

NOI MESERII: STIINTA SI ARTA IN UNIVERSUL MICROMETRIC

Mirela Suchea

<https://mirananoart.wordpress.com/>

Împreună pe aripile carierei în Jobland, Bucuresti, 30 Octombrie 2019

Cuprins

- Cate ceva despre mine
- Microscopia electronica in stiinta: vizualizarea micro- nano- universului
- Micro- si nano- litografie: manipularea materiei la nivel micro- si nanometric
- Despre NanoArta
- Concluzii si discutii

- Concurs de ghicitori

Cine sunt? Mirela (Mira) Suchea



Activitate stiintifica: autor si coautor al peste 40 de publicatii ISI cu mai mult de 750 de citari in domeniul Stiinta Materialelor si Nanotehnologie, Hirsh=13

URL:<http://www.researcherid.com/rid/B-7547-2012> ORCID:<http://orcid.org/0000-0003-0389-7944>

Linkedin: <https://www.linkedin.com/in/m-suchea-67602b3b>

Fizician Principal la IMT Bucuresti www.imt.ro

Membru senior al grupului de cercetatori al Center of Materials Technology and Photonics, Hellenic Mediterranean University, Crete, Greece

<http://www.cematep.hmu.gr/>

Activitate Artistica: NanoArta si fotografie

Din 2012 NanoArta: participante in Festivalurile Internationale NanoArt, co-curator ed 3,4 ai 5(2018), o expozitie personala "MICROfotografie" Iasi, Romania in 2014, Participanta cu 10 lucrari in expozita permanenta de la UAIC Intrarea Drept din 2017.

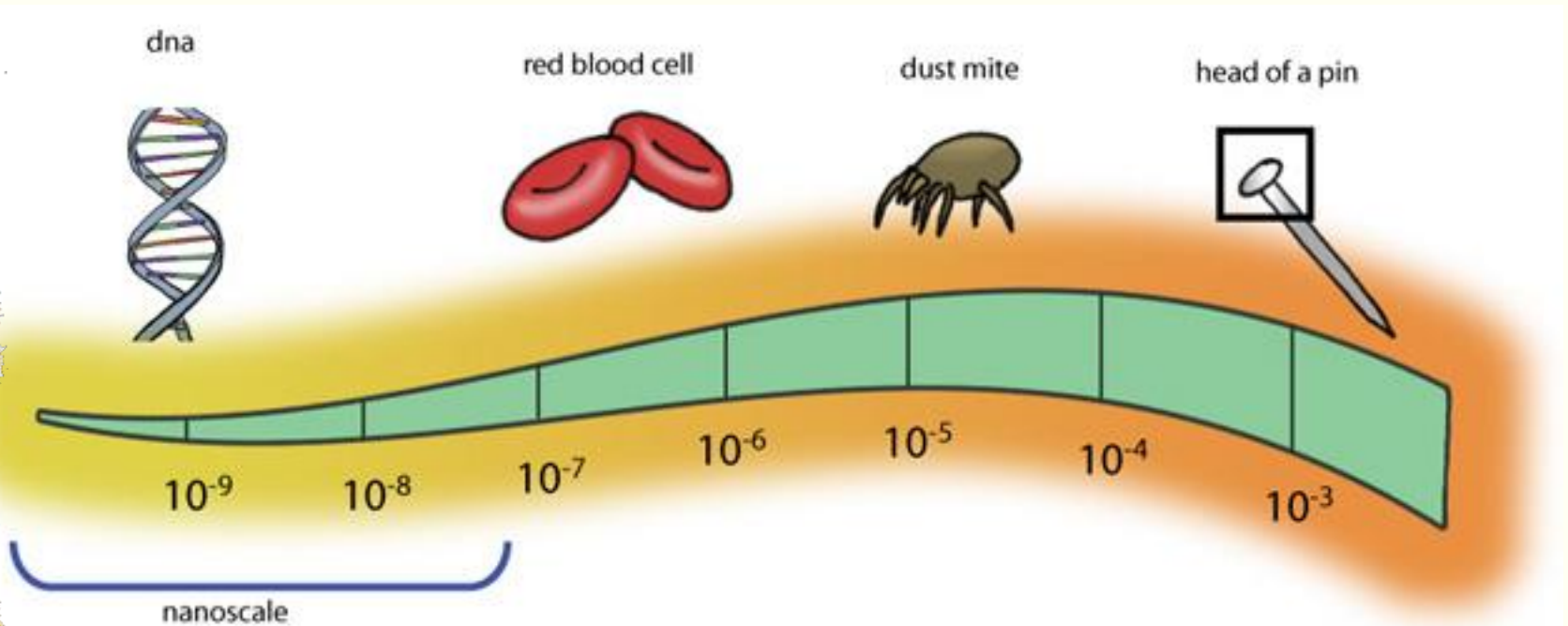
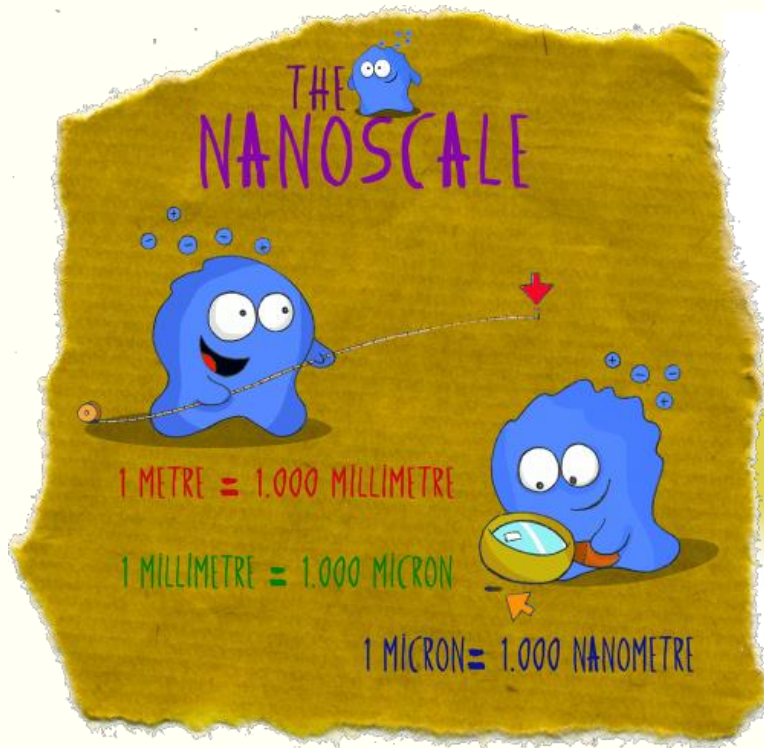
Directorul pentru Europa al "Academy of NanoArt" <http://nanoart.org> din 2017

Fotografie: Membru al Fotolasi din 2013, participari in diverse expozitii colective, fondatoarea si organizatoarea 1st and 2nd Art & Science International Photo Contest Romania (2014, 2016), si Septembrie 2018

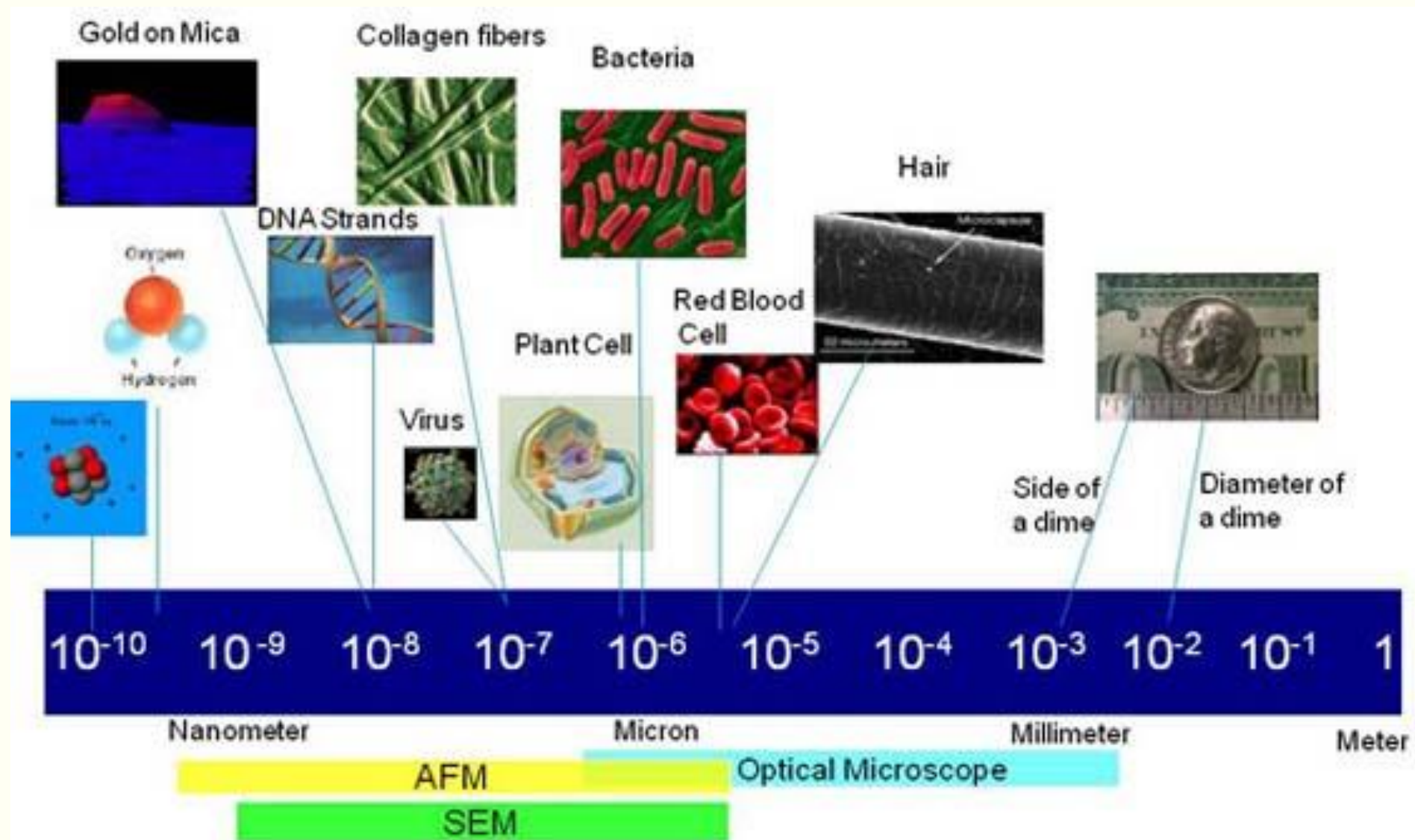
Webpage: <https://mirananoart.wordpress.com/>

FB: www.facebook.com/mira.suchea

Cat e de mic nanometrul?



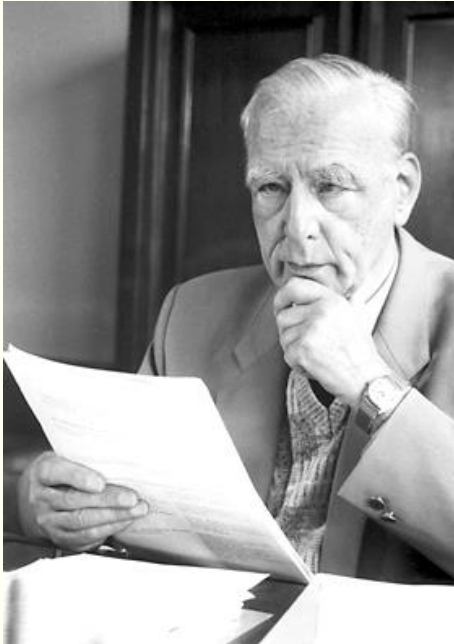
Cat e de mic nanometrul?



Microscopia electronica de baleiaj sau cu scanare- SEM

Scanning Electron Microscopy

Microscopia electronica de baleiaj - SEM



Ernst Ruska: **Nobel prize Physics 1986**

Born: 25 December 1906, Heidelberg, Germany

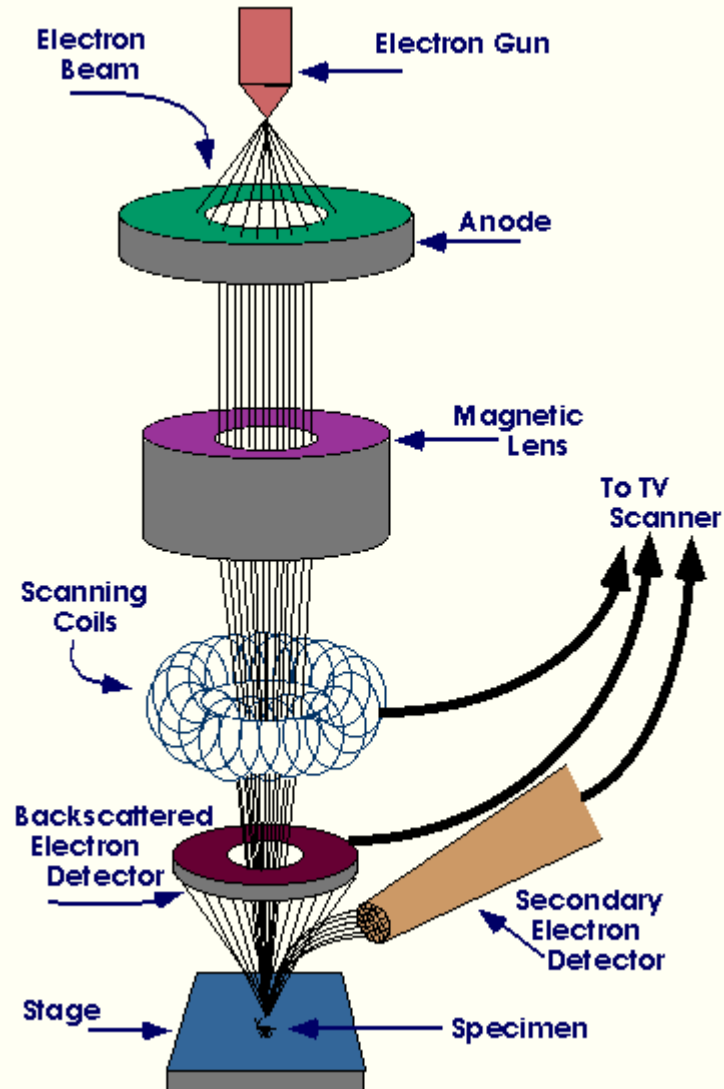
Died: 27 May 1988, West Berlin, Germany

Affiliation at the time of the award: Fritz-Haber-Institut
der Max-Planck-Gesellschaft, Berlin, Federal Republic
of Germany

Prize motivation: "for his fundamental work in electron
optics, and for the design of the first electron
microscope"

- Primul microscop electronic a fost construit în 1931 de către inginerii germani Ernst Ruska și Max Knoll. Acesta era bazat pe ideile și descoperirile fizicianului francez Louis de Broglie. Deși primitiv și nepotrivit utilizărilor practice, instrumentul era capabil să transmită o imagine mărită a obiectelor de patru sute de ori.
- În același deceniu, Manfred von Ardenne a inventat microscopul electronic de baleiaj și un microscop electronic universal.

Microscopul electronic de baleiaj - SEM



- utilizam electronii in loc de fotoni cu rol in vizualizarea suprafetei probelor
- posibilitati de vizualizare mult mai bune comparativ cu microscopul optic
- este necesara o incinta vidata pentru a putea obtine fasciculul de electroni

Microscopul electronic de baleiaj - SEM

- <https://www.youtube.com/watch?v=bfSp8r-YRw0>
- Fasciculul de electroni:
 - este focalizat de una sau doua lentile de focalizare rezultand un spot intre 5nm si 0.4 mm in diametru
 - apoi trece printr-o pereche de bobine de scanare sau placi pentru deflexie situate in coloana electronica, tipic sunt asezate in zona lentilelor finale. Astfel unda este deflectata pe x si pe y astfel incat sa baleiem o arie dreptunghiulara pe suprafata probei.
- Cand fasciculul de electroni interactioneaza cu proba, electronii pierd energie prin imprastieri repetate aleatorii si / sau absorbtie in interiorul volumului de interactie. Acest volum se extinde pe o distanta de la 5 nm la 100nm de suprafata probei in interiorul acesteia. Volumul de interactie depinde de energia electronilor, numarul atomic al specimenului si densitatea acestuia.

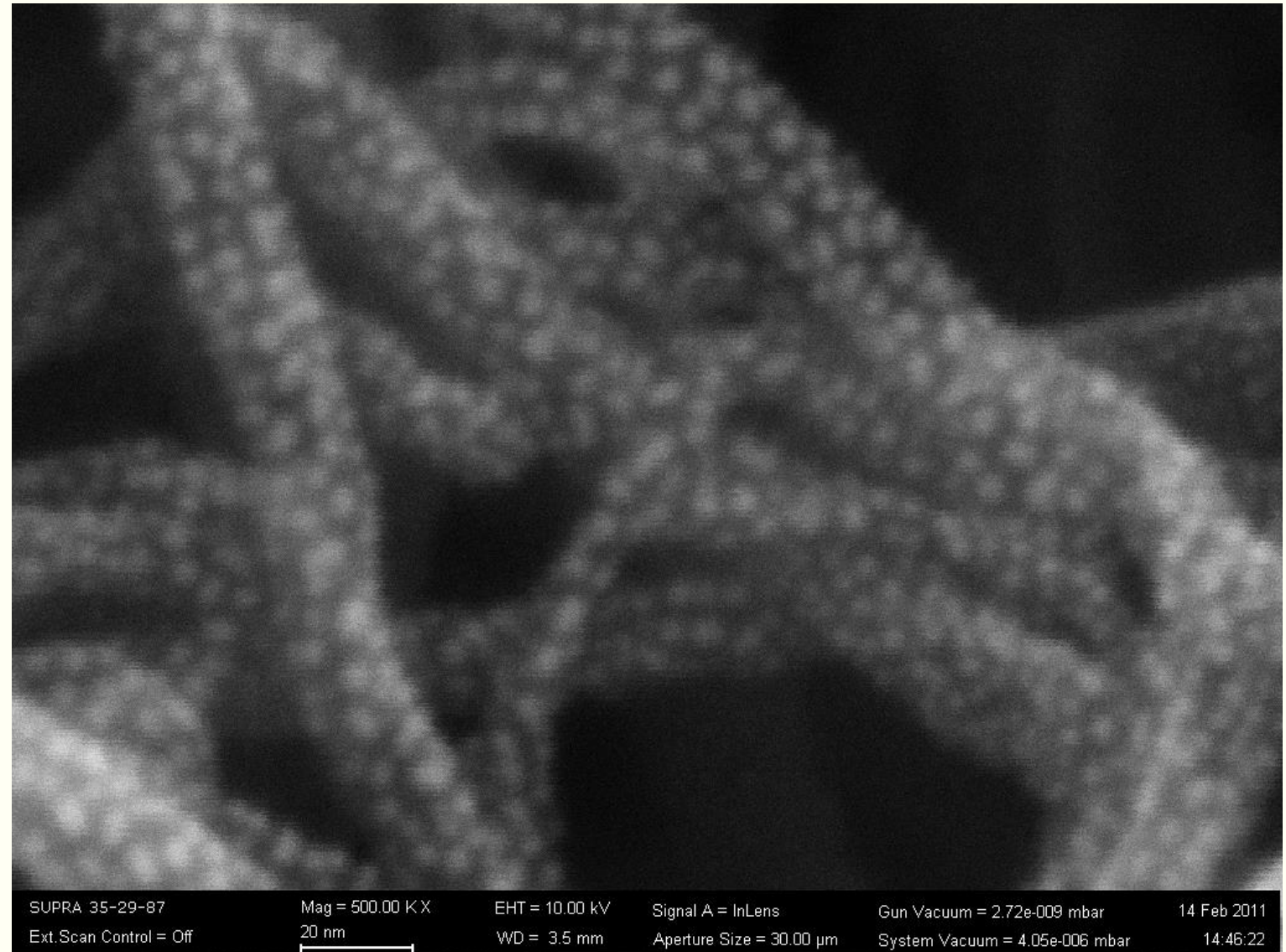
Microscopia electronica de baleiaj – SEM-Imagini

