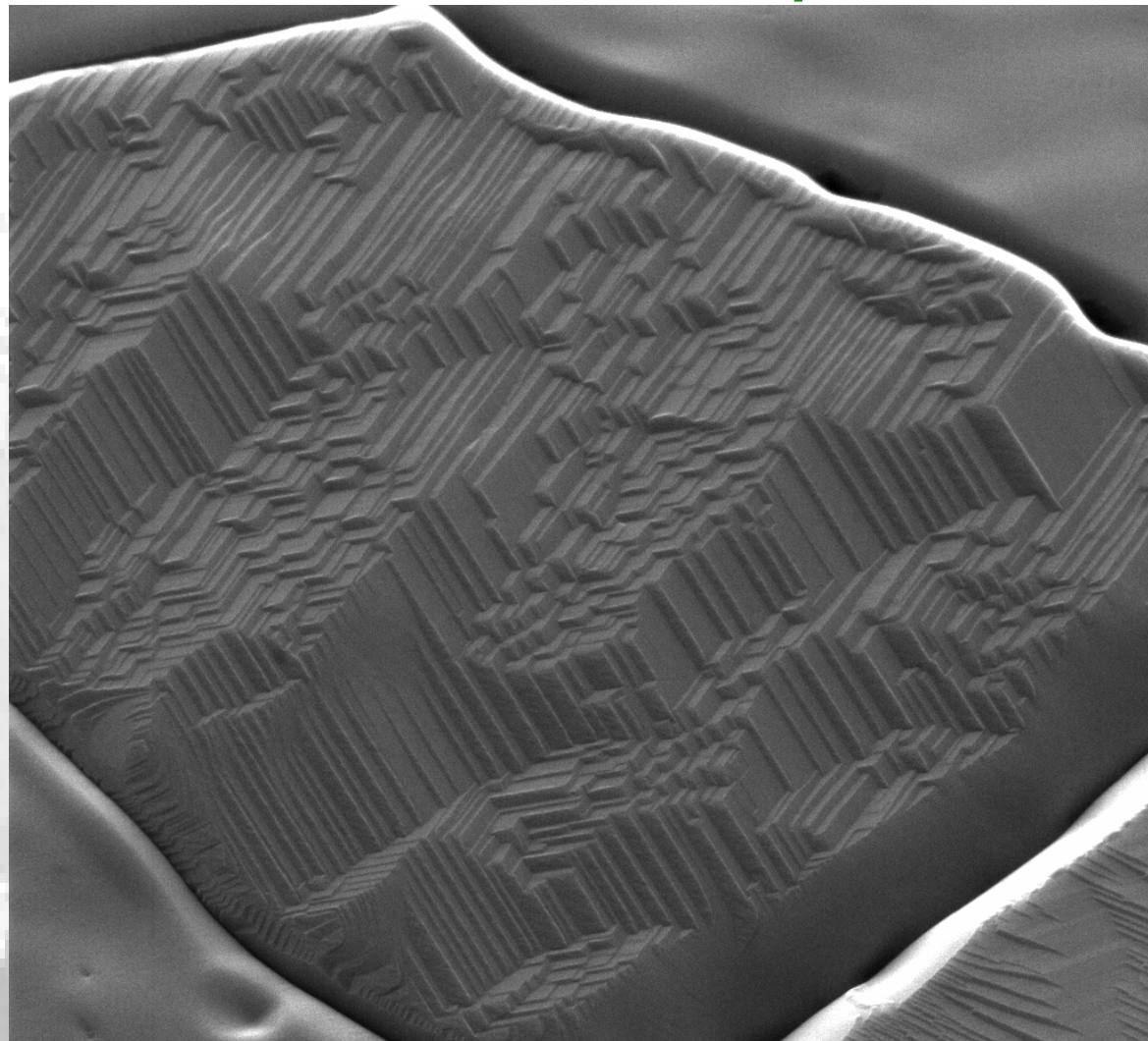



**Magnification (3"x4" image): X20
Submitted by: J. Cordeiro**

**Instrument (Make and Model): Zeiss Axio Obs. Z1M
Affiliation: BioColloNa LTM-CNRS**



2010 EIPBN MicroGraph Contest



 CARL ZEISS SMT	Field Of View 4.00 um	500.00 nm	Dwell Time 5.0 us	Date: 6/19/2008 Time: 1:06 PM
	Mag (4x5 Polaroid) 31,750.00 X	Blanker Current 4.0 pA	Line Averaging 16	Acceleration V 35491.9 V

Micrograph Title:
Stackable Atoms

Description: *This is a tungsten weld that exhibits remarkable faceting due to the rapid heating and cooling. Surprisingly, some of the adjacent grains show no evidence of this faceting.*