Material compozit

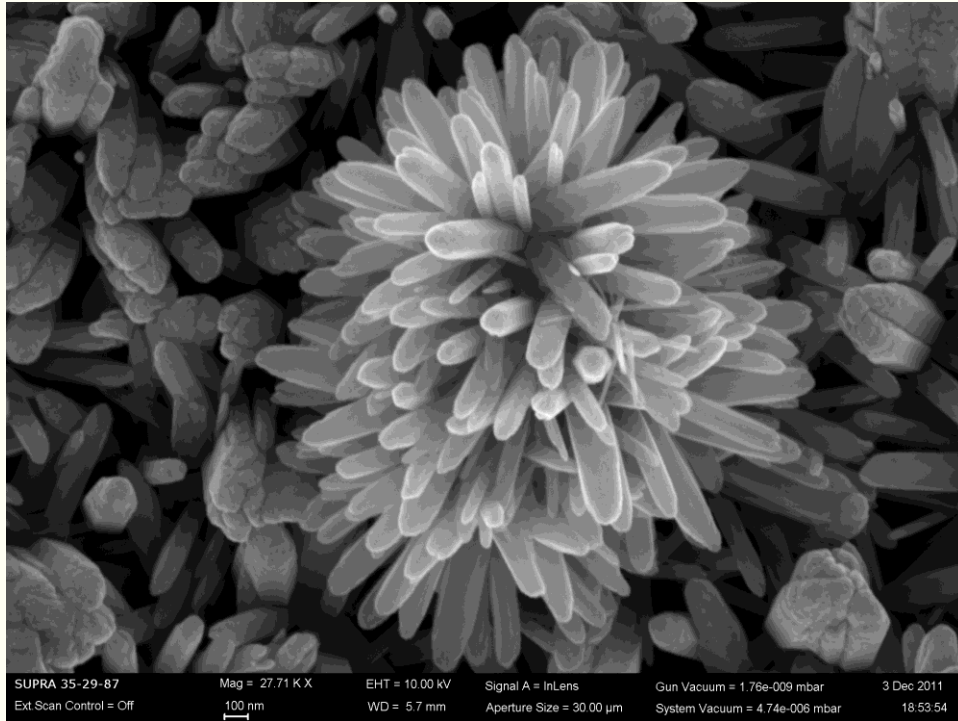
Scala:20 nm

Autor: Adrian Dinescu

IMT Bucuresti

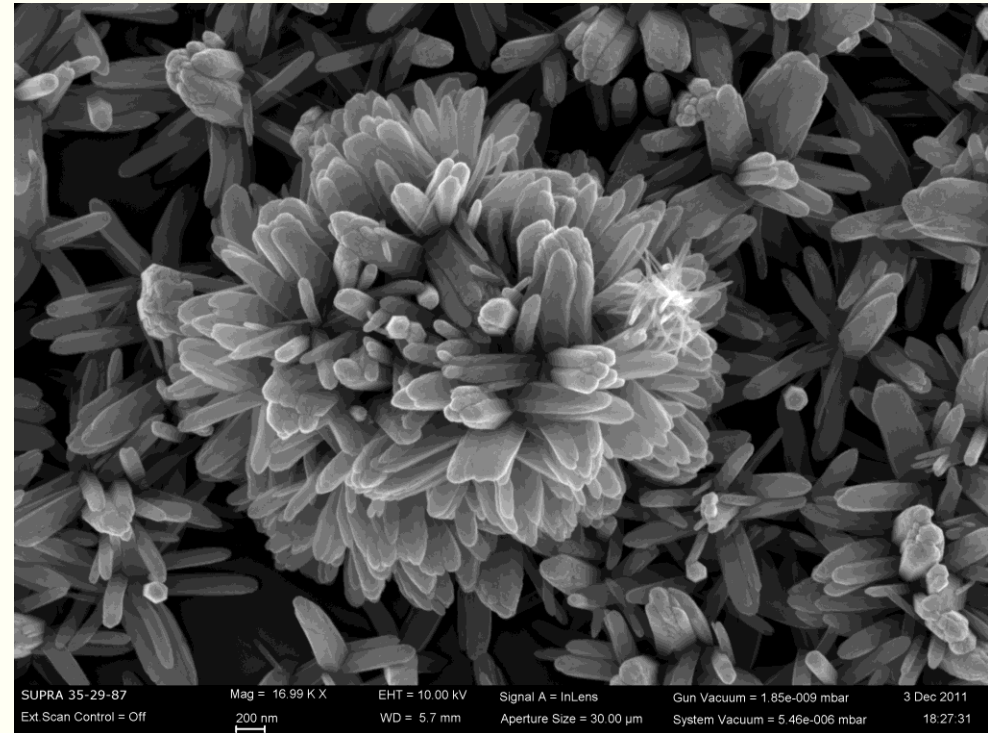


Microscopia electronica de baleiaj – SEM-Imagini



Flori din Oxid de Zinc
Scala:100 nm

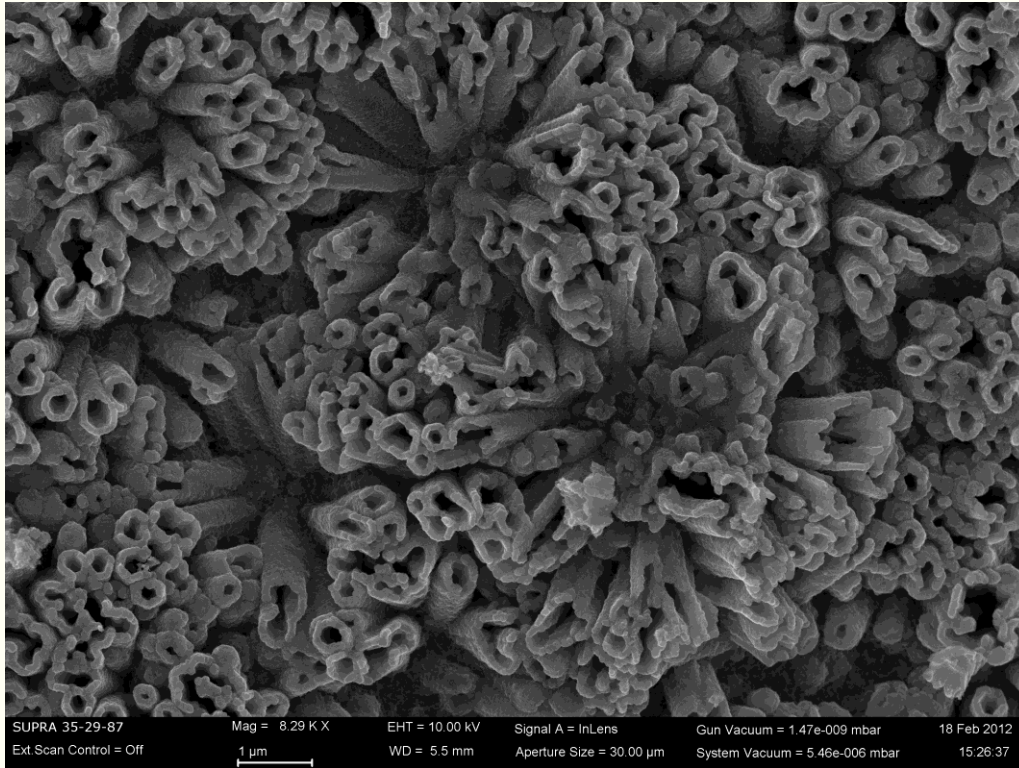
Autor: Adrian Dinescu
IMT Bucuresti



Flori din Oxid de Zinc
Scala:200 nm

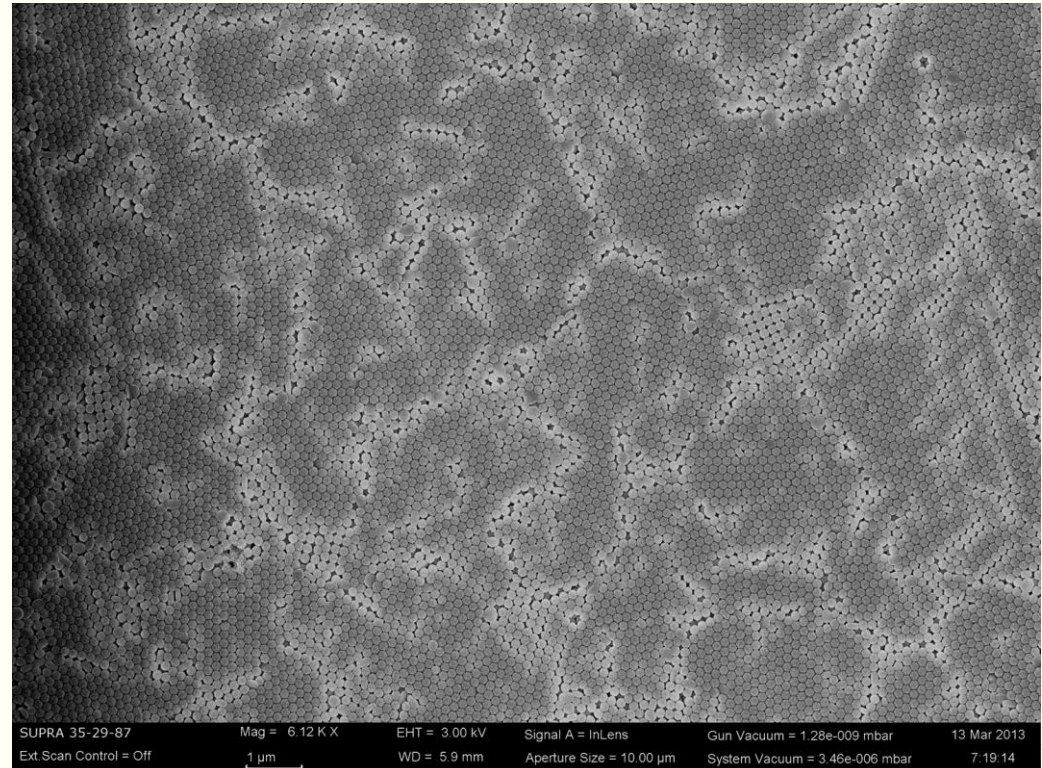
Autor: Adrian Dinescu
IMT Bucuresti

Microscopia electronica de baleiaj – SEM-Imagini



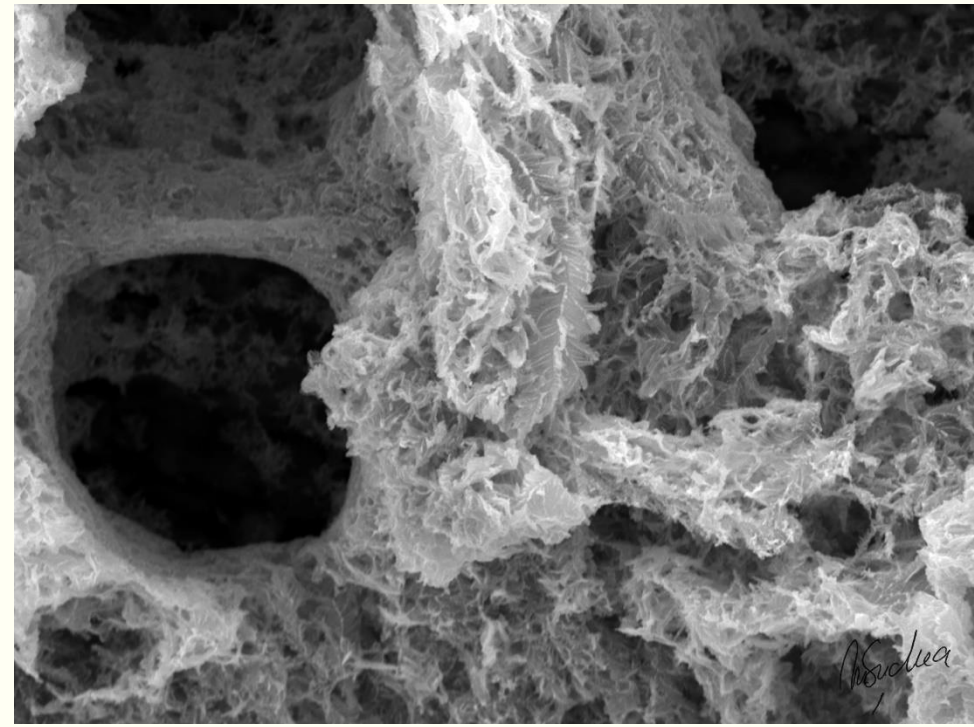
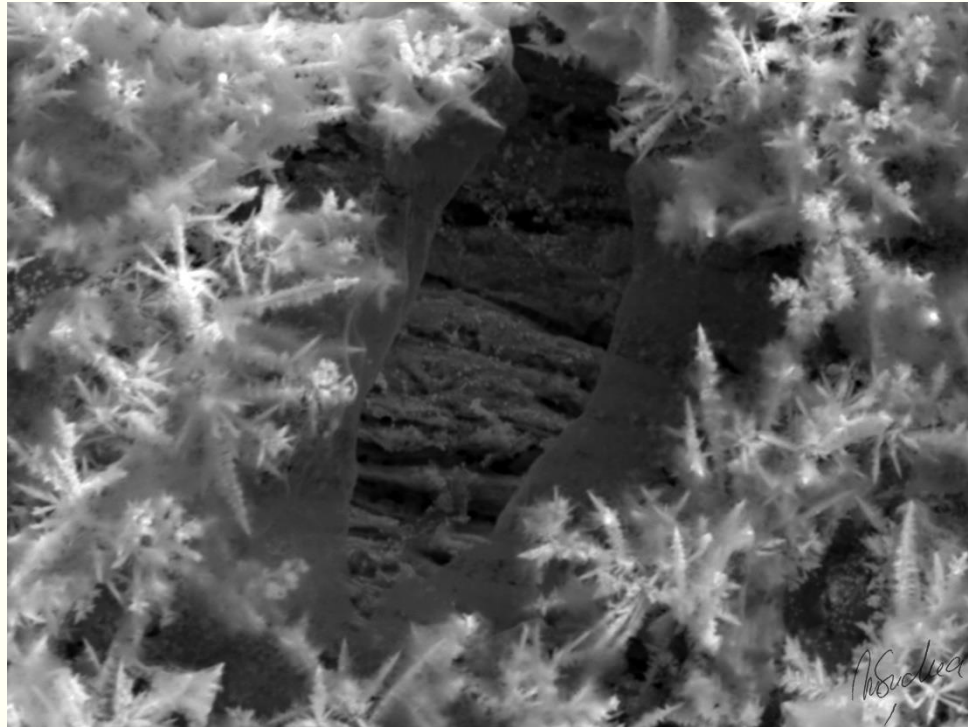
Oxid de Zinc Scala:1um

Autor: Adrian Dinescu IMT Bucuresti



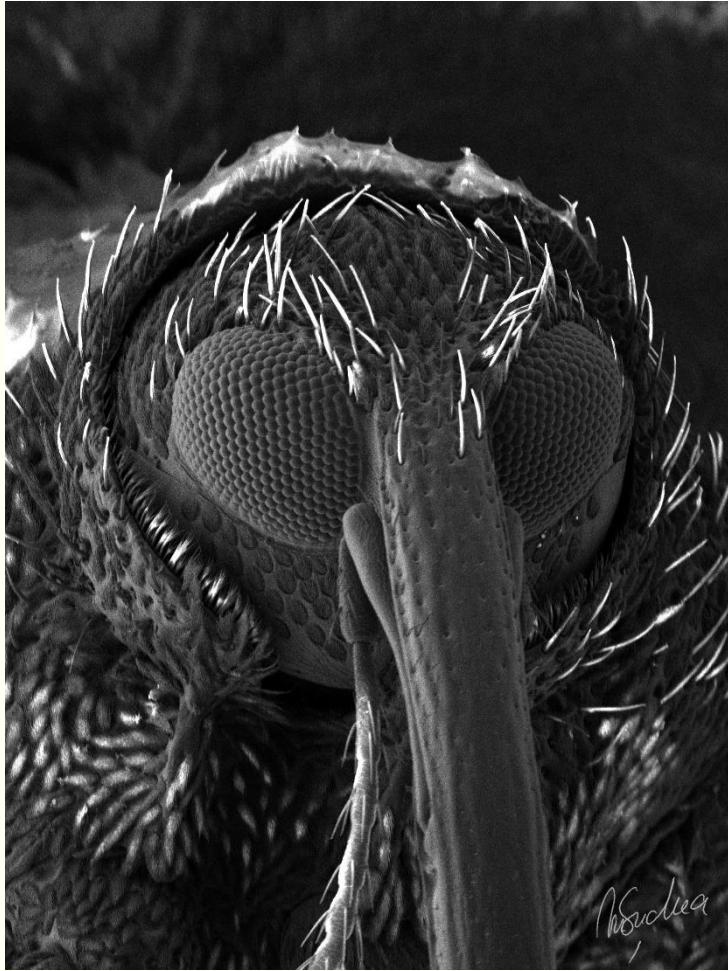
Bile polimerice - autoasamblare

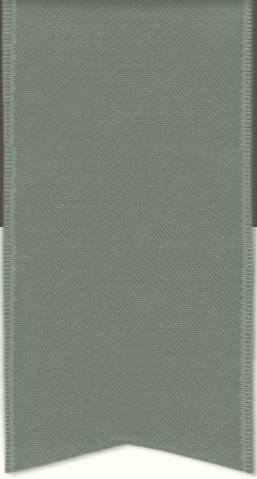
Microscopia electronica de baleiaj – SEM-Imagini



Argint Scala:1um

Microscopia electronica de baleiaj – SEM-Imagini





Micro- si nano- litografie: manipularea materiei la nivel micro- si nanometric

Electron Beam Lithography (EBL)

Litografia cu fascicul de electroni -EBL

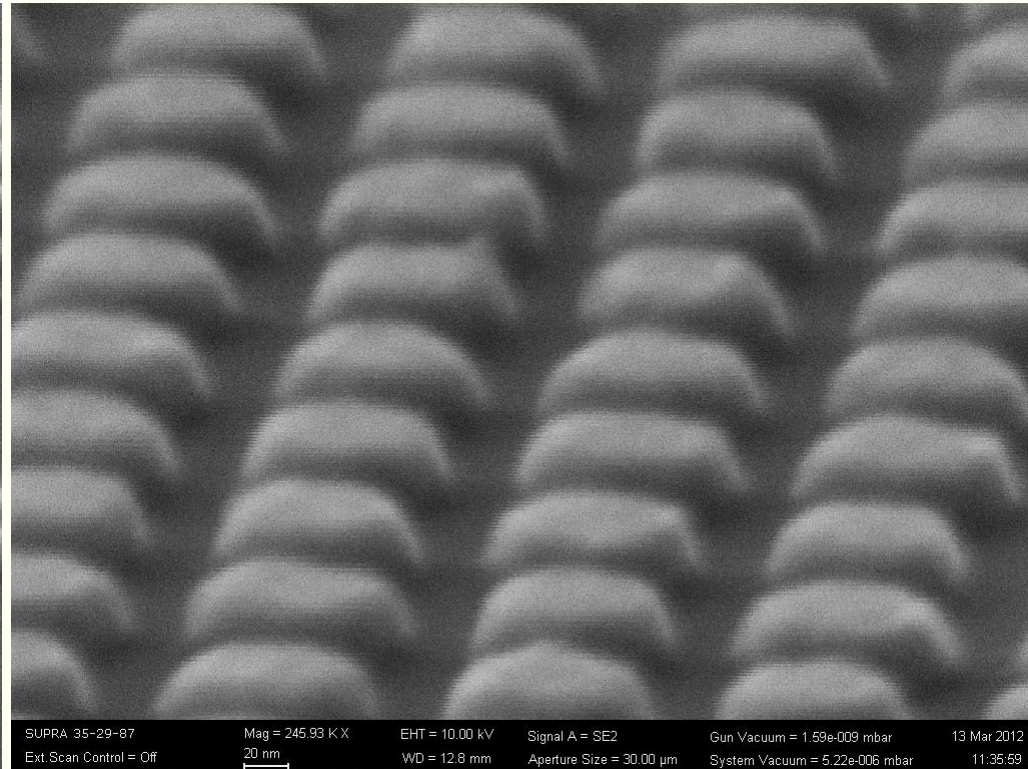
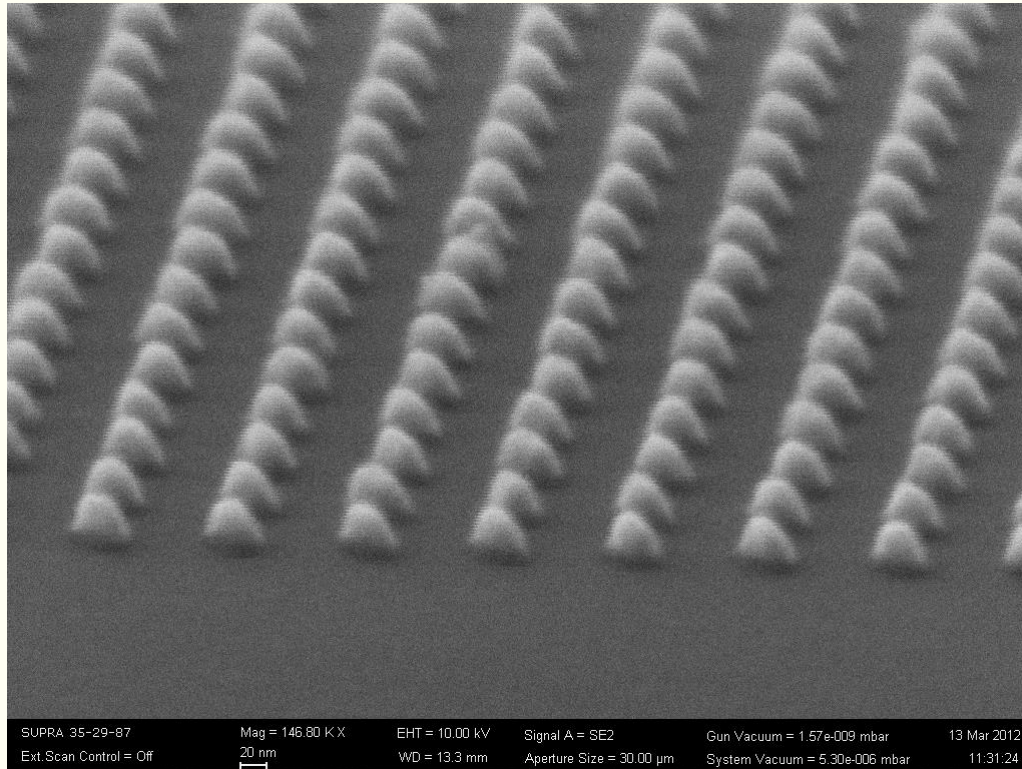
Foloseste un fascicul de electroni pentru a “sculpta” materialul in interiorul unui SEM:

<https://www.youtube.com/watch?v=25AsHRgBJDM>

Aplicatii ale litografiei cu electroni

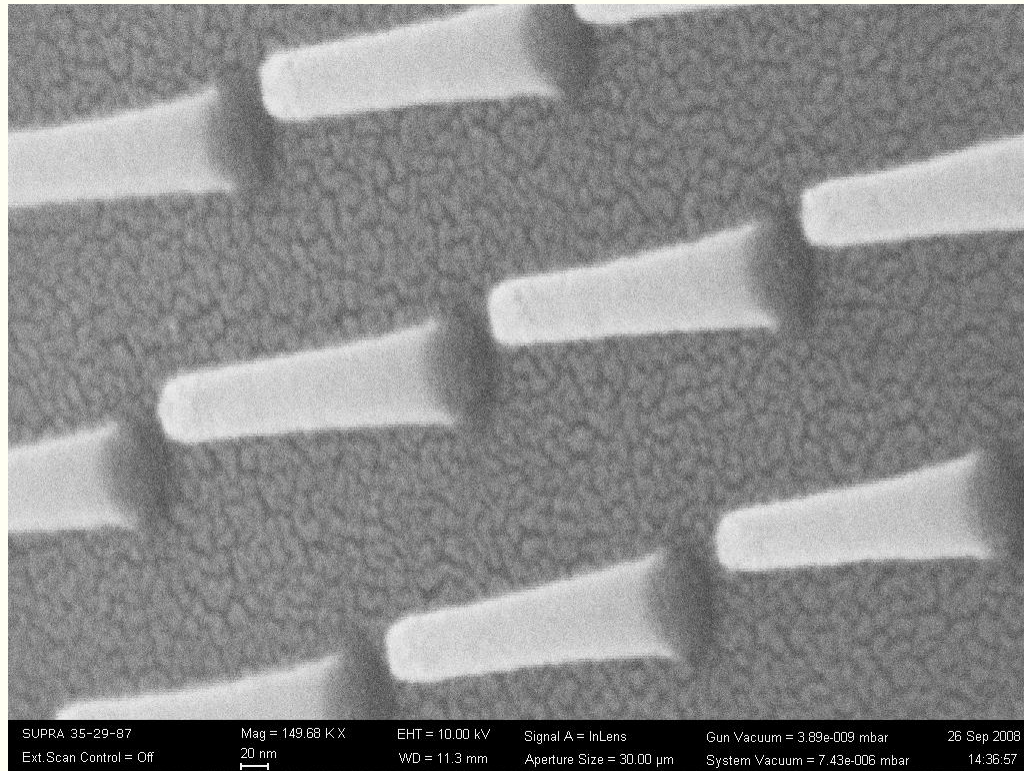
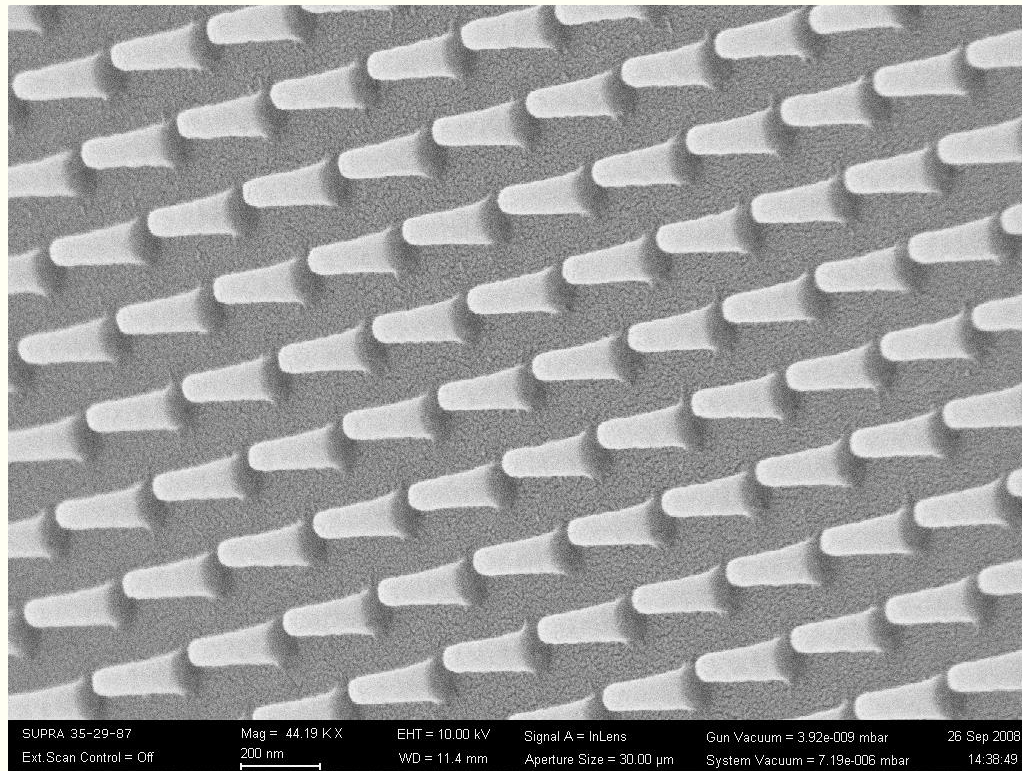
- circuite integrate fotonice
- expunere in pmma
- proces de lift-off folosind masca la corodare de Crom
- corodare uscata
- Micro si NanoArta

Litografia cu fascicul de electroni: Aplicatii



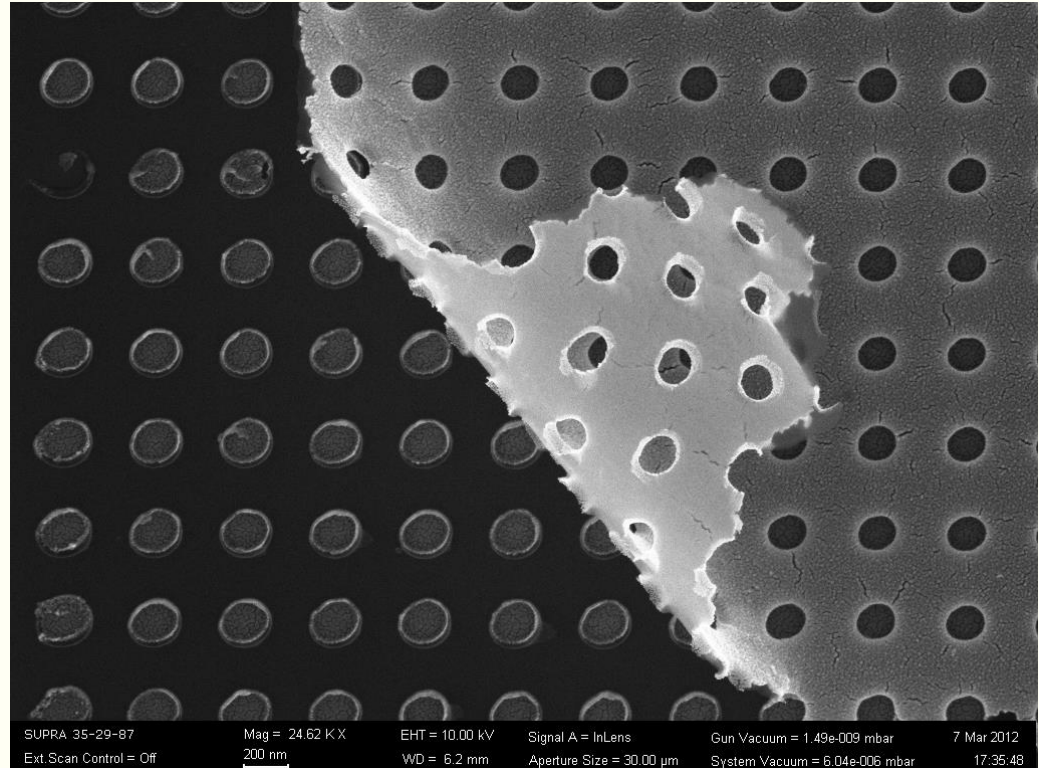
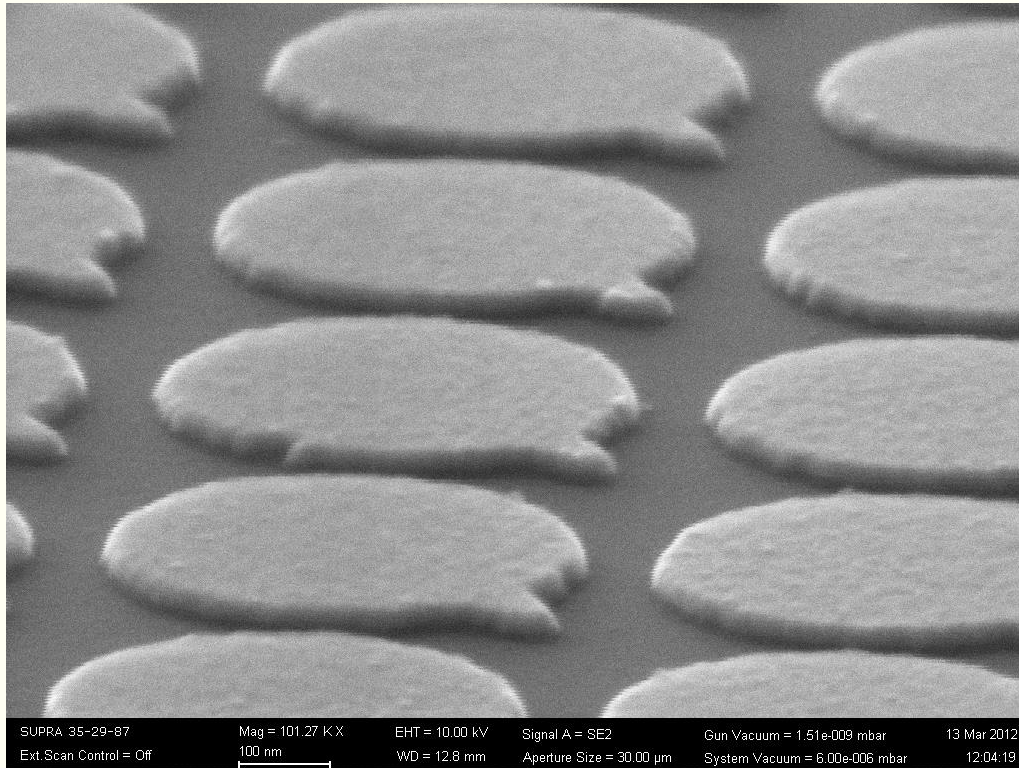
- Imagini: Adrian Dinescu IMT Bucuresti

Litografia cu fascicul de electroni: Aplicatii



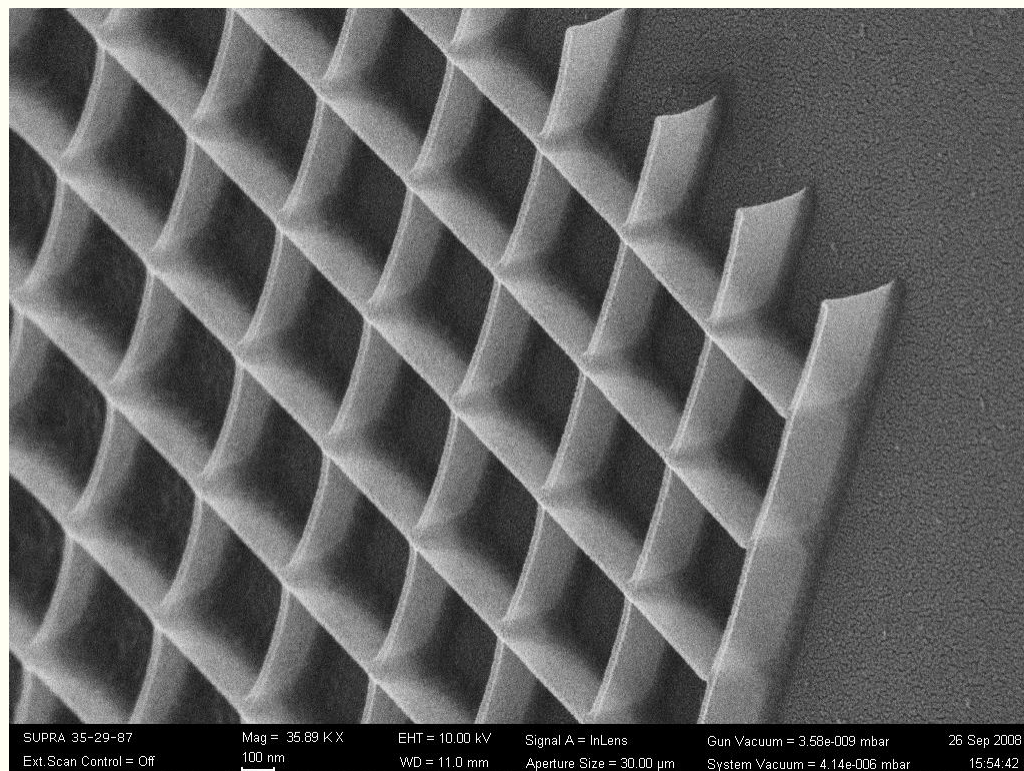
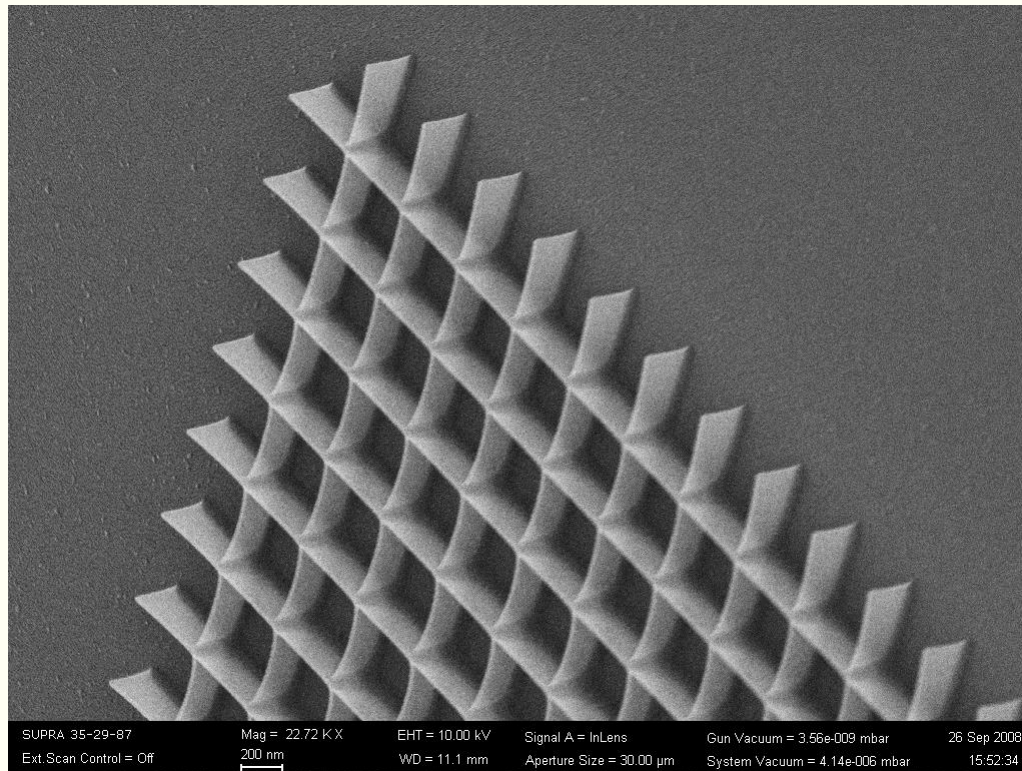
- Imagini: Adrian Dinescu IMT Bucuresti