Magnification (3"x4" image): 32 kX

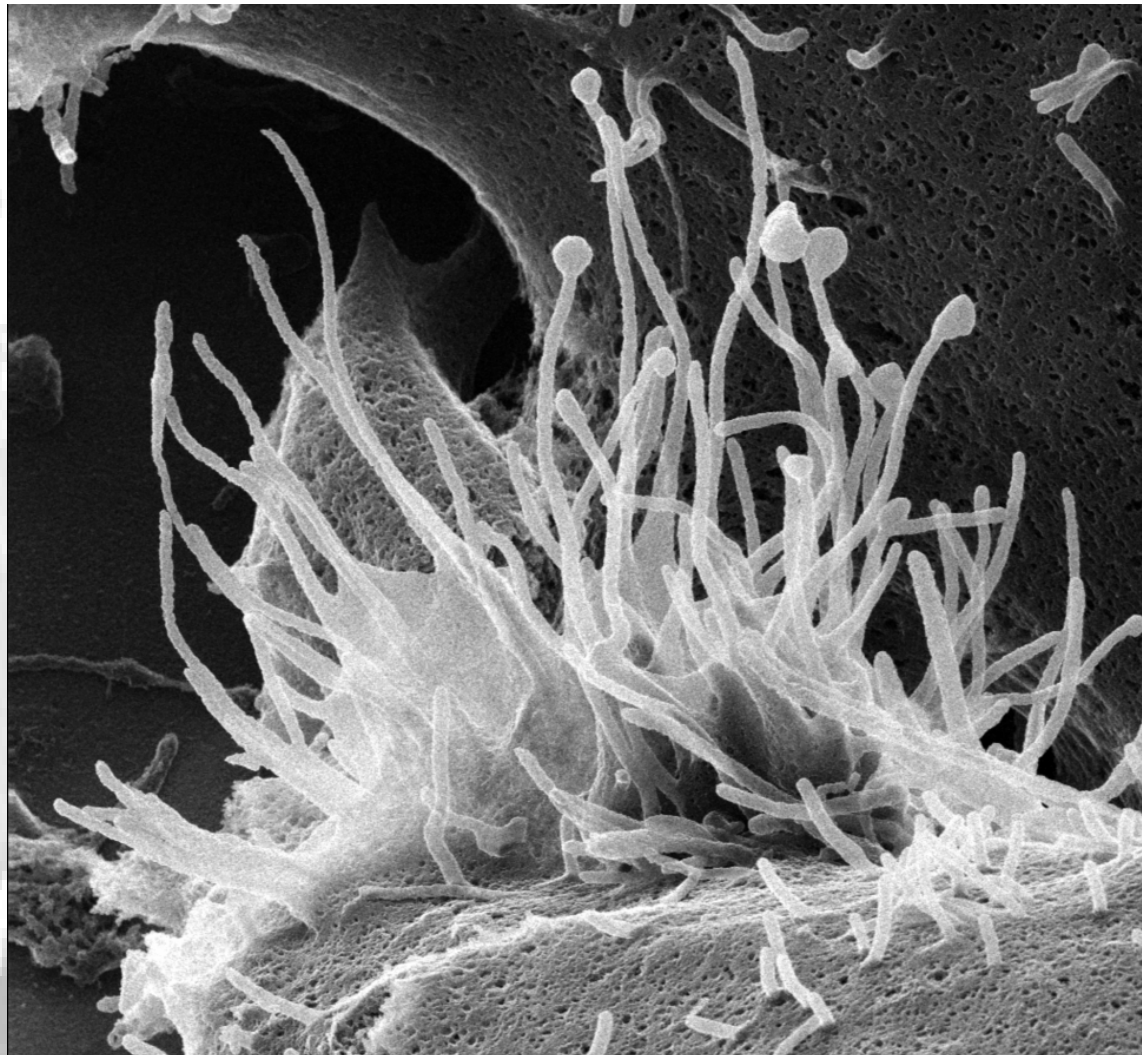
Submitted by: Shawn McVey and Dave Voci



Instrument (Make and Model): ORION Plus He Ion Microscope

Affiliation: Carl Zeiss SMT



2010 EIPBN MicroGraph Contest



 CARL ZEISS SMT	Field Of View 5.00 um		Dwell Time 0.3 us	Date: 4/7/2010
	Mag (4x5 Polaroid) 22,860.00 X		Blanker Current 0.4 pA	Line Averaging 128

Micrograph Title:
Snake Charmer

Description: *This is the membrane of a mouse cell with the micro-villi reaching up – just as snakes rise for the music of the serpent charmer.*

Magnification (3"x4" image): 23 kX

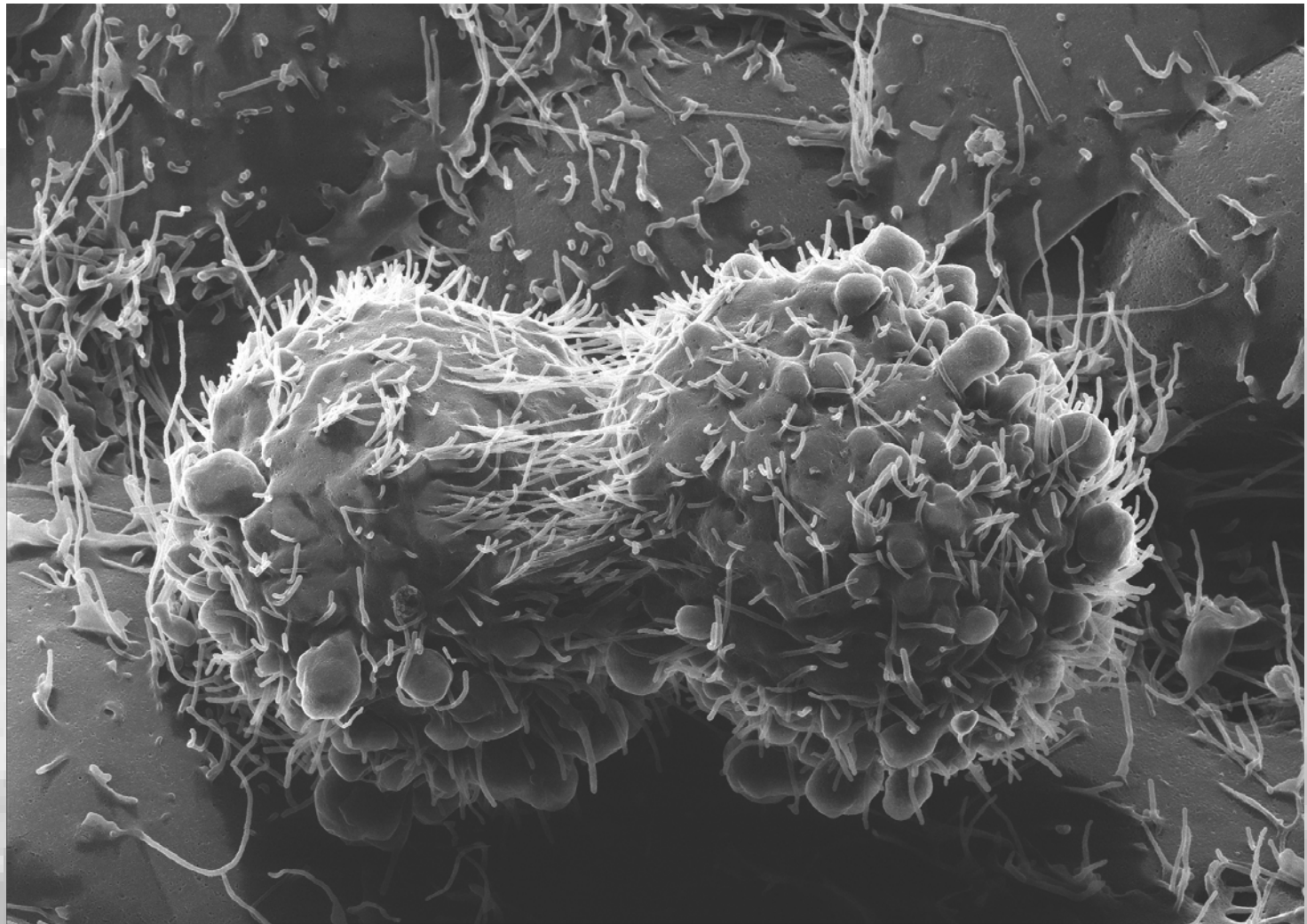
Submitted by: Shawn McVey and Dave Voci

Instrument (Make and Model): ORION Plus He Ion Microscope

Affiliation: Carl Zeiss SMT





2010 EIPBN MicroGraph Contest



Micrograph Title: Two Cells - Adam and Eve

Description: *These two whole cells had their micro villi entangled as if hugging.*