Litografia cu fascicul de electroni: Aplicatii



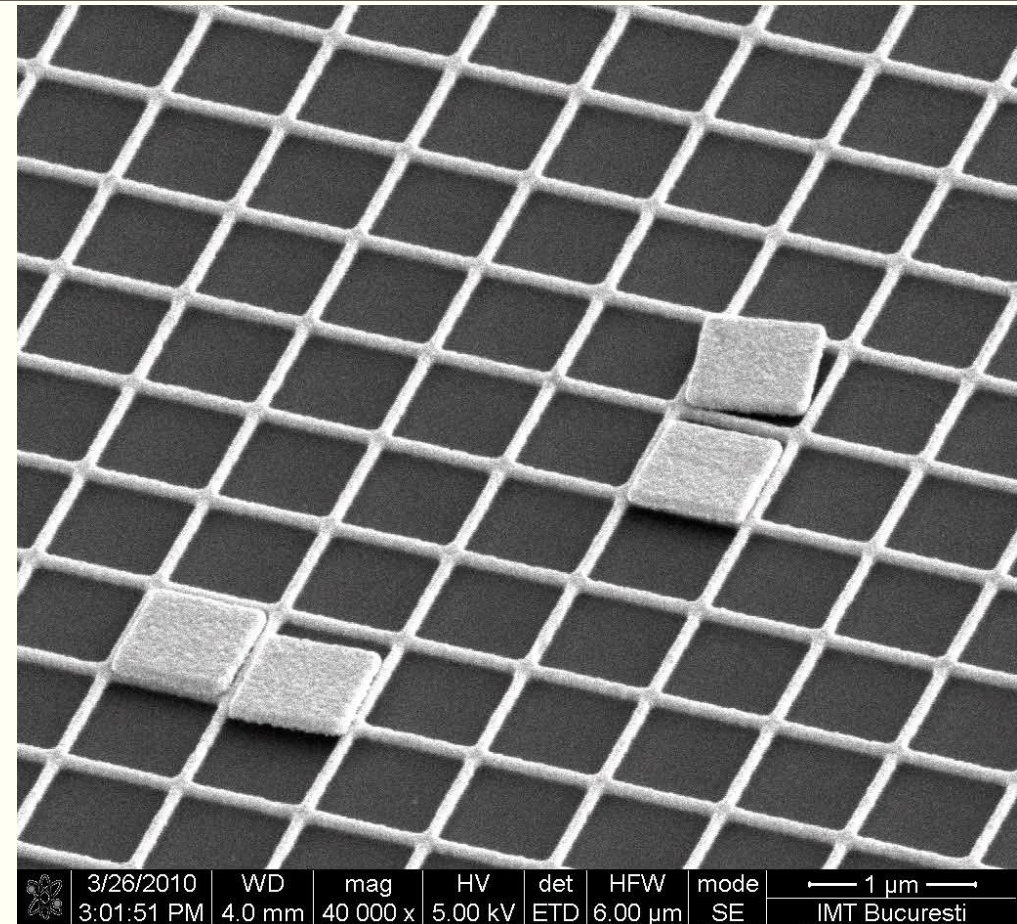
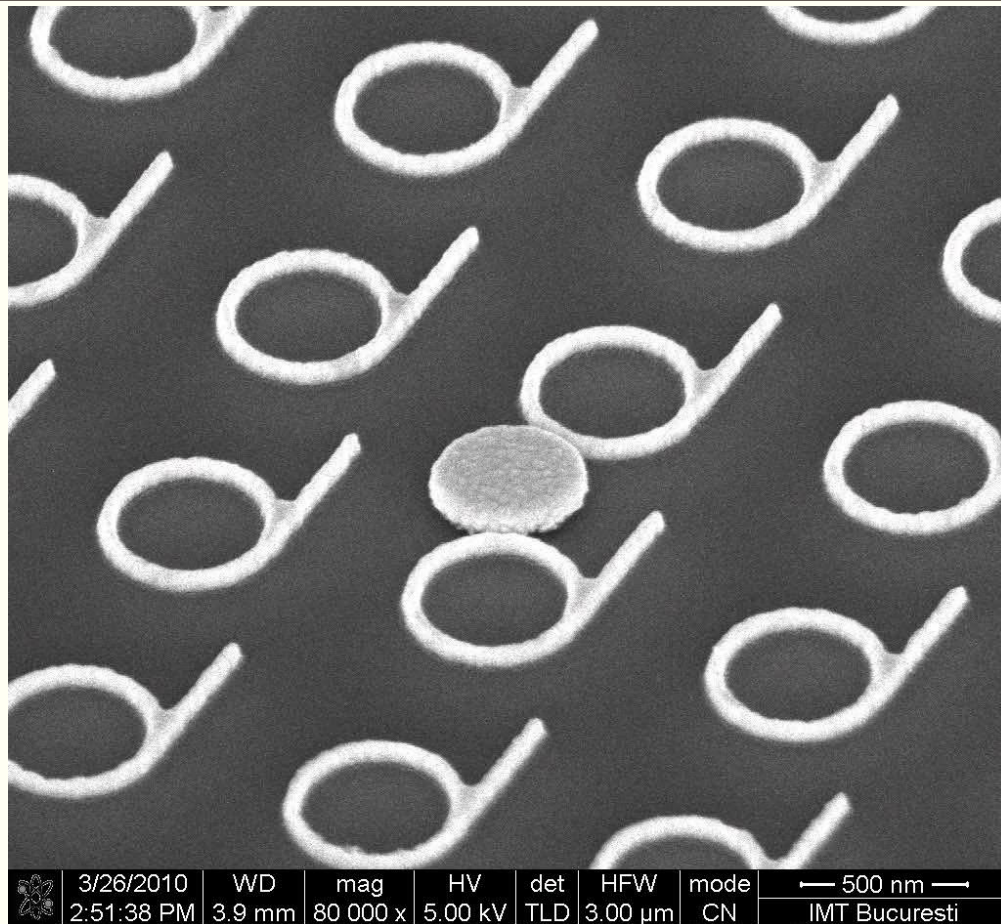
- Imagini: Adrian Dinescu IMT Bucuresti

Litografia cu fascicul de electroni: Aplicatii



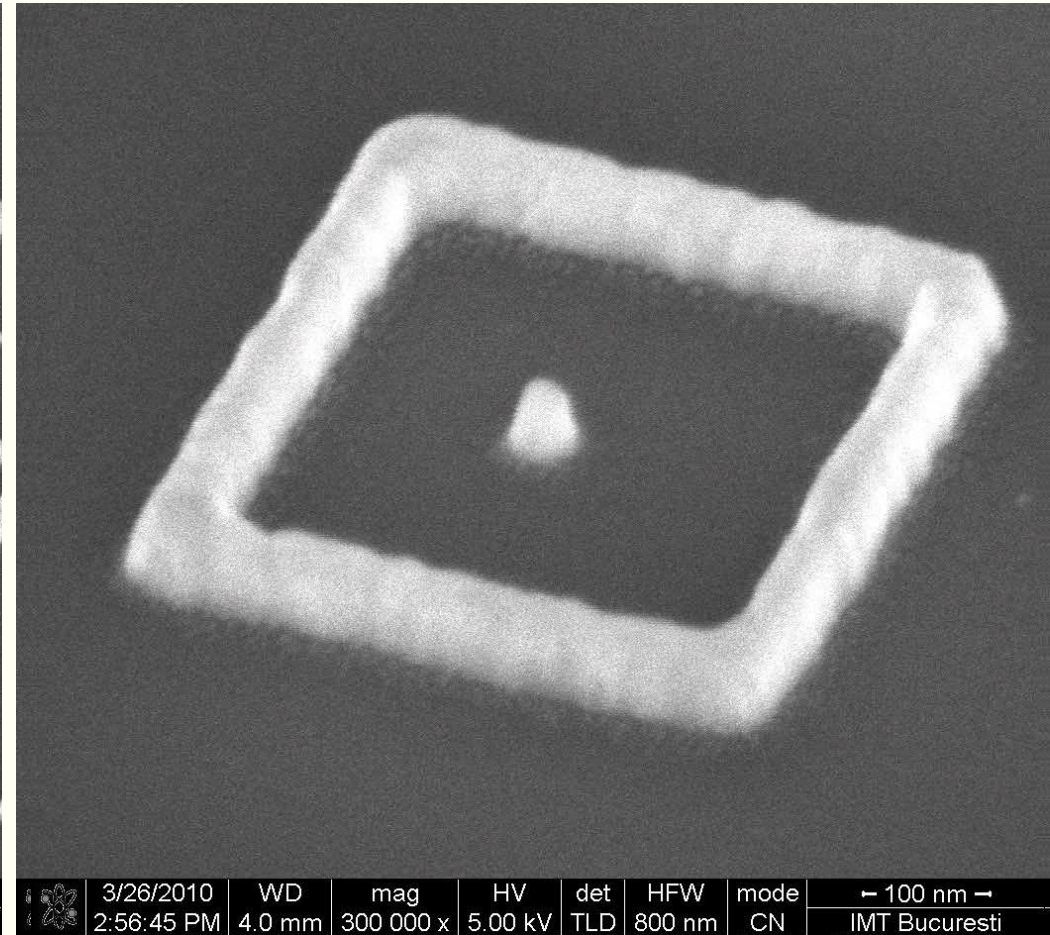
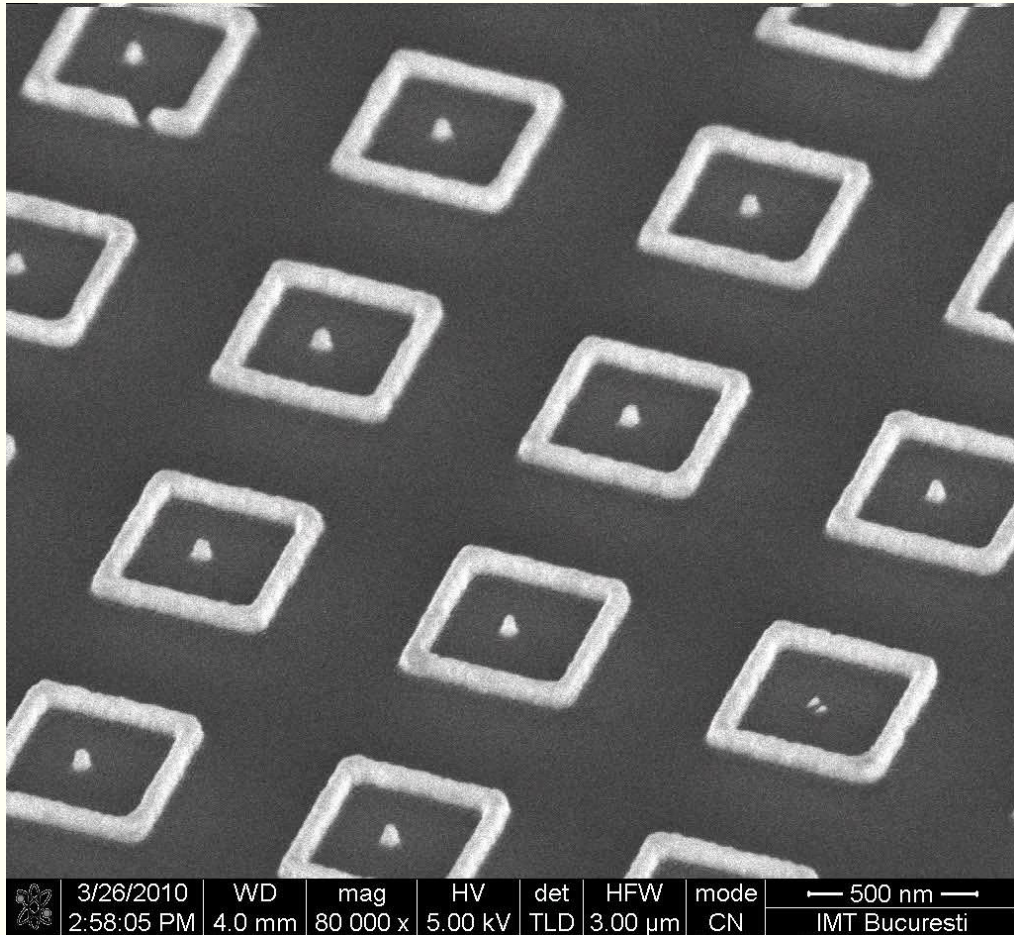
- Imagini: Adrian Dinescu IMT Bucuresti

Litografia cu fascicul de electroni: Aplicatii



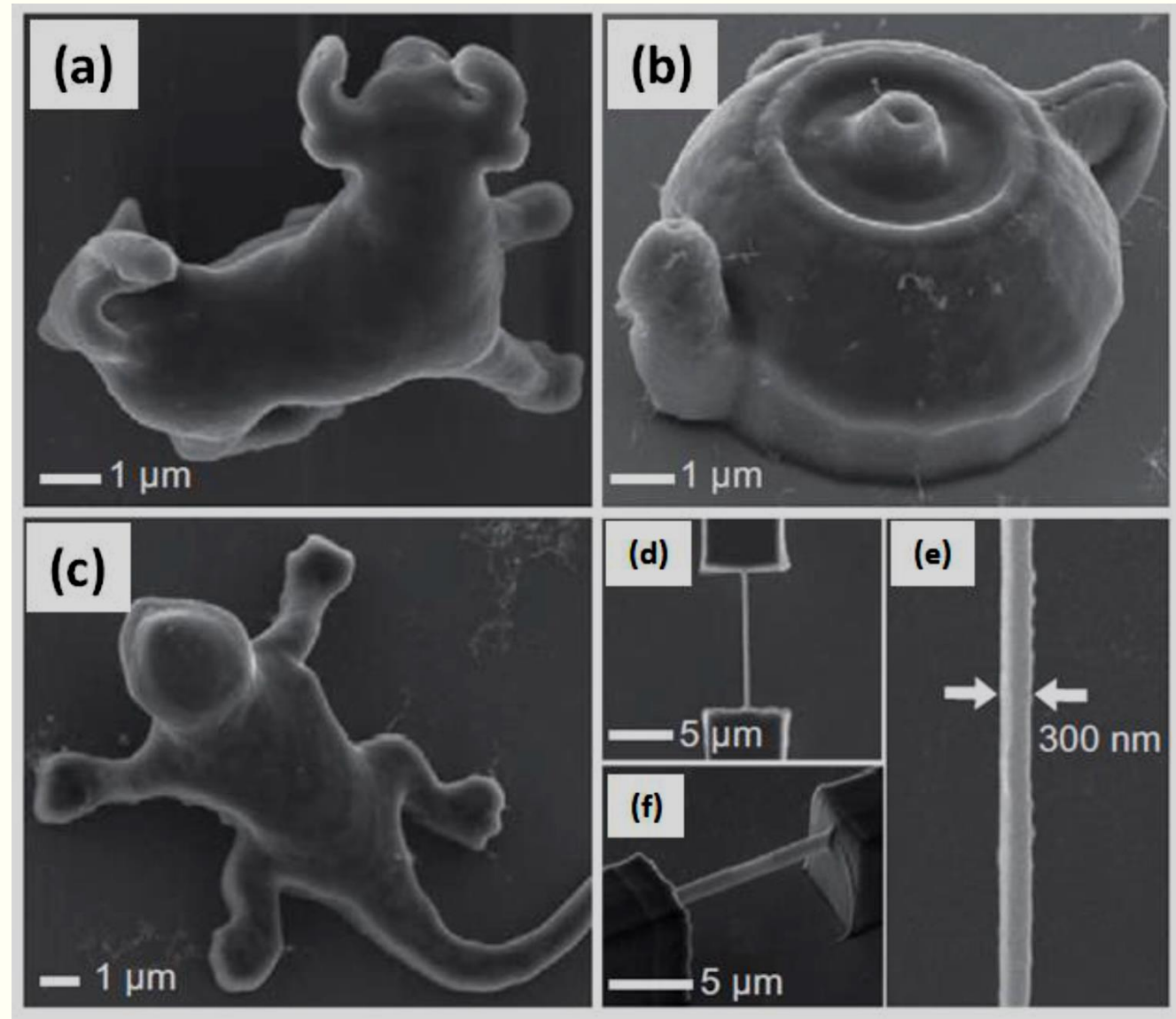
- Imagini: Adrian Dinescu IMT Bucuresti

Litografia cu fascicul de electroni: Aplicatii

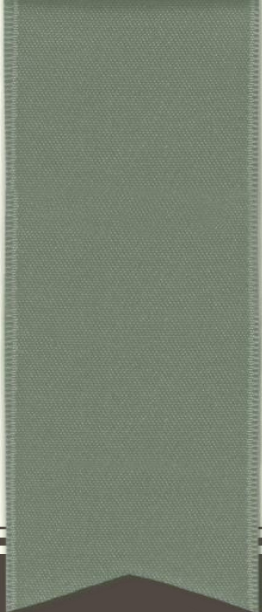


- Imagini: Adrian Dinescu IMT Bucuresti

Litografia cu fascicul de electroni: Aplicatii



- Sursa imagini: textile journal 2014



NanoArta

NanoArt www.nanoart.org

Ce este NanoArta?

NanoArta este un domeniu artistic nou, situat la intersecția artă-știință-tehnologie și are ca subiect nanopeisaje (peisaje ale structurilor naturale la nivel molecular și atomic) și nanosculpturi (sculpturi create de către cercetători științifici și artiști prin manipularea materiei la nivel molecular și atomic prin intermediul diferitelor reacții chimice și procese fizice).

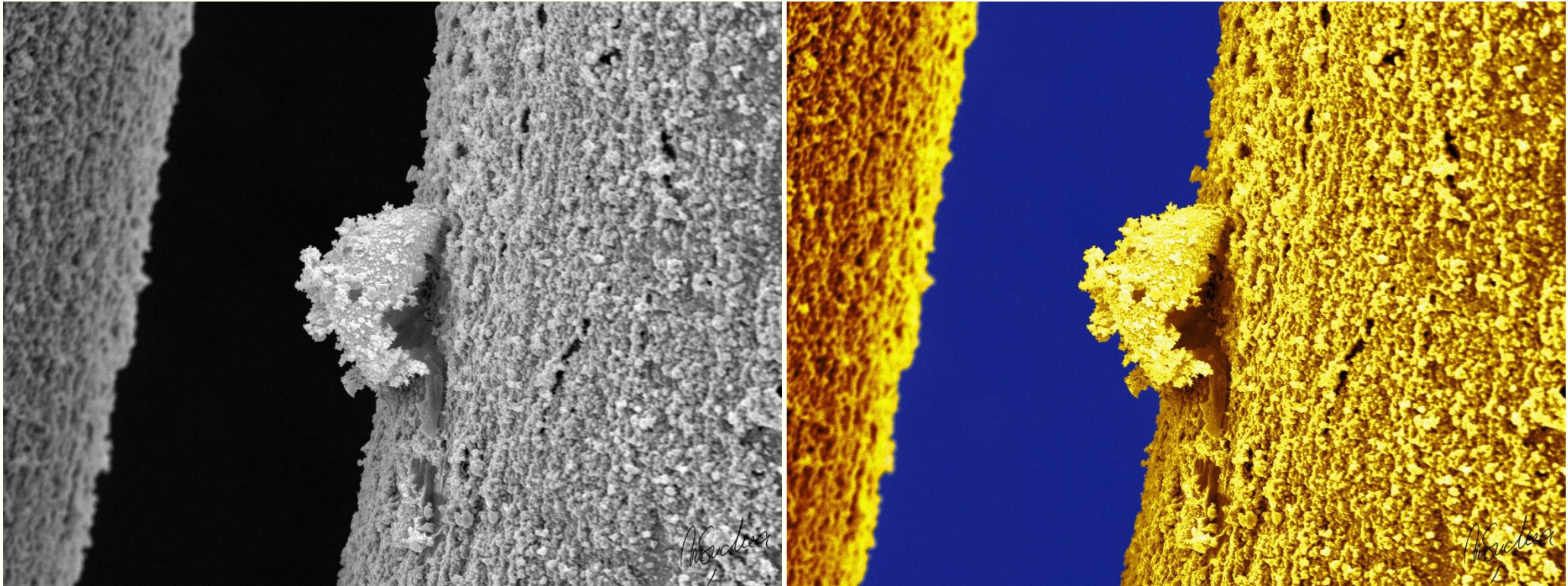
În concepția lui Cristian Orfescu, unul dintre pionierii acestui curent artistic, NanoArta înseamnă sculptură la scară moleculară și atomică. La asemenea sculpturi se folosesc în loc de ciocan și dală, fluxul de electroni sau ioni și diferite unelte pentru a modela materia la această scară.

Aceste imagini se pot vizualiza doar la microscopul electronic, apoi sunt captate în computer și eventual pictate digital. Apoi, imaginile sunt transferate pe pânză sau pe hârtie de artă specială.

Folosind tehnici de micro- nano- litografie unii artisti creaza sculpturi la nivel micro/nano

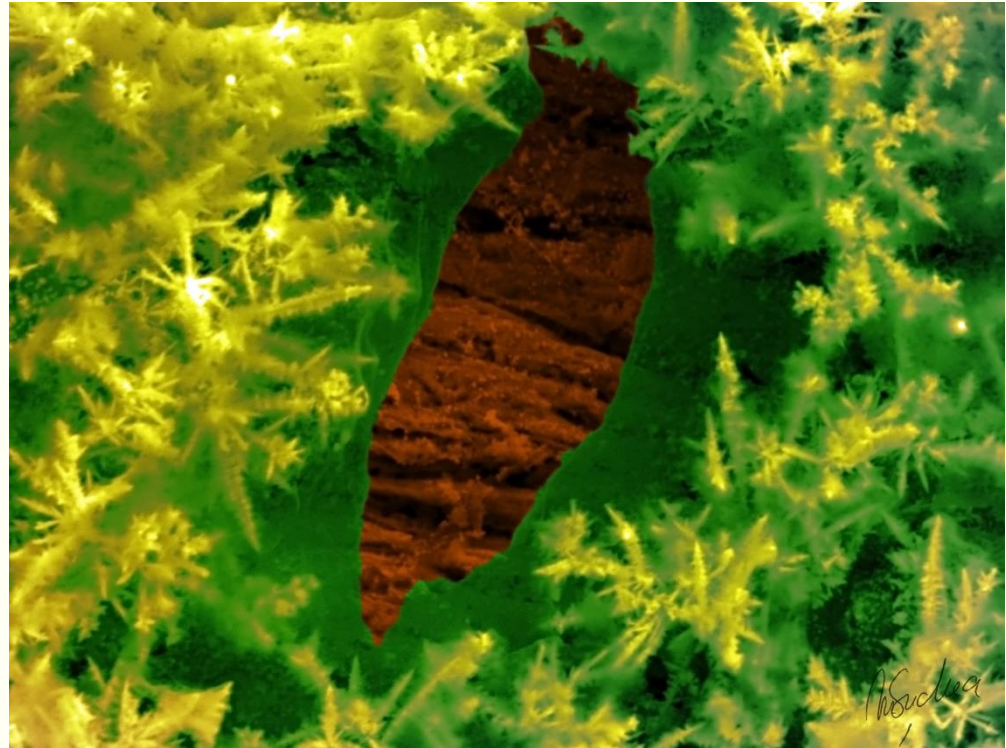
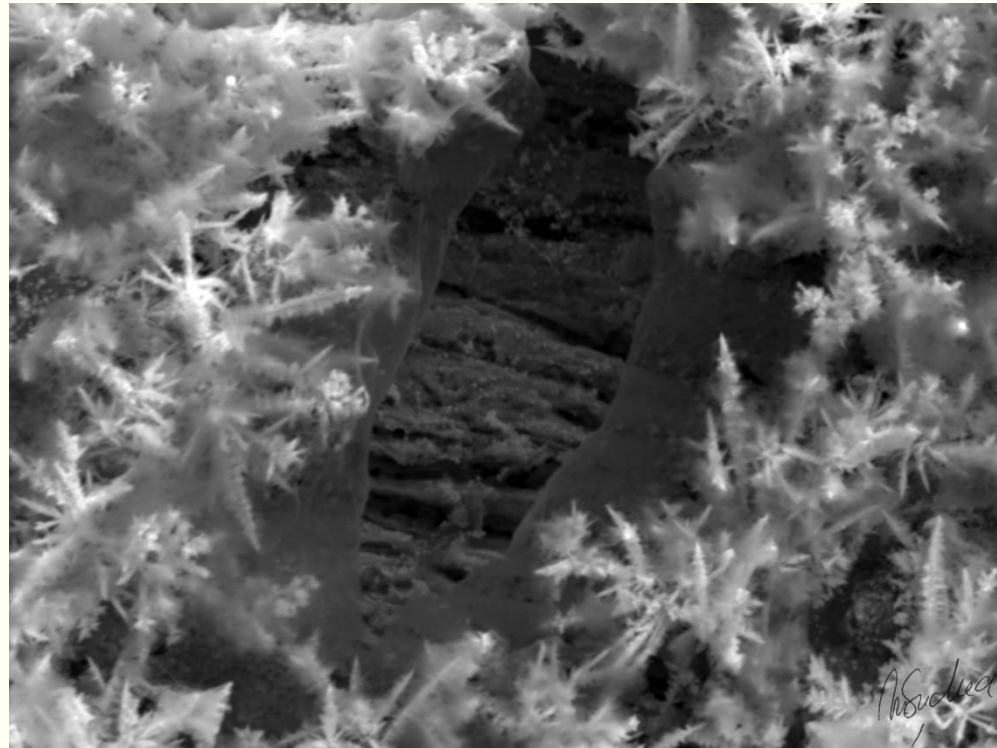
Mai mult despre: <https://viralitativirtuale.wordpress.com/2015/01/30/despre-nanoarta-ca-dezvrajire-a-unei-lumi-ascunse-un-dialog-cu-artistul-cris-orfescu/>

NanoArta – ce? cum?



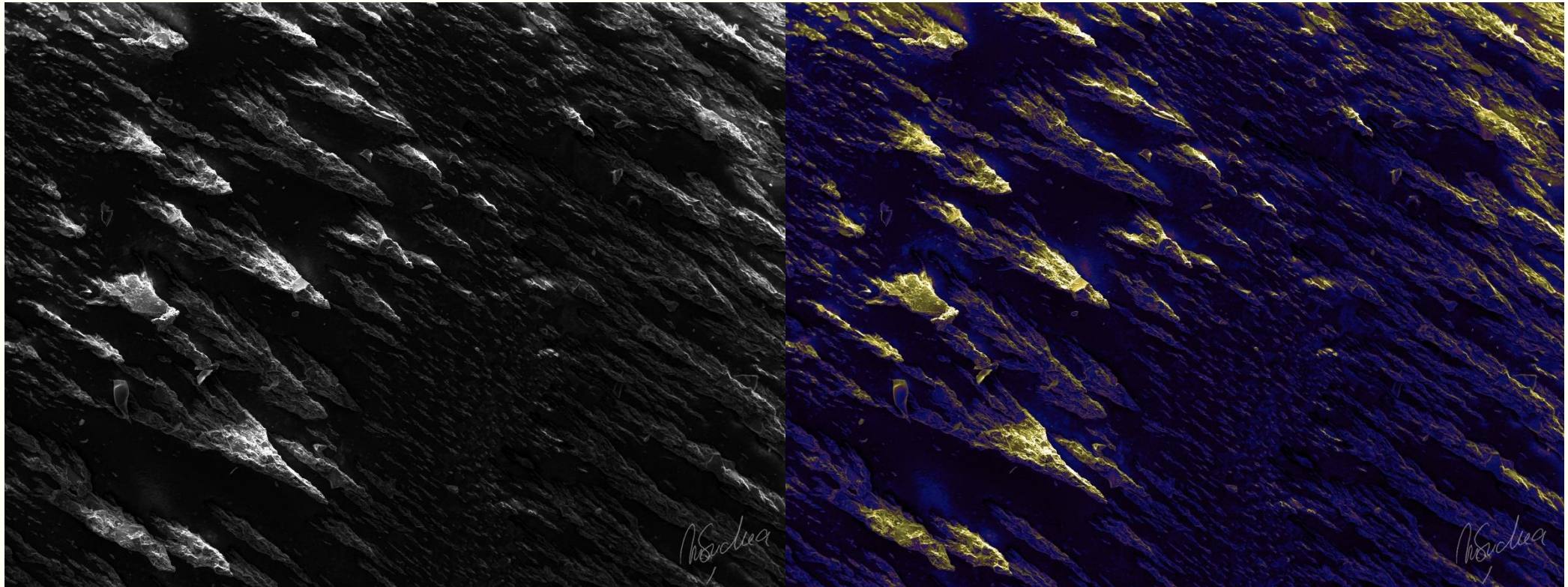
Iluzia stralucirii

NanoArta – ce? cum?



Ferigi?

NanoArta – ce? cum?



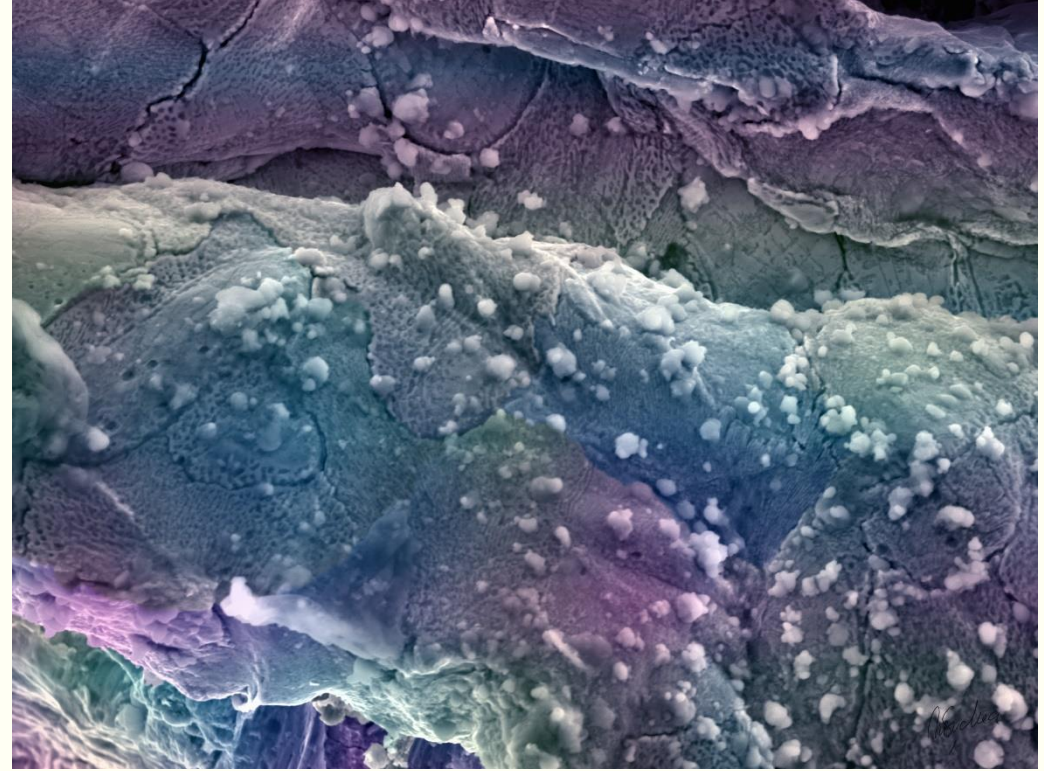
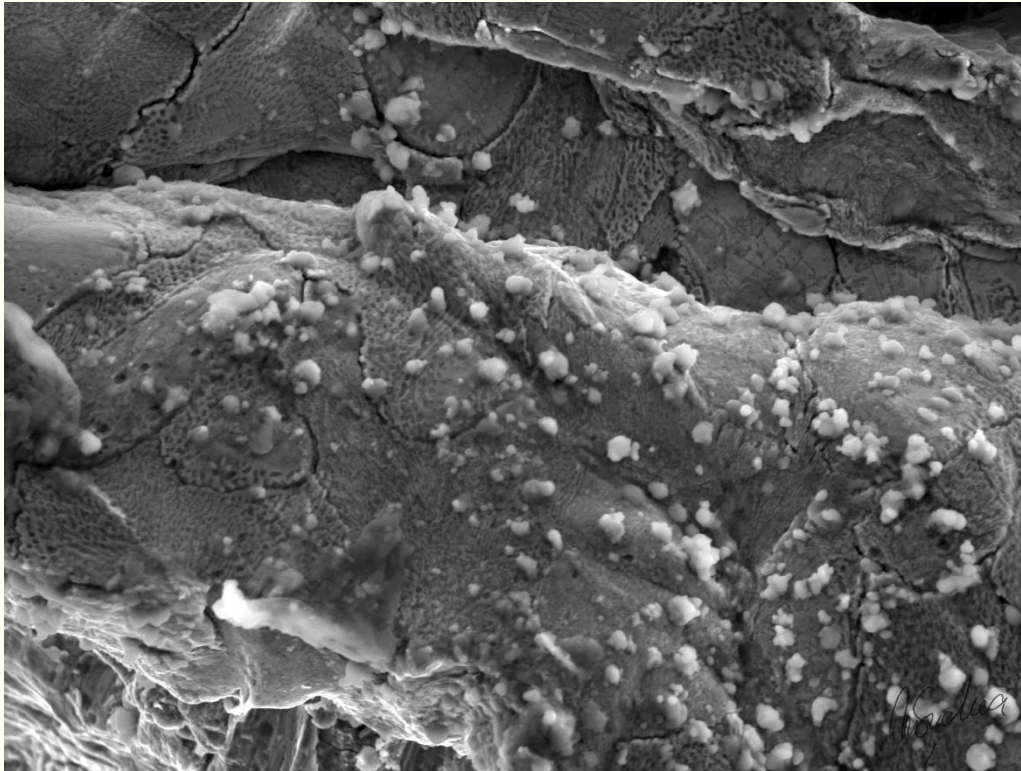
Ploaia de stele

NanoArta – ce? cum?



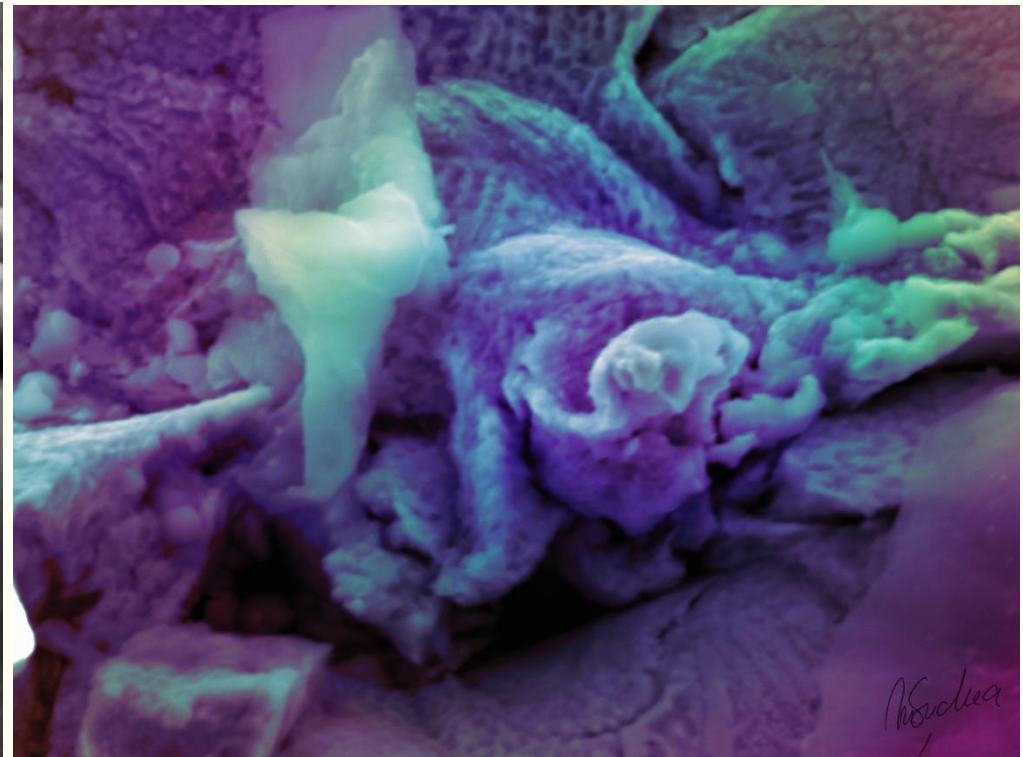
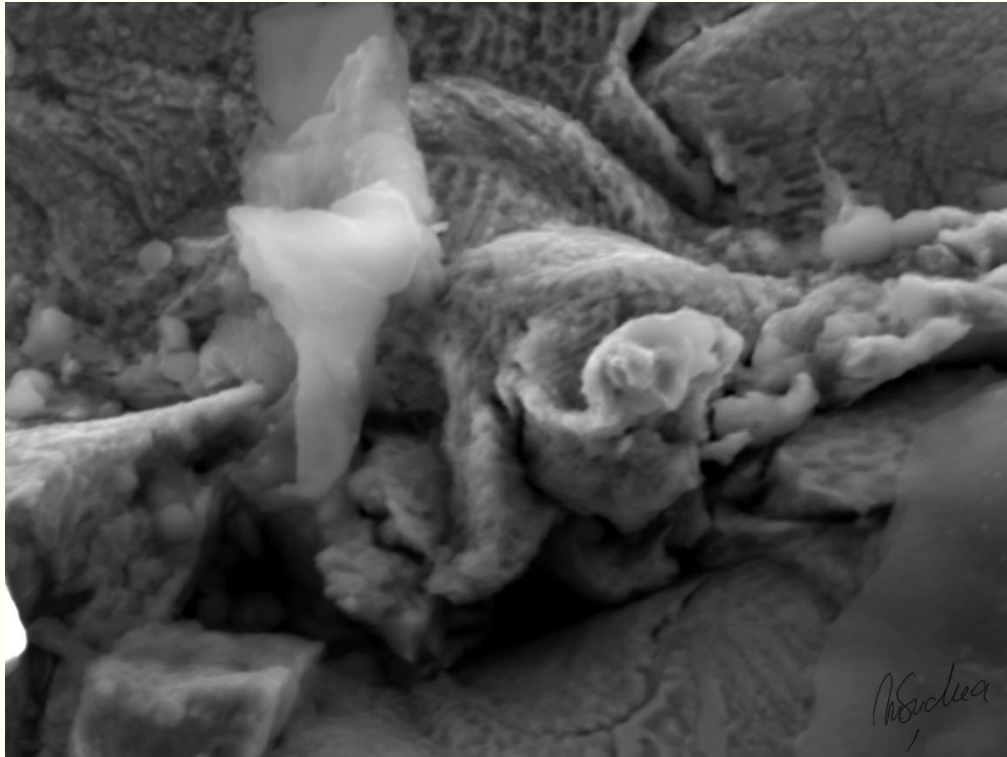
Portret de paianjen

NanoArta – ce? cum?