 CARL ZEISS SMT	Field Of View 25.00 um	 2.00 um	Dwell Time 0.3 us	Date: 4/8/2010 Time: 10:32 AM
	Mag (4x5 Polaroid) 4,572.00 X	Blanker Current 0.7 pA	Line Averaging 255	Acceleration V 36.5 kV

Magnification (3"x4" image): 4.6 kX

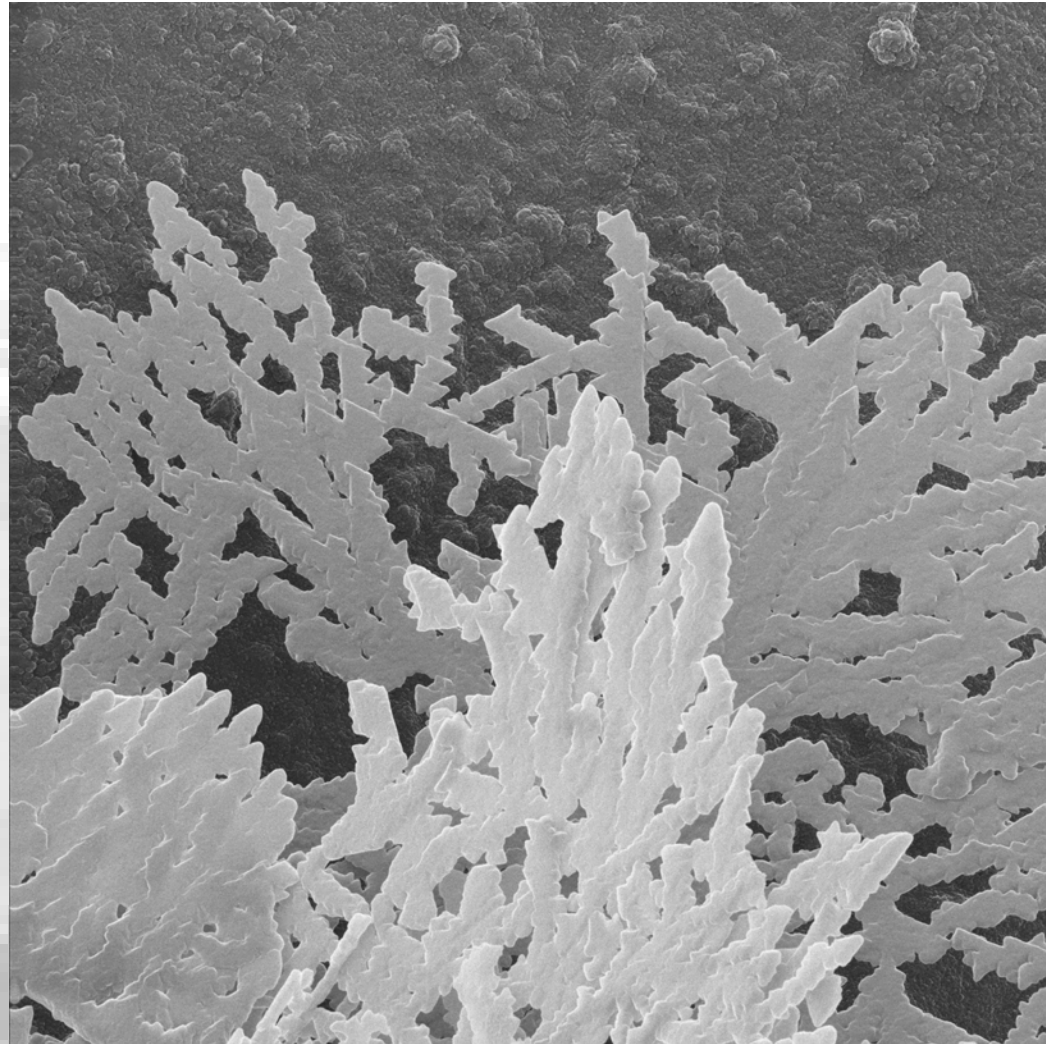
Submitted by: Shawn McVey and Dave Voci


Instrument (Make and Model): ORION Plus He Ion Microscope

Affiliation: Carl Zeiss SMT



2010 EIPBN MicroGraph Contest



 CARL ZEISS SMT	Field Of View 6.50 um	500.00 nm	Dwell Time 0.3 us	Date: 2/2/2010 Time: 4:34 PM
	Mag (4x5 Polaroid) 17,584.62 X	Blanker Current 0.7 pA	Line Averaging 128	Acceleration V 37.8 kV

Micrograph Title:
Snow Flakes

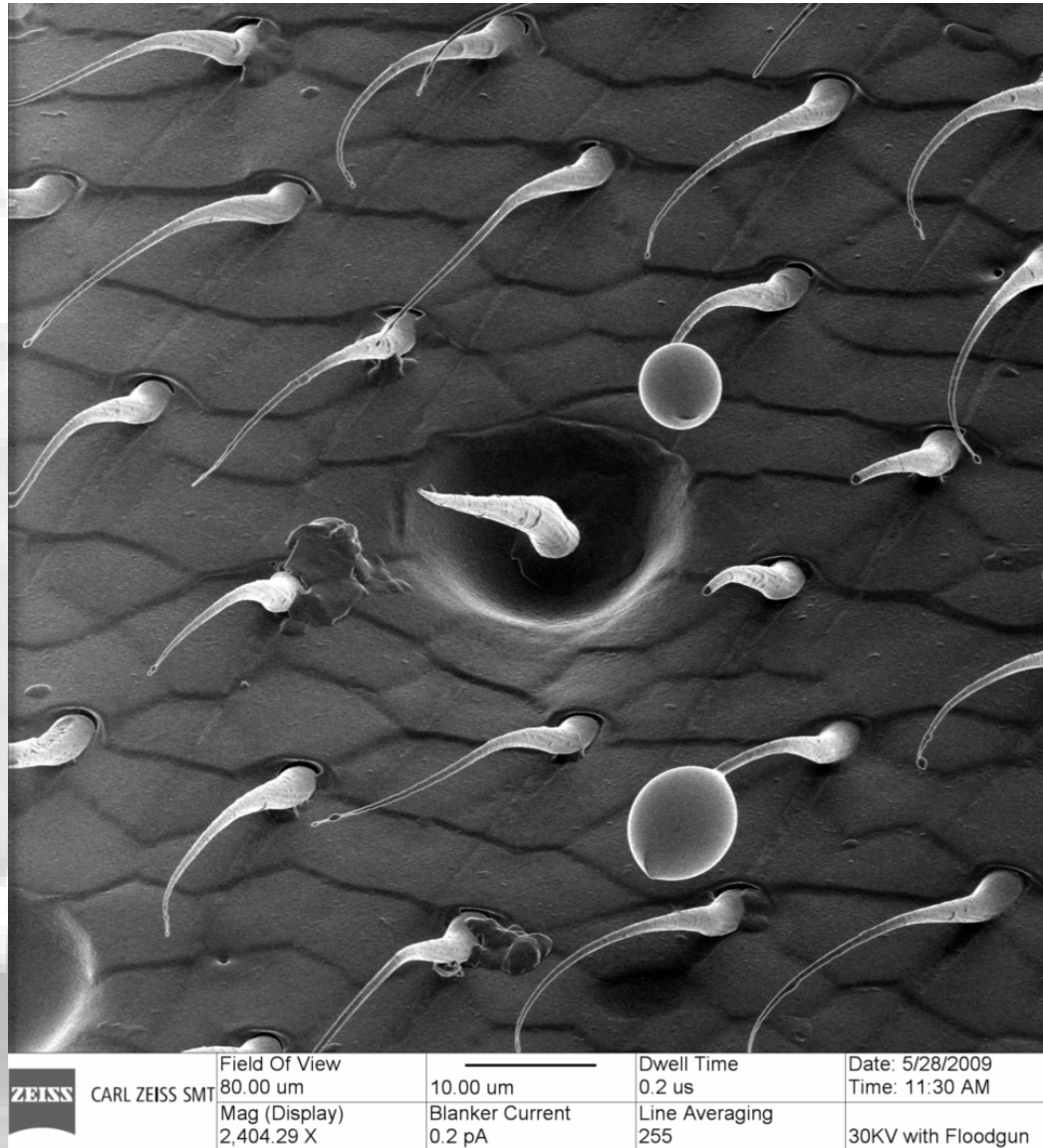
Description: The planar nature of the crystal formation process is plainly visible here.

Magnification (3"x4" image): 17kX
Submitted by: Lou Farkas and Dave Voci

Instrument: Carl Zeiss, ORION Plus (He Ion Microscope)
Affiliation: Carl Zeiss SMT



2010 EIPBN MicroGraph Contest



Micrograph Title:
Defective Wing

Description: These are the several of the small hairs that are found on the wing of a bee. The scaly nature of the membrane is also seen. Also, several of the hairs show a defect suspected to be a parasite egg.

Magnification (3"x4" image): 2.4kX

Submitted by: Shawn McVey and Dave Voci

Instrument: Carl Zeiss, ORION Plus (He Ion Microscope)

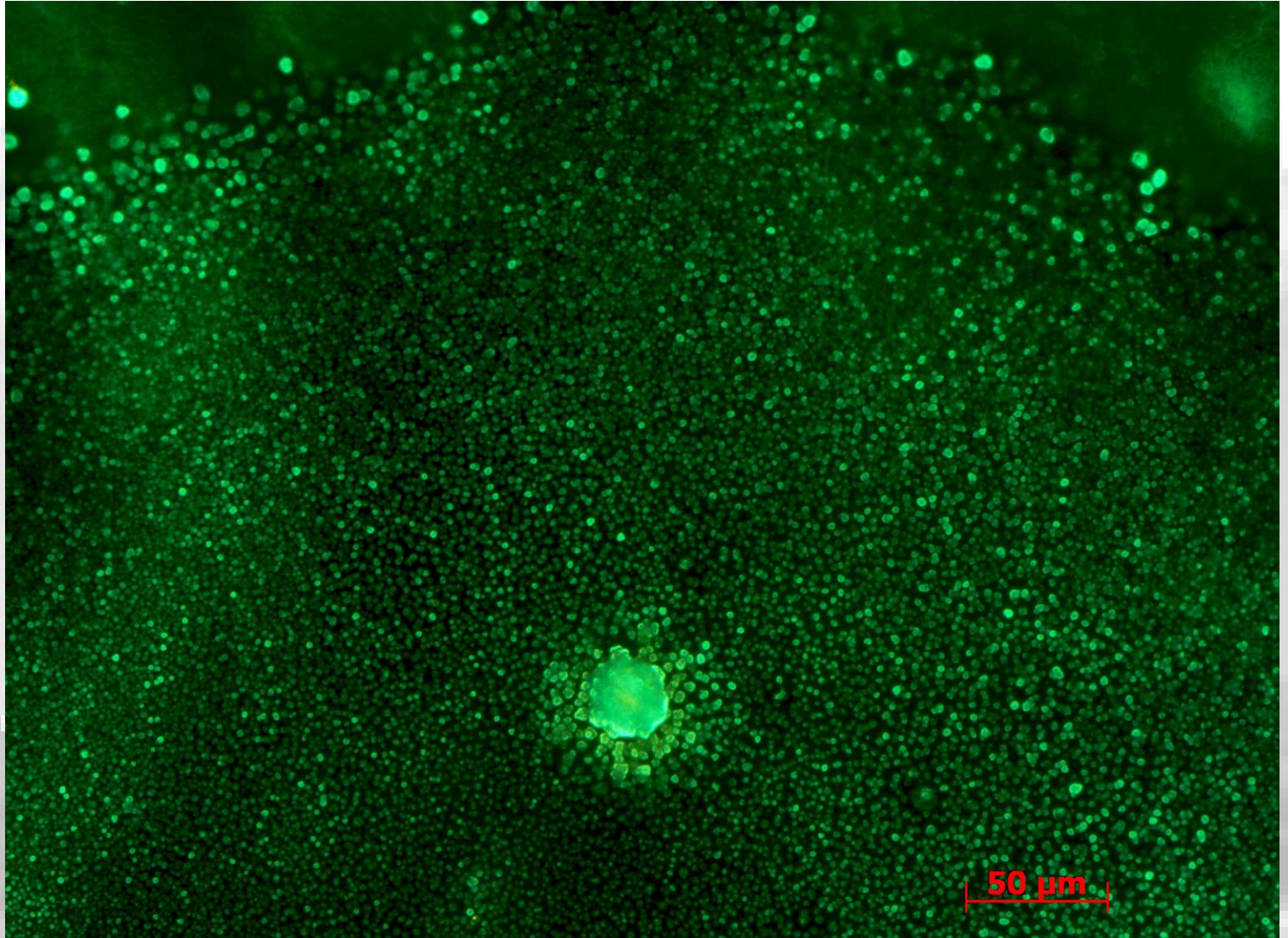
Affiliation: Carl Zeiss SMT



2010 EIPBN MicroGraph Contest