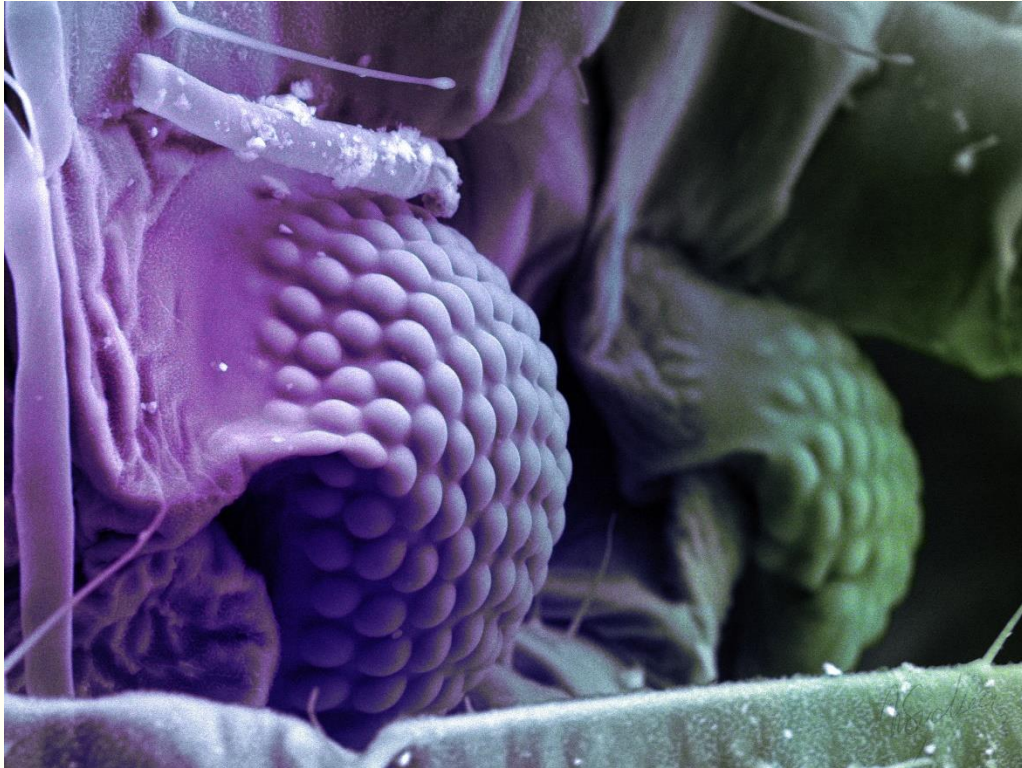
Galaxie ascunsa 1

NanoArta – ce? cum?



Galaxie ascunsa 2

NanoArta – peisaje/iluzii/aluzii din universul micro/nano



In Oglinda

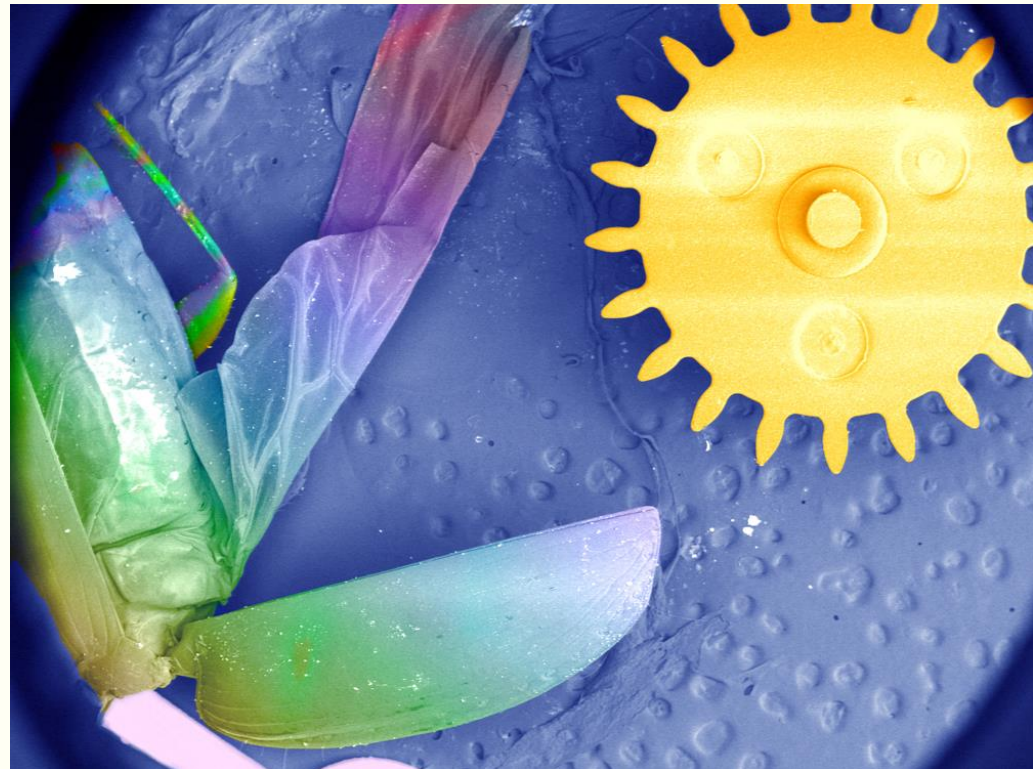


Planeta

NanoArta – natura statica in universul micro/nano

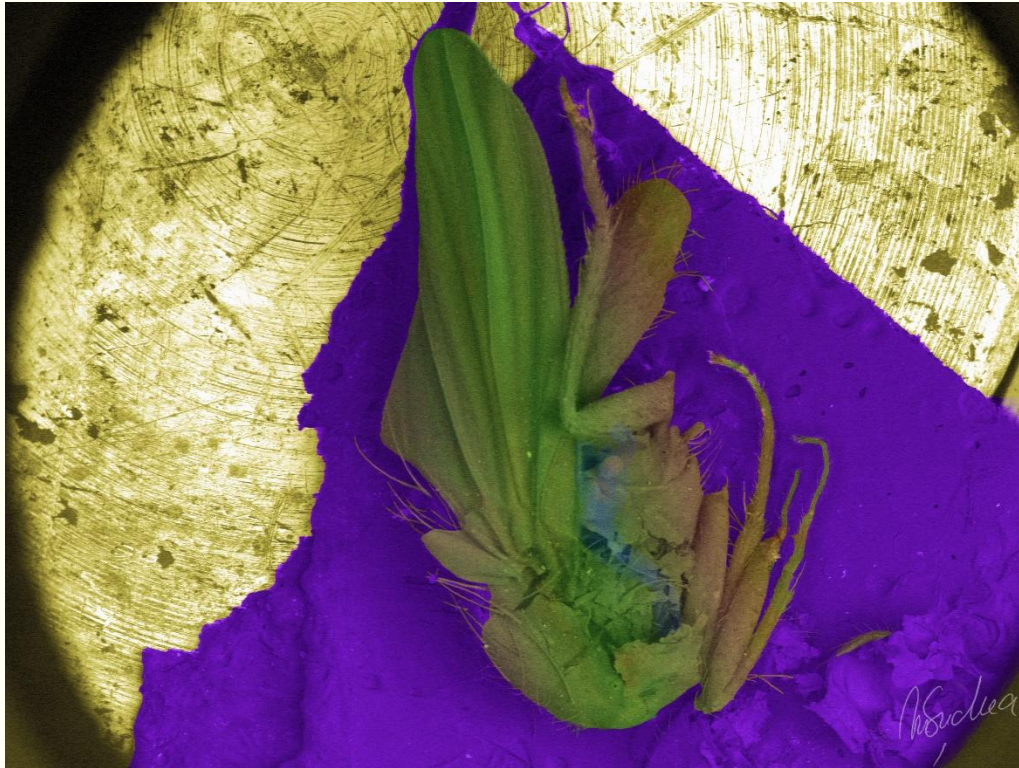


Dulce diagonal

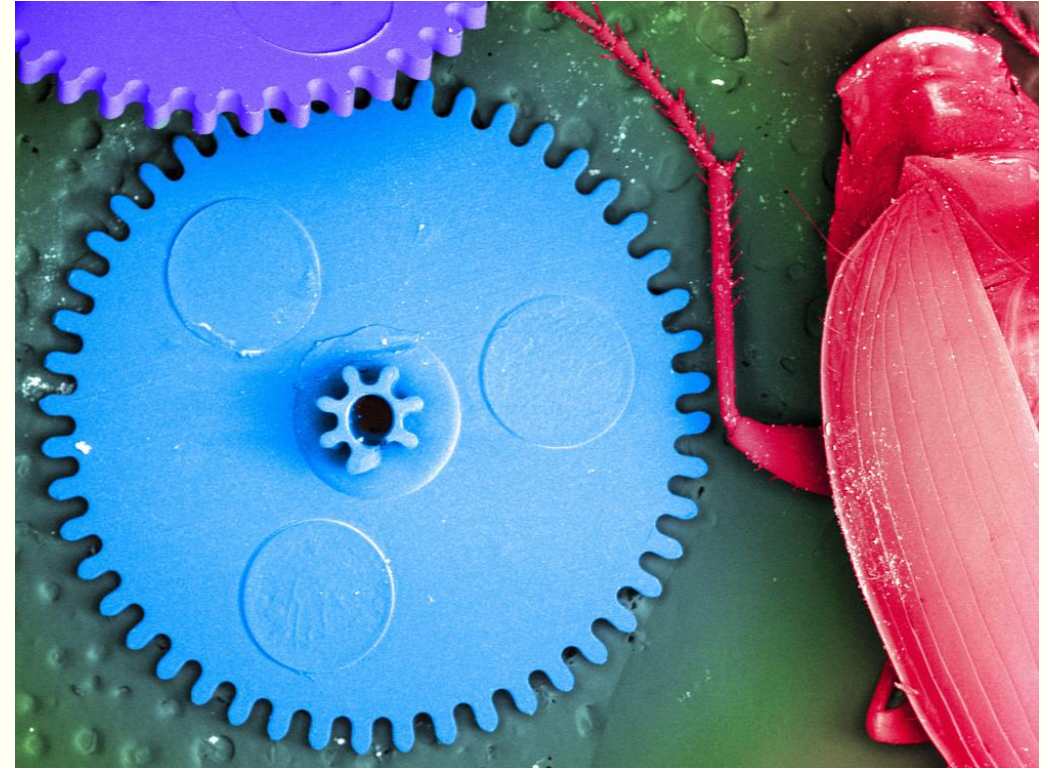


Soare fals

NanoArta – peisaje/iluzii/aluzii din universul micro/nano



Degradare



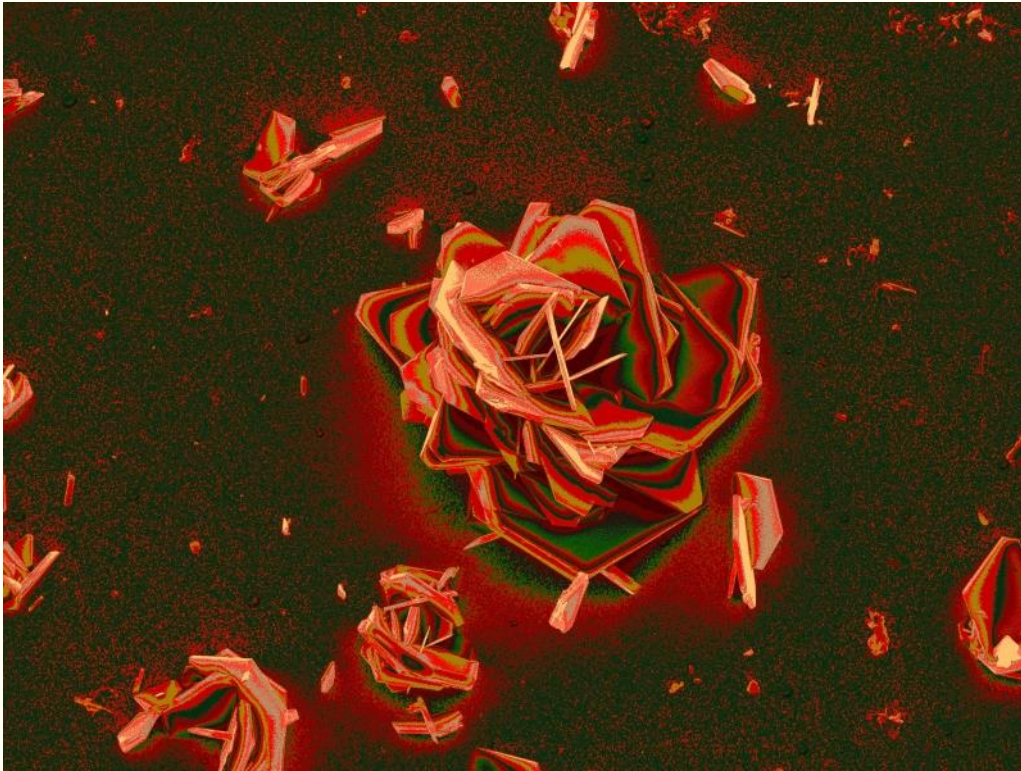
Time to go

NanoArta – peisaje/iluzii/aluzii din universul micro/nano



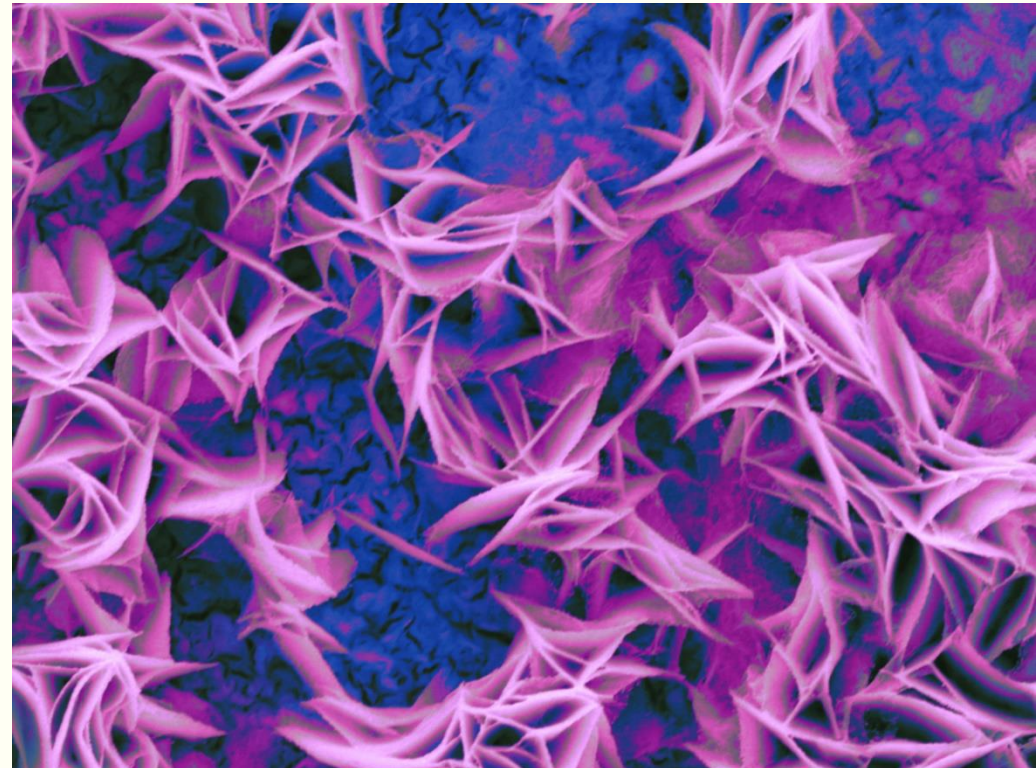
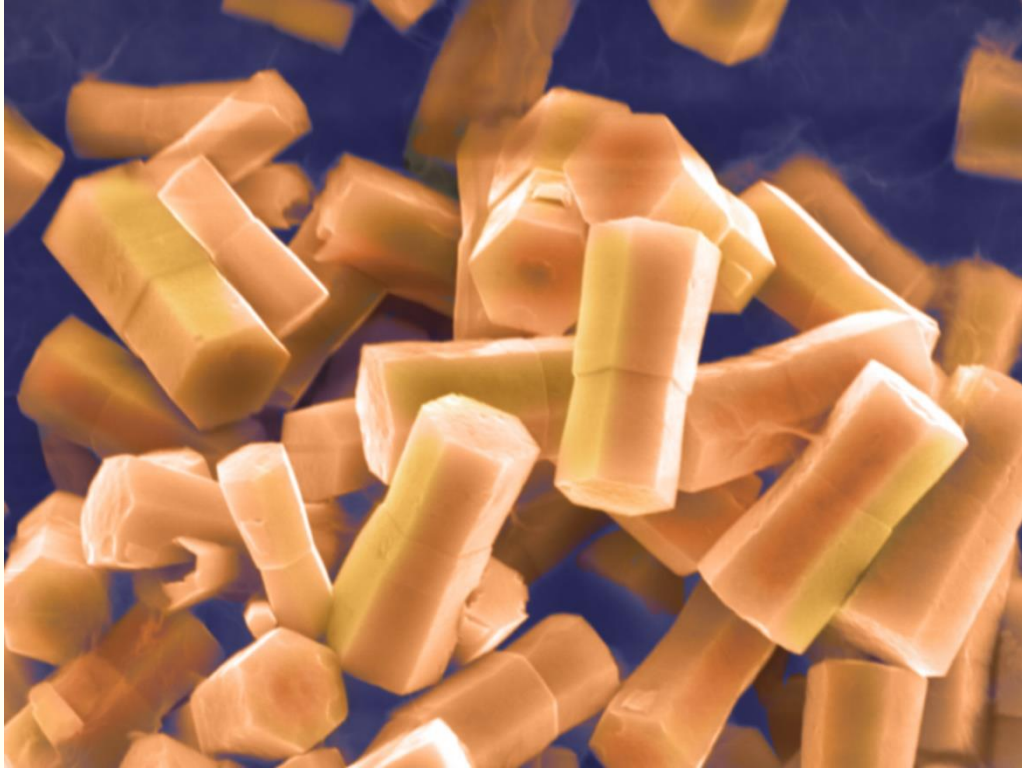
De dragoste ...