**Micrograph
Title: Carried
by the crowd**

**Description:
Evaporation of
a DNA droplet
on a glass
slide**



**Magnification (3"x4" image): X20
Submitted by: J. Cordeiro**

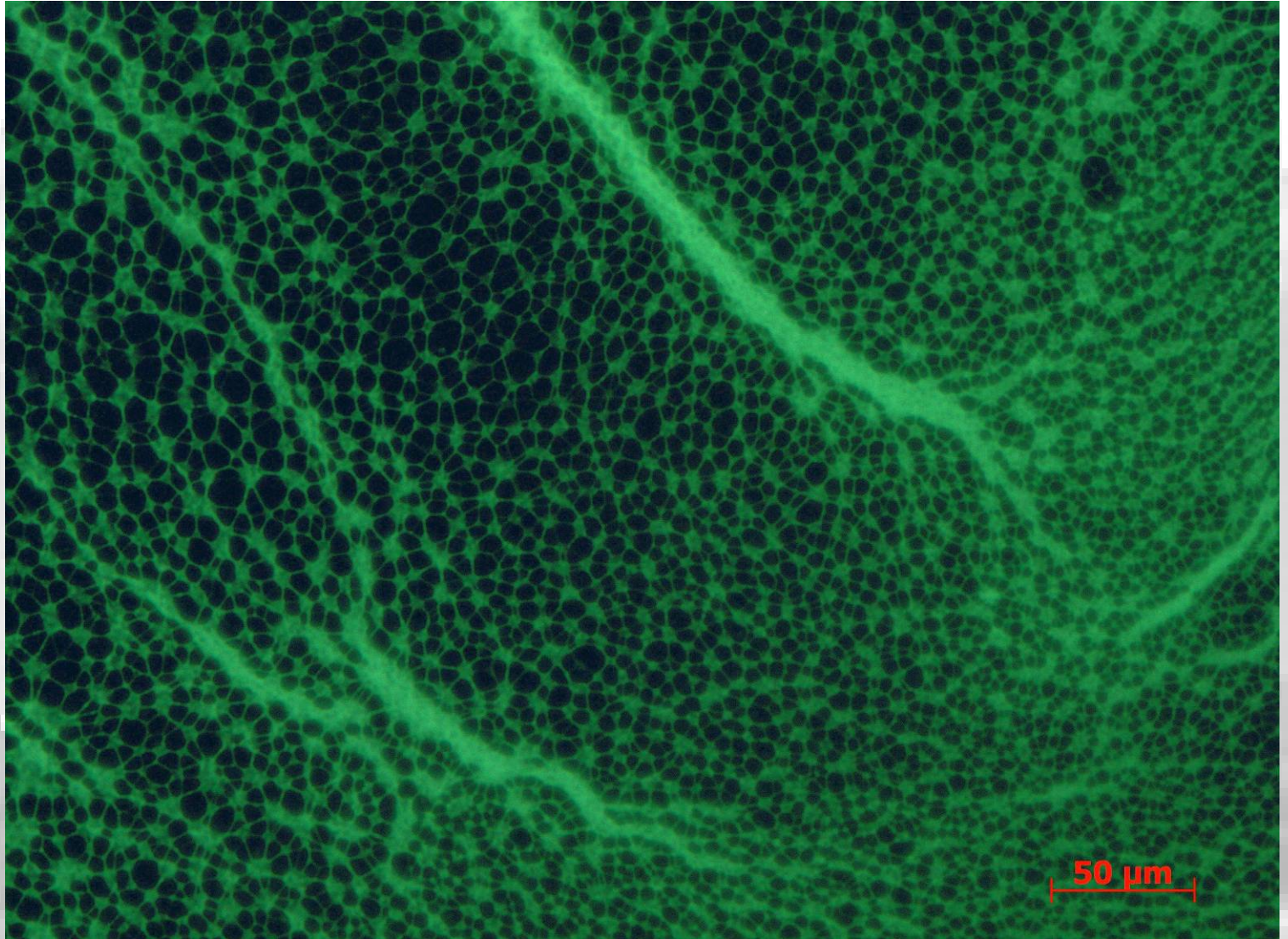
**Instrument (Make and Model): Zeiss Axio Obs. Z1M
Affiliation: BioColloNa LTM-CNRS**



2010 EIPBN MicroGraph Contest

**Micrograph
Title: Green
lacework**

**Description:
Network
formed
on glass slide
after
evaporation of
a droplet of
DNA with 1 per
100 of Triton**



**Magnification (3"x4" image): X20
Submitted by: J. Cordeiro**

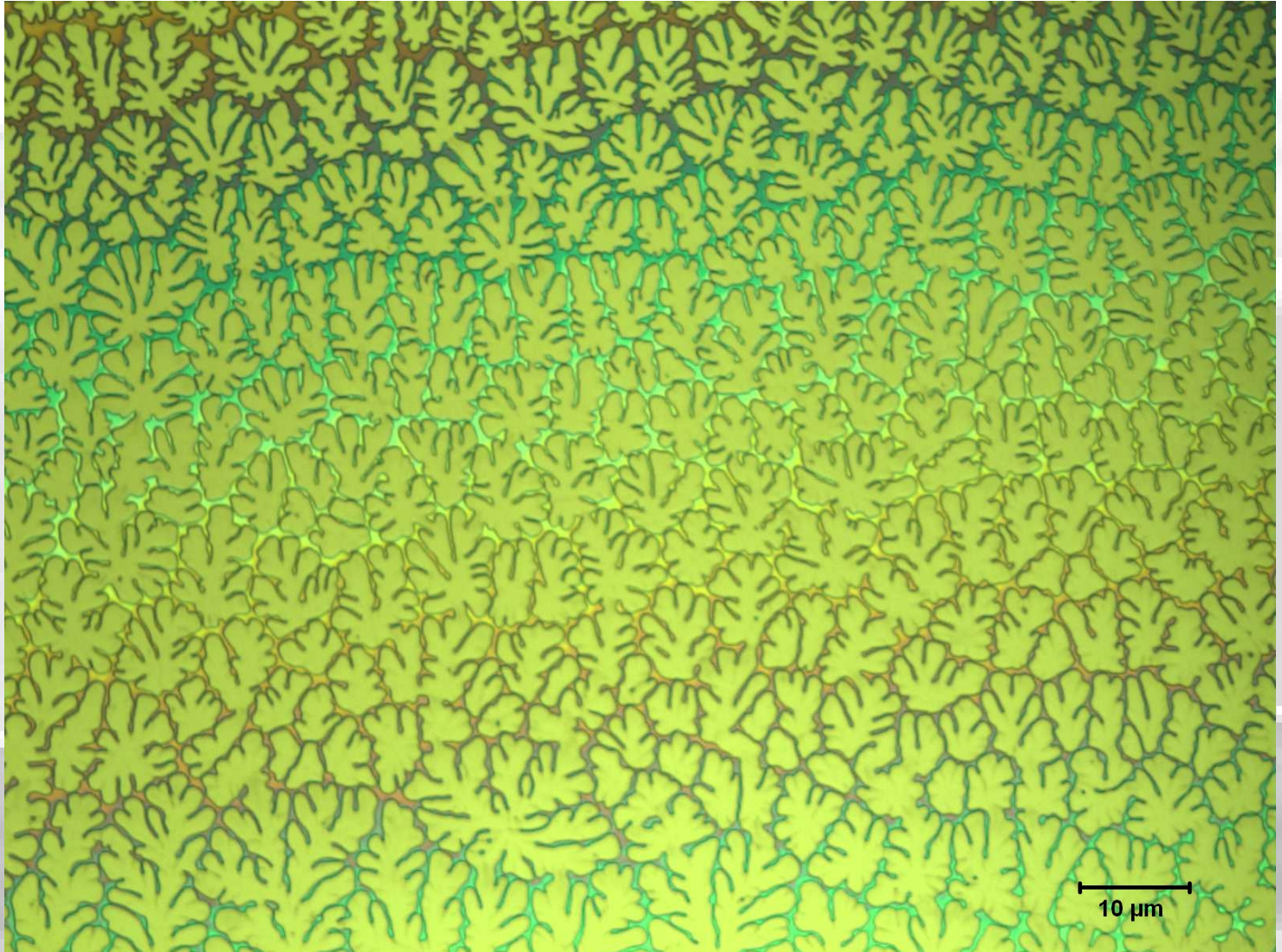
**Instrument (Make and Model): Zeiss Axio Obs. Z1M
Affiliation: BioColloNa LTM CNRS**



2010 EIPBN MicroGraph Contest

**Micrograph
Title:
Luau-On-A-
Sample**

**Description:
Nanoimprint
failures make me
want a tropical
vacation.**



**Magnification (3"x4" image):
Submitted by: Teresa Fazio**

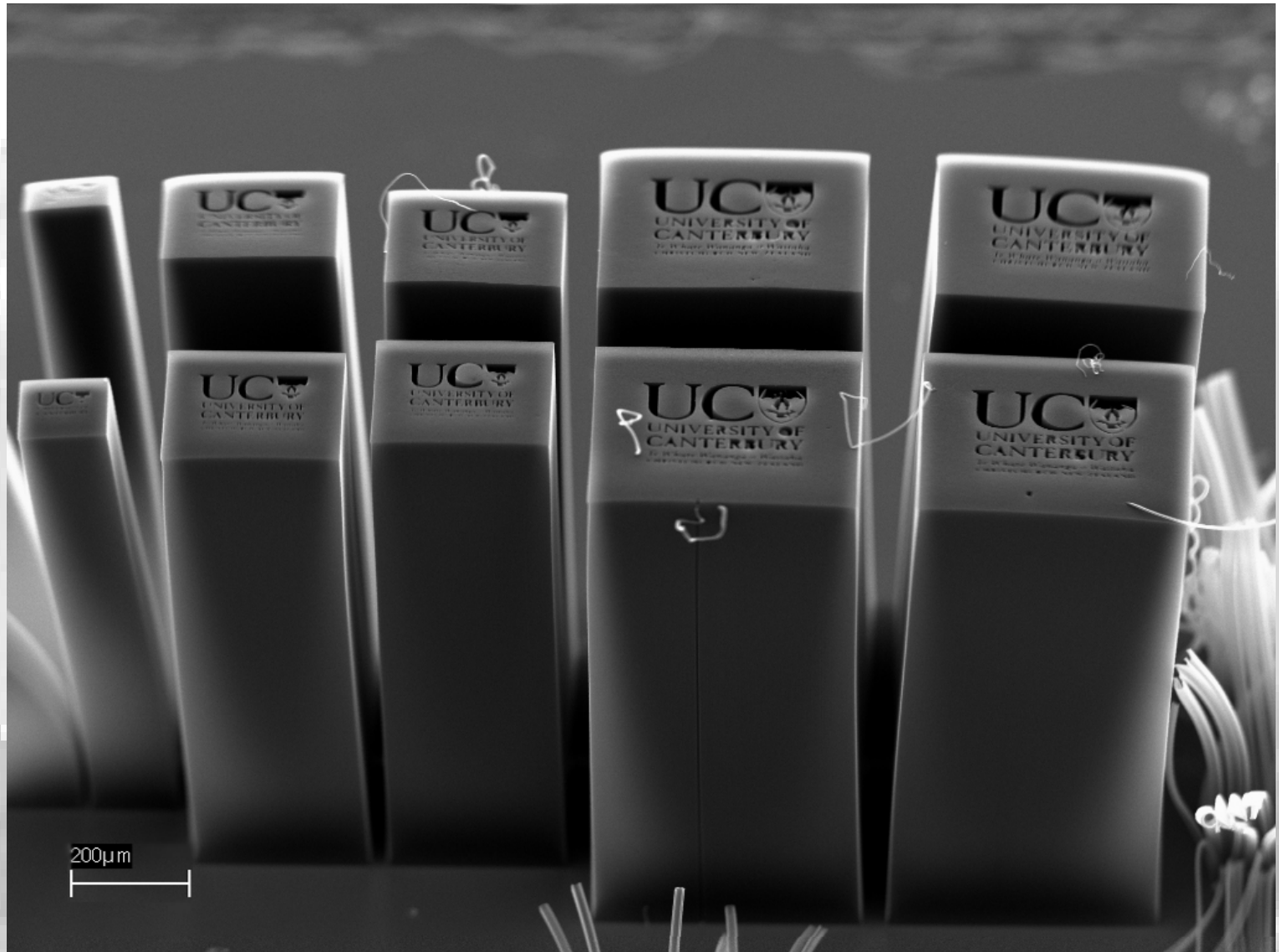
**Instrument (Make and Model): Nikon ME600
Affiliation: Columbia University**



2010 EIPBN MicroGraph Contest

Micrograph Title:
Micro towers
of Canterbury

Description:
Patterned voids in
carbon nanotube
towers. Alumina and
iron catalyst
deposited by e-
beam evaporation
was patterned by
photolithography.
The carbon
nanotubes were
grown by chemical
vapour deposition
from the pattern on
the substrate.