NanoArta – peisaje/iluzii/aluzii din universul micro/nano



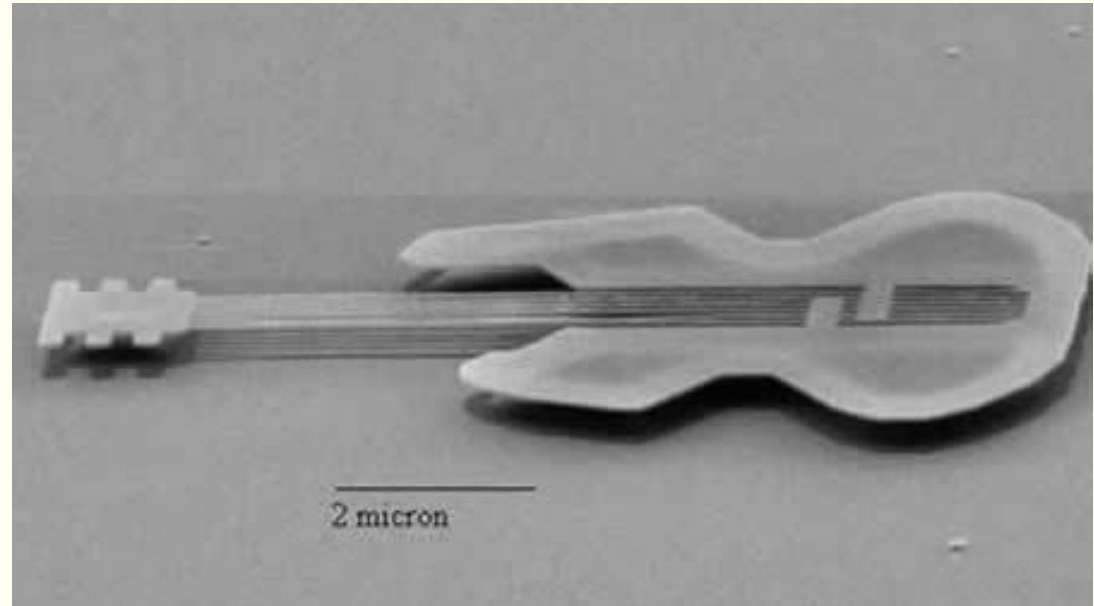
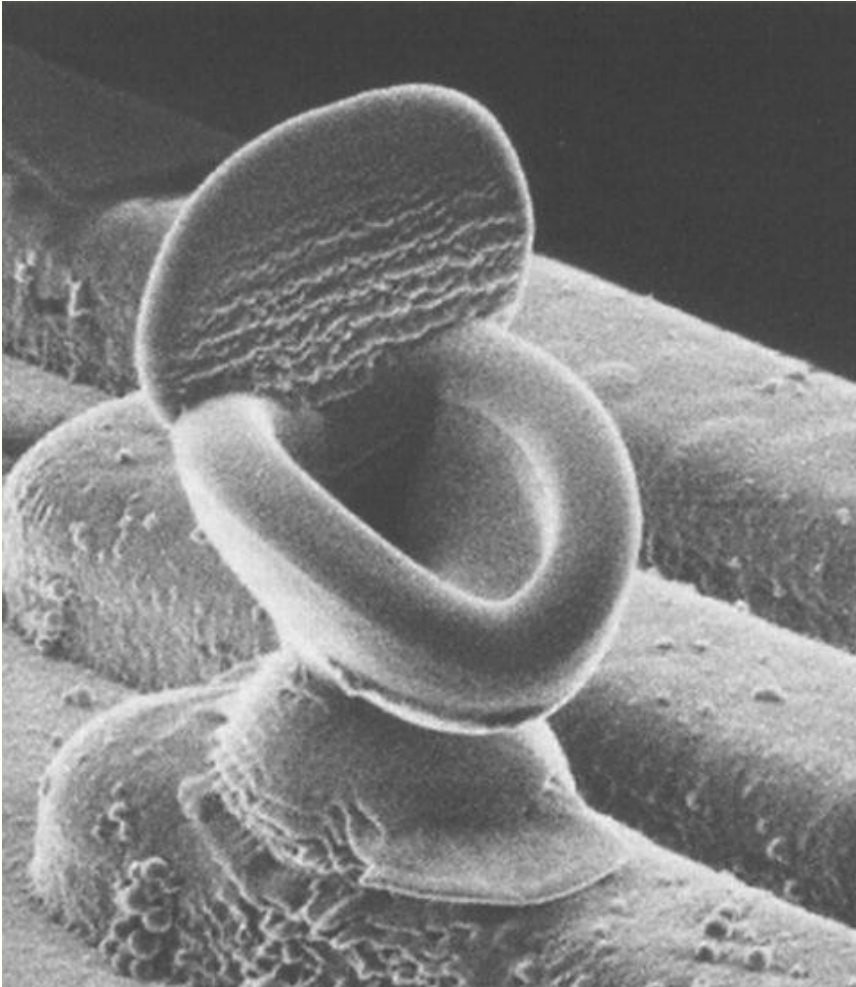
Abstract

NanoArta – peisaje/iluzii/aluzii din universul micro/nano



Abstract

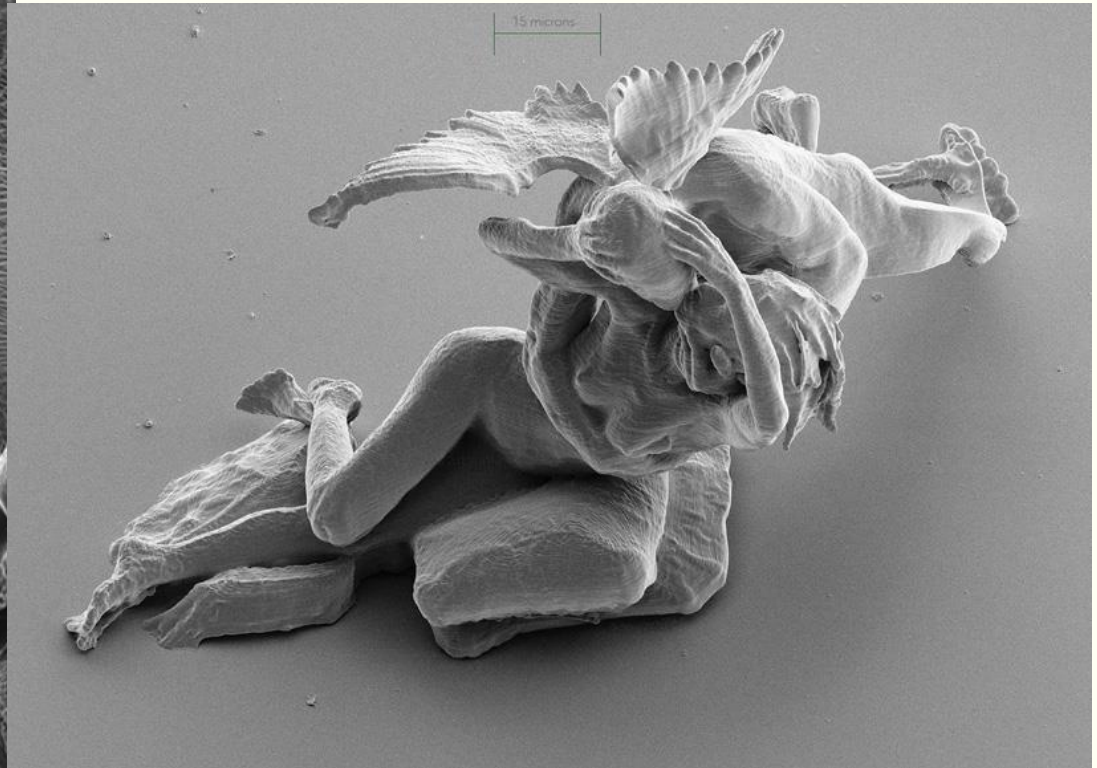
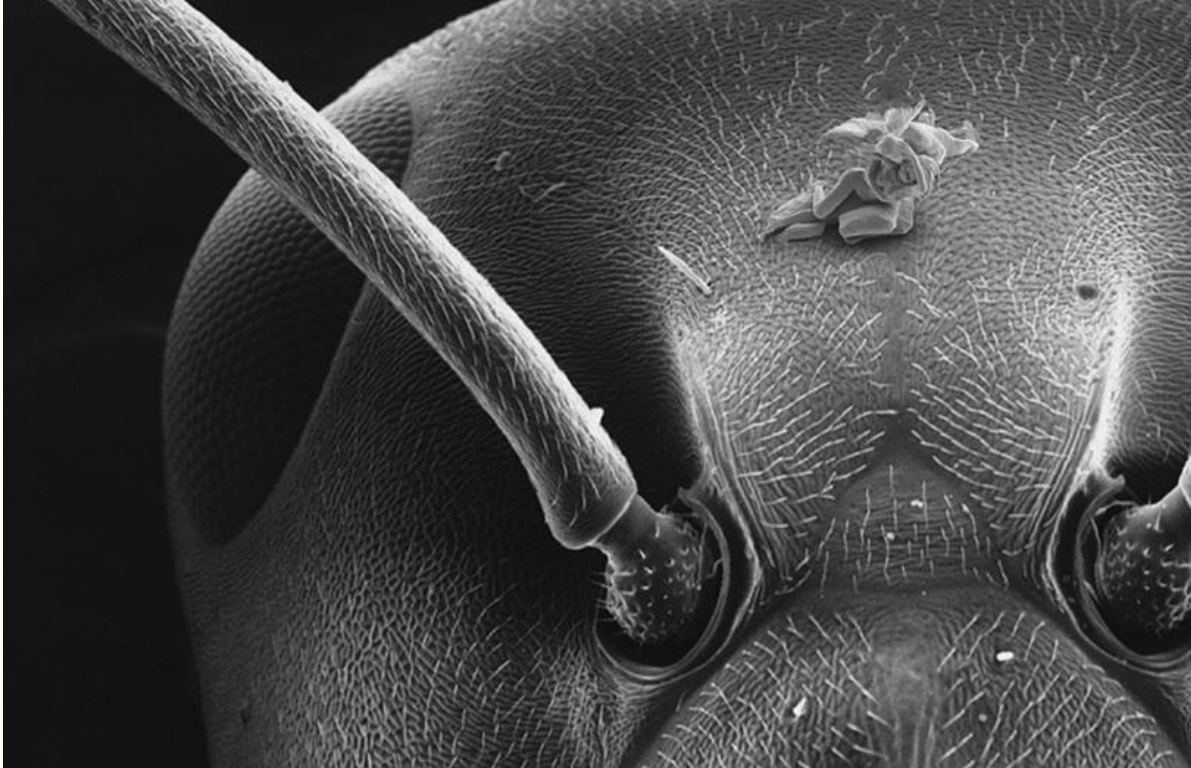
NanoArta – sculptura in universul micro/nano



Nano-Chitara de Dustin Carr (Cornell University)

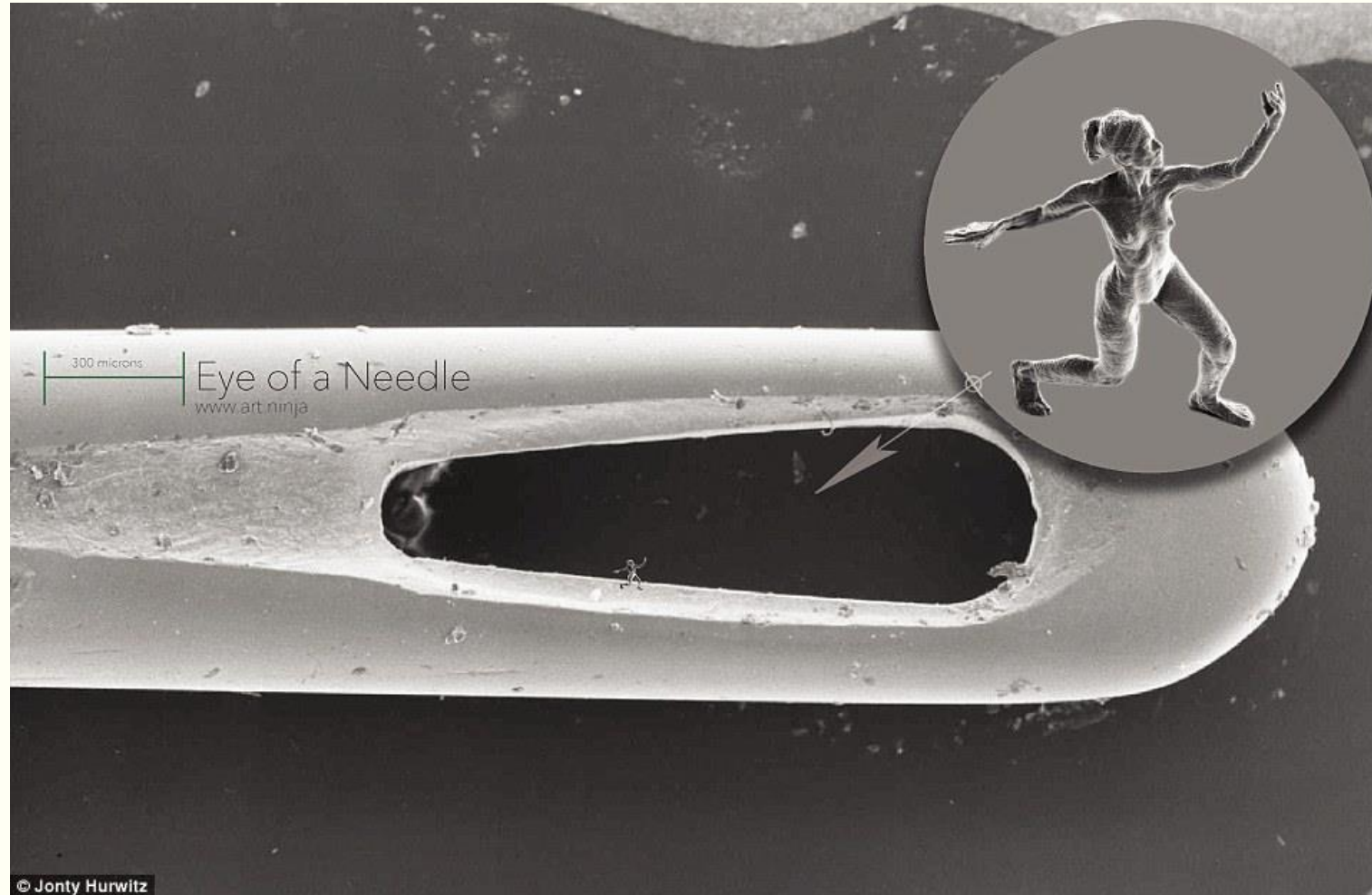
Nano-wc de Kaito Takahasi

NanoArta – sculptura in universul micro/nano - Jonty Hurwitz

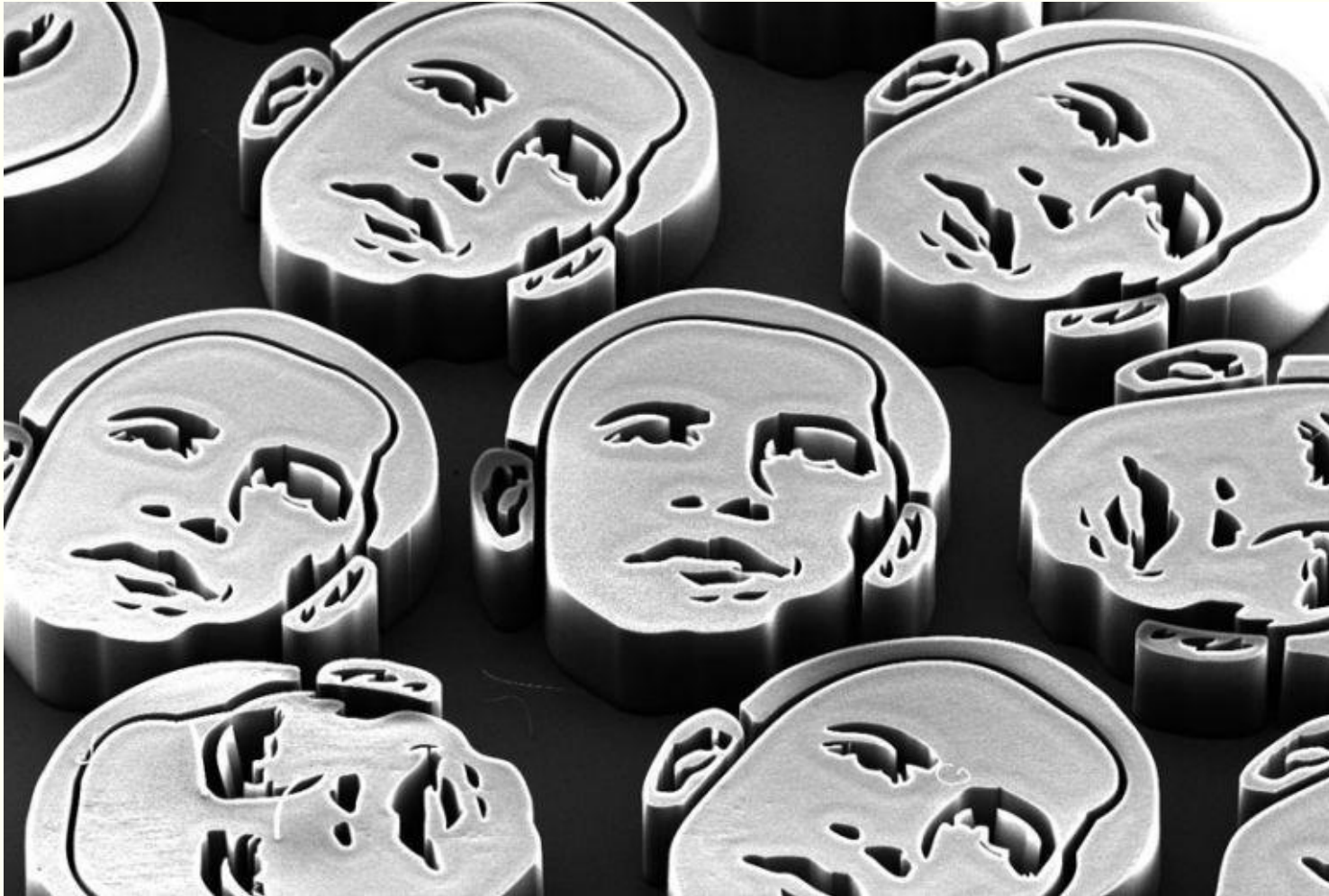


Jonty Hurwitz

NanoArta – sculptura in universul micro/nano - Jonty Hurwitz

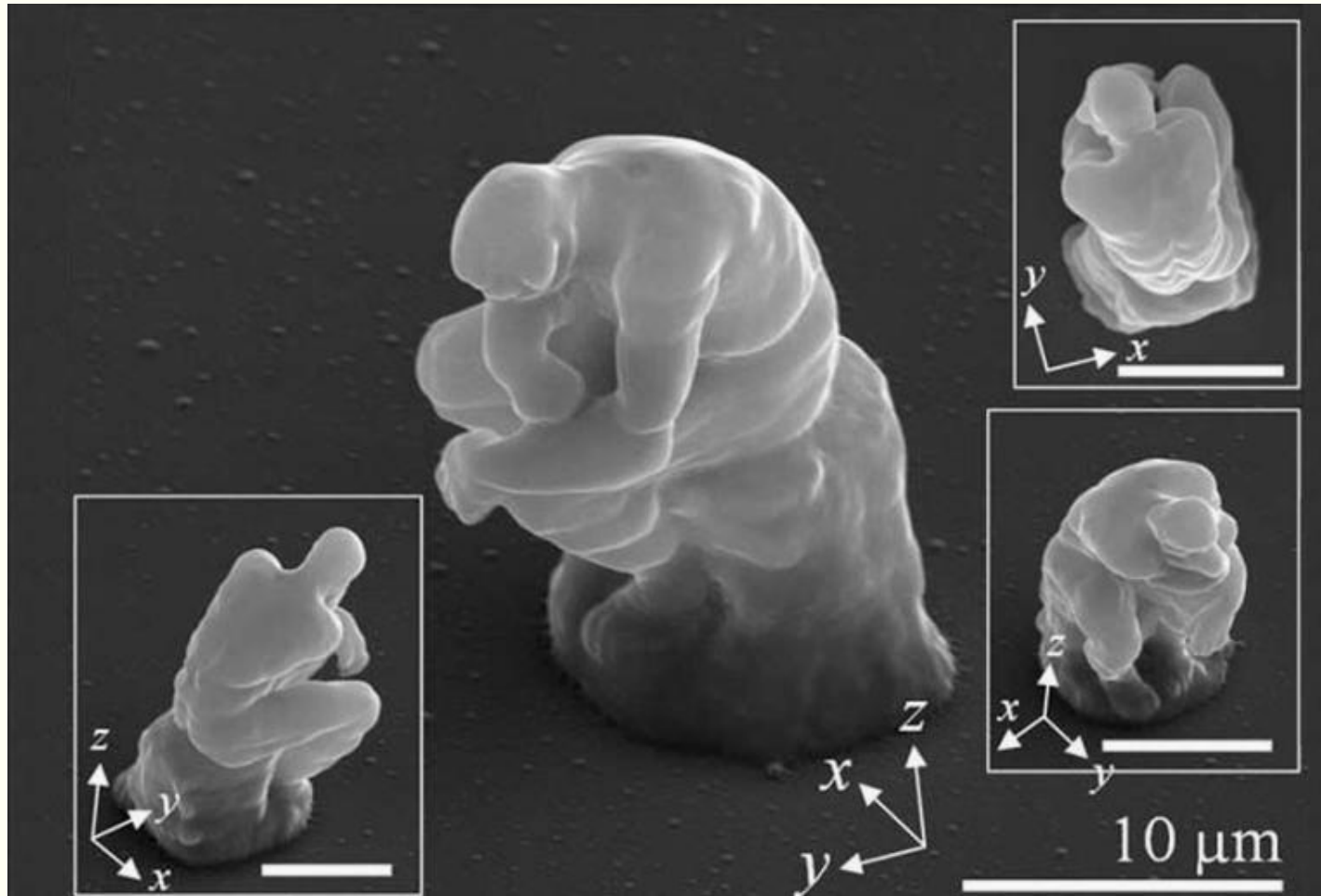


NanoArta – constructii in universul micro/nano



"nanobamas" de John Hart –
constructie din nanotuburi de
carbon aliniate

NanoArta – constructii in universul micro/nano



Ganditorul
de Dong-Yol Yang (Corea de
Sud)