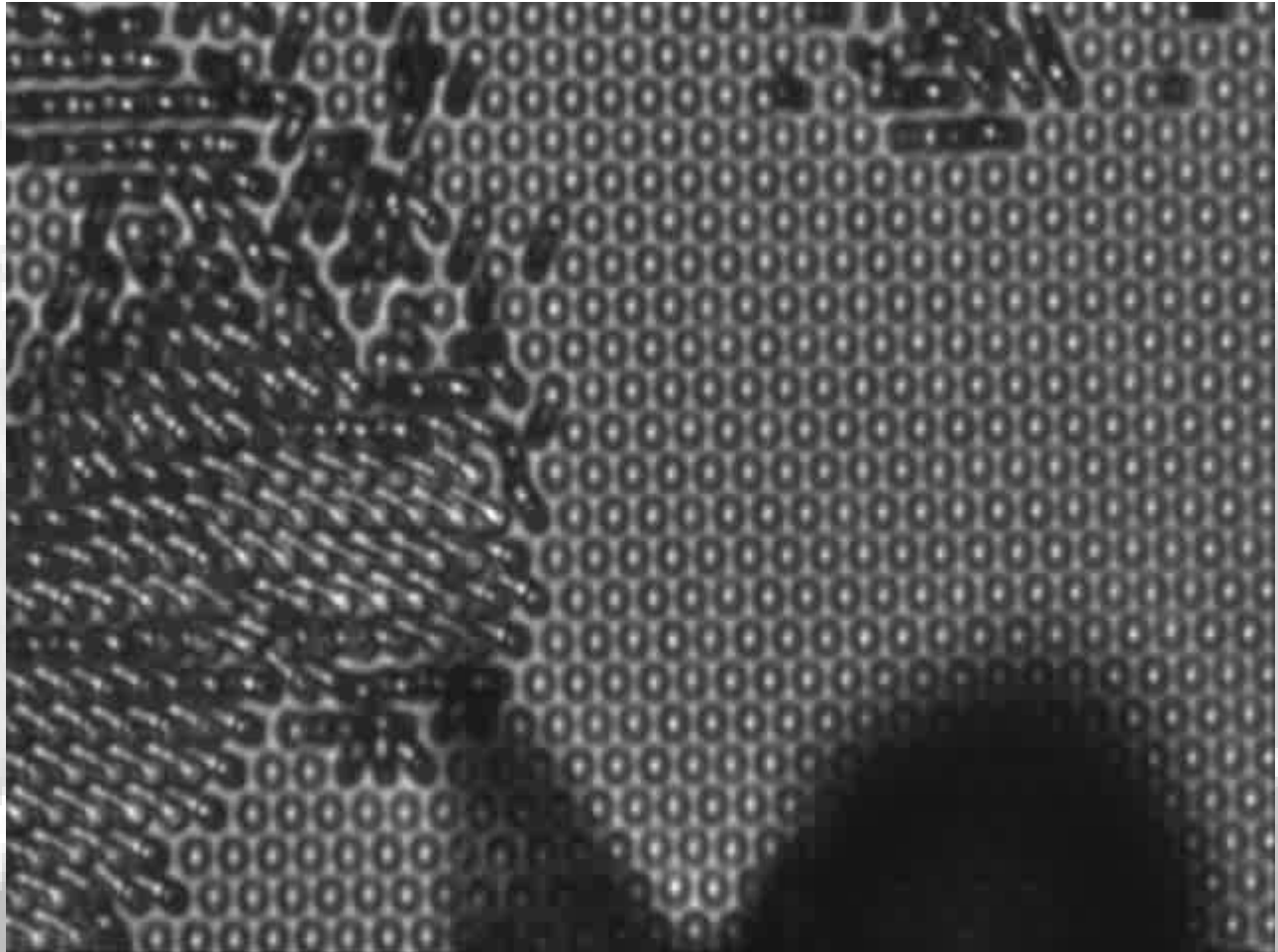


Magnification (3"x4" image): 40 x
Submitted by: Volker Nock, David Garrett
and Nanotechnology, University of Canterbury, Christchurch, New Zealand

Instrument (Make and Model): Leica S440
Affiliation: The MacDiarmid Institute for Advanced Materials



2010 EIPBN MicroGraph Contest



Micrograph

Title:

Dangerous
Drive

Description:

The DIC stack of a hexagonal array of PDMS pillars with magnetic tips. As magnetic tweezer gets close, pillars adhere to each other.

Magnification (3"x4" image):

objective

Submitted by: Saba Ghassemi

Instrument (Make and Model): CCD camera with 40X

Affiliation: Columbia University



2010 EIPBN MicroGraph Contest



Micrograph

Title: Dancing Neon Atoms

Description: The bright dots are actual neon atoms moving under their thermal energies. Under high fields, the Van der Waals forces are exaggerated causing them to temporarily bond together.

Magnification (3"x4" image): 3 Million X

Submitted by: Dave Voci, John Notte, FHM Faridur (Milton) Rahman

Instrument: Carl Zeiss Field Ion Microscope

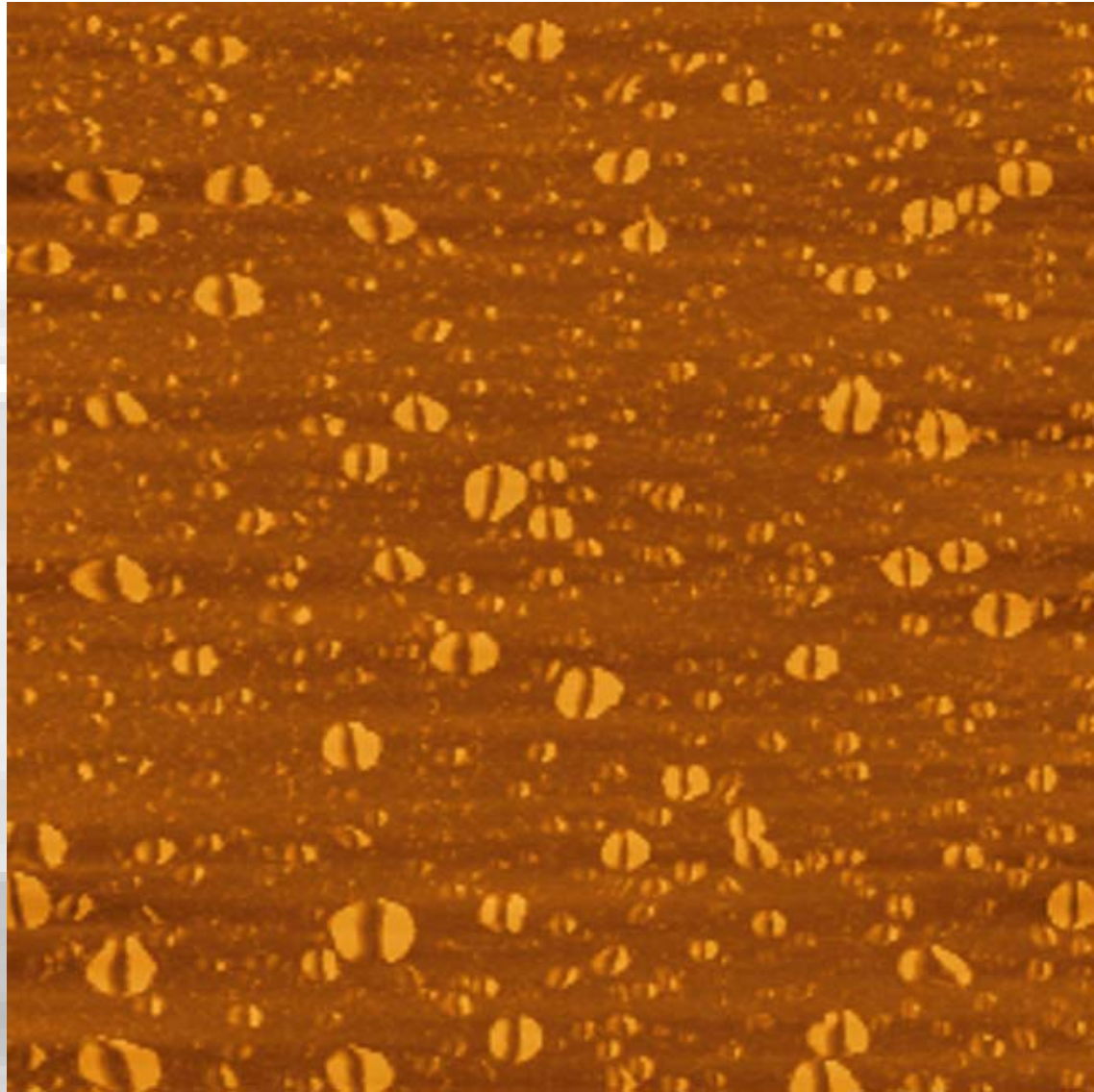
Affiliation: Carl Zeiss SMT



2010 EIPBN MicroGraph Contest

**Micrograph
Title: Coffee
grains.**

**Description:
AFM phase
image of polymer
nanotopography**

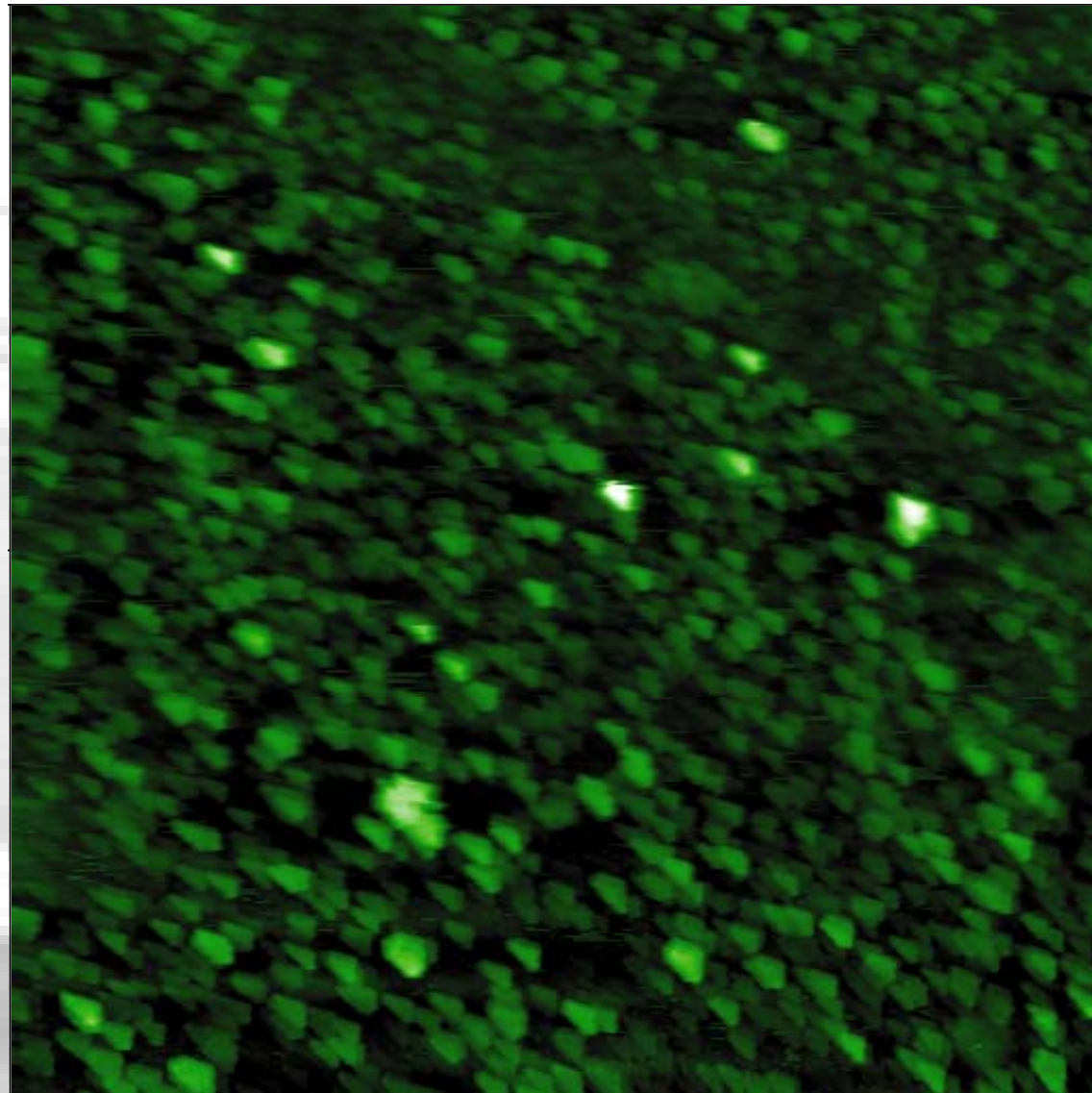


**Magnification: 2umx2um image
Submitted by: Kontziampasis Dimitrios**

**Instrument (Make and Model): CP-II, AFM, Veeco
Affiliation: N.C.S.R. "Demokritos"**



2010 EIPBN MicroGraph Contest



**Micrograph
Title: Poison
Ivy.**

**Description:
AFM topography
image of a
polymer after
plasma etching**

**Magnification : 2umx2um image
Submitted by: Kontziampasis Dimitrios**

**Instrument (Make and Model): CP-II, AFM, Veeco
Affiliation: N.C.S.R. "Demokritos"**