Sculptura foarte detaliata cu
laser a unei replici a
Ganditorului de Auguste
Rodin cu dimenisunea de 20
de micrometri

Academy of NanoArt

- Este o initiativa non-guvernamentala fondata de omul de stiinta si artistul Cris Orfescu in SUA in 2017. Reuneste specialisti pasionati de pe toate continentele.
- Promoveaza accesul public la realizarile si instrumentele nanostiintei si nanotehnologiilor prin intermediul activitatilor educationale si artistice
- Organizeaza Festivalul International NanoArt ajuns la a 6a editie si concursuri internationale on-line
- Detalii precum si informatii, cursuri, tutoriale <http://nanoart.org/>

Echipa “Academy of NanoArt”

Browser tabs: chema - X, Microscop electronic - Wikiped X, Academy of NanoArt

Address bar: nanoart.org 67% Arca lunara

Academy of NanoArt
From Science to Art through Technology

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Academy of NanoArt Team



Visual Artist, Scientist, Nanotechnologist,
Los Angeles, California, USA



Visual Artist, Media Technology Consultant,
Professor of Visual Communication Santa Fe,
New Mexico, USA



Visual Artist, Researcher, Professor of Visual
Arts Darwin, NT, Australia



Visual Artist, Nano Scientist Heraklion, Crete
Island, Greece



Visual Artist, Professor of Visual Arts,
Member of nanoCenter at University of
South Carolina Columbia, South Carolina,
USA



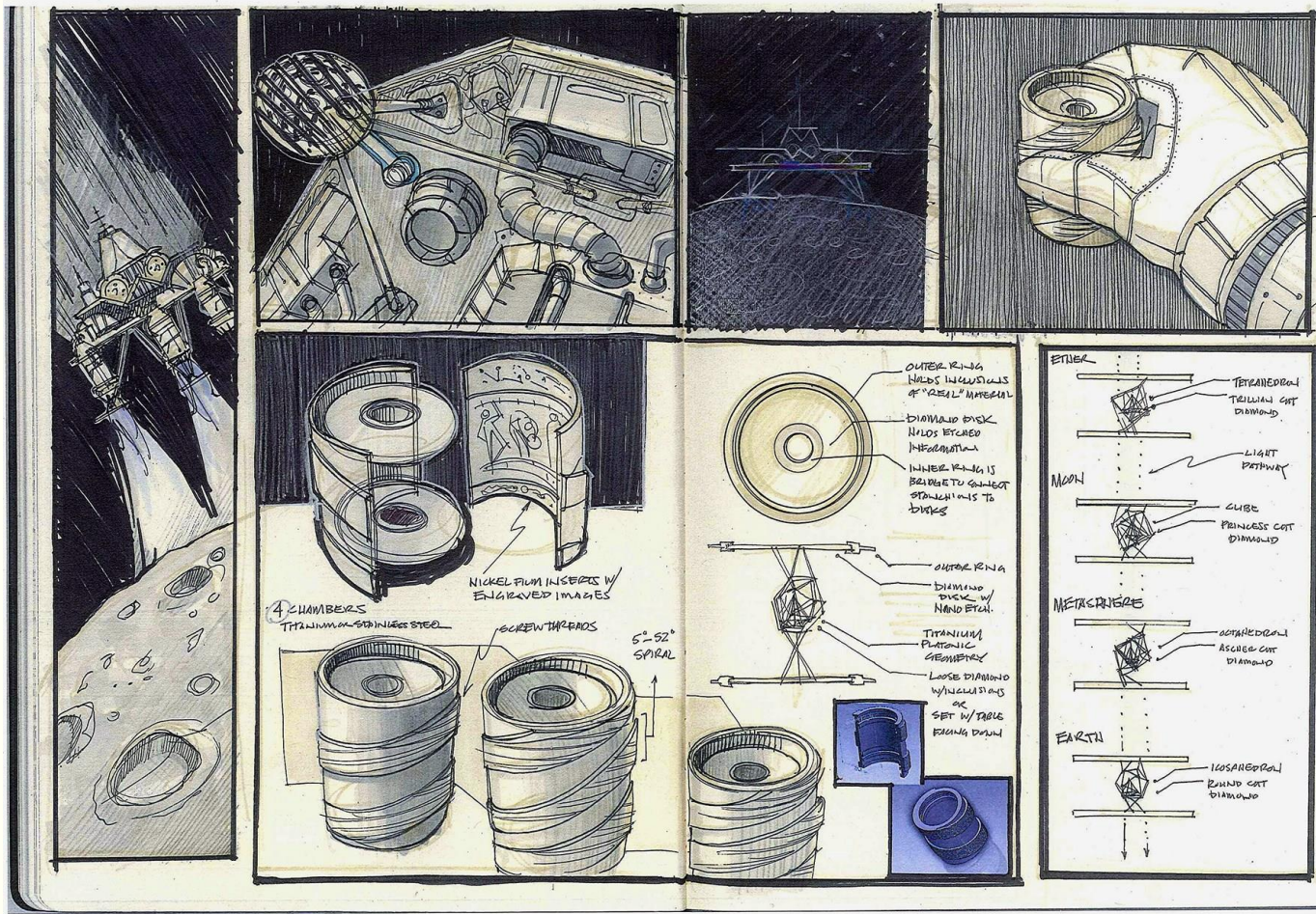
Join our team

NanoArt21

- 7 International Online Competitions and exhibitions
- 6 International Festivals of NanoArt
- Several NanoArt 21 group shows in brick-and-mortar galleries worldwide
- NanoArt K12 page with info about Nanoscience and Nanotechnology
- NanoArt K12 online exhibition

www.nanoart21.org

The MoonArk Project <http://moonarts.org/>



Start : Carnegie Mellon University
2008

Lansarea capsulei 2019

18 institutii

60 membrii in echipe

250 artisti

Consta in crearea a doua capsule
gemene foarte rezistente, cu
dimensiuni de 6"x6"continand o
istorie a civilizatiei umane sub
forma de creatii artistice si
tehnologice comprimate la nivel
micro- si nanometric. Una va fi
lansata pentru a fi stocata pe luna,
a doua va calatori de pe un
continent pe altul si va fi prezentata
in expozitii si show-uri. In acest
proiect NanoArta joaca un rol
esential. [Video](#)

Va multumesc pentru atentie!

Mulumiri speciale:

Dr. Marcela Claudia Călineci, CMBRAE

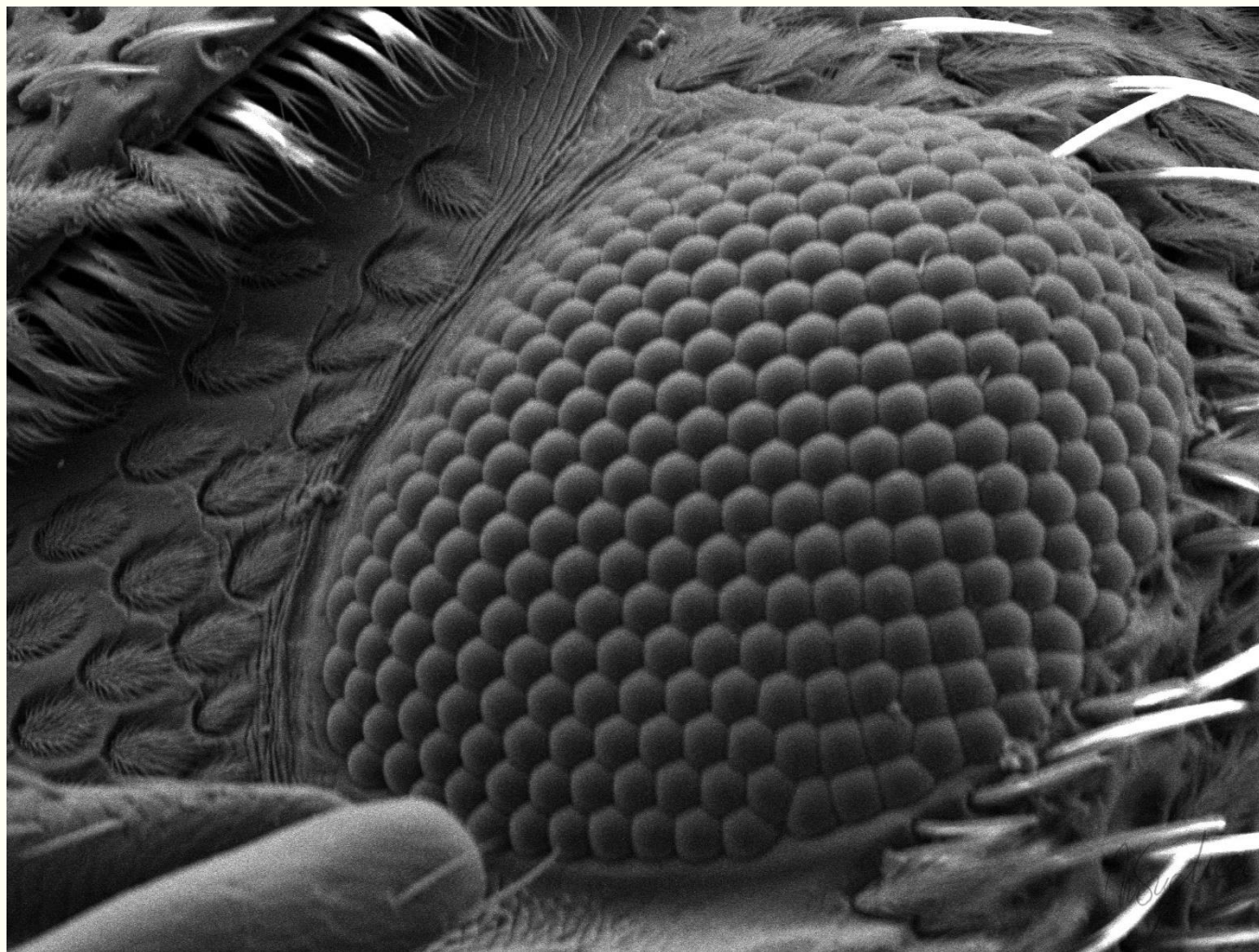
Dr. Cristian Orfescu – Academy of NanoArt

Dr. Adrian Dinescu – Director General al IMT Bucuresti

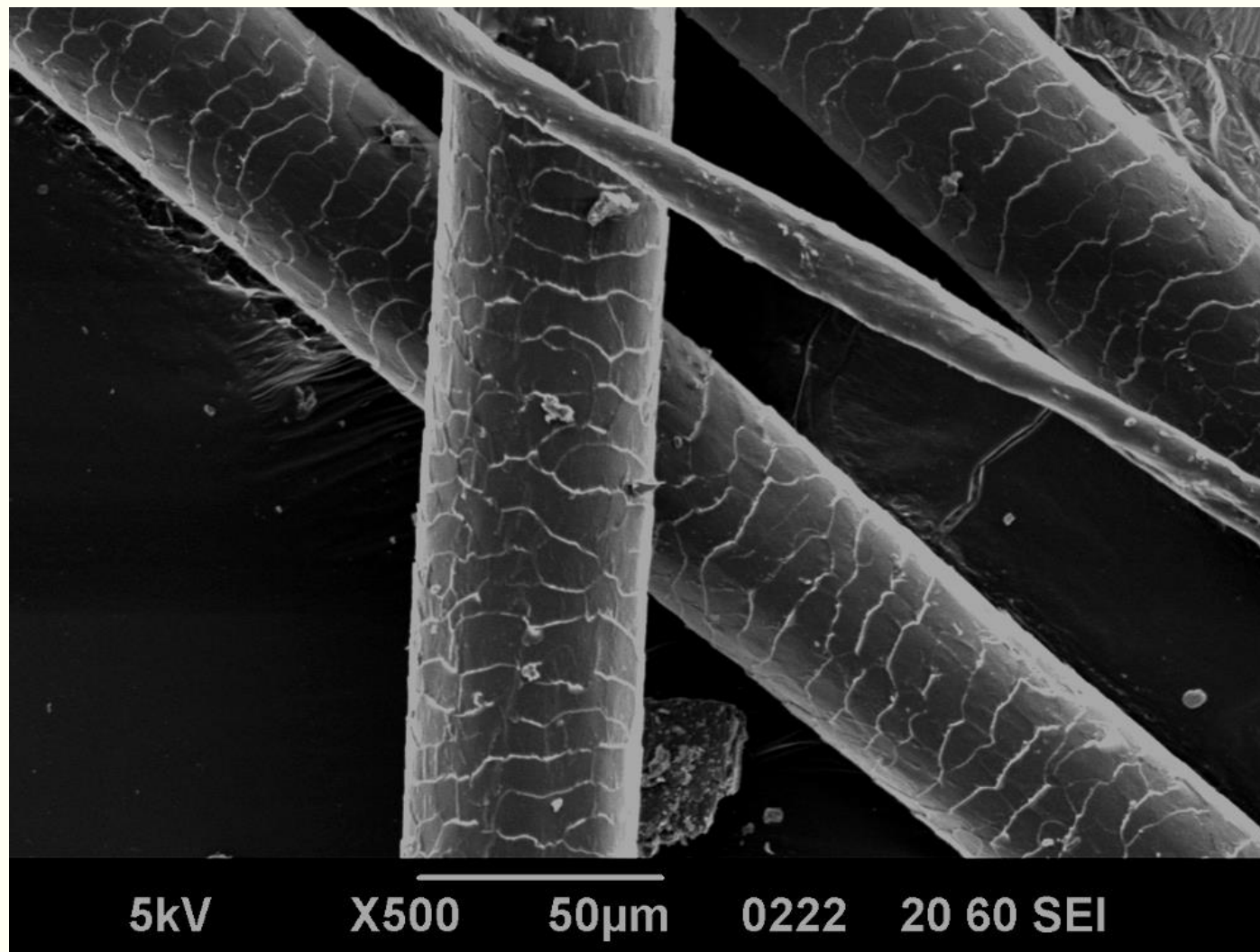
Dr. Florin Comanescu - IMT Bucuresti

Concurs de ghicitori

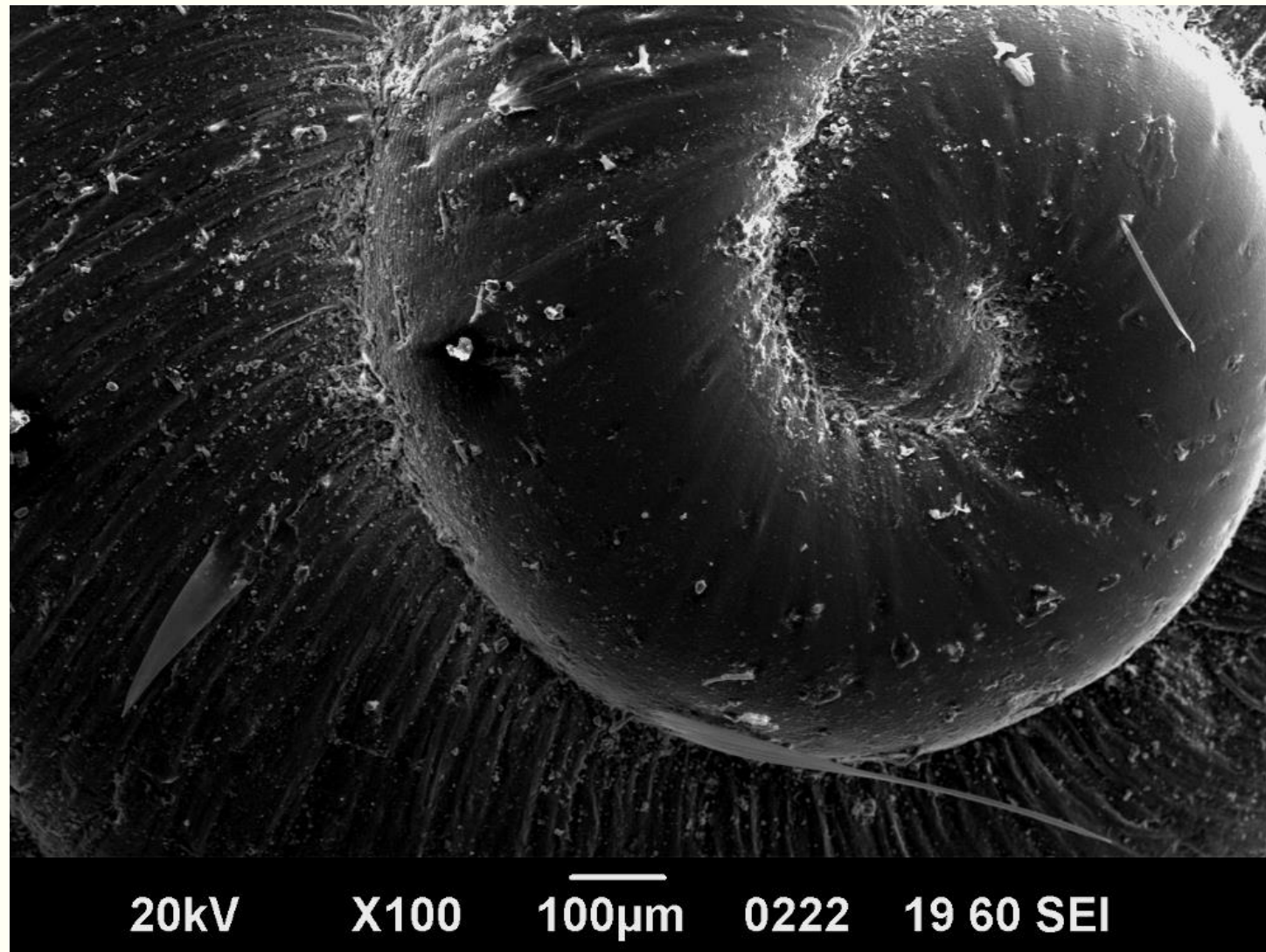
Ghicitoare 1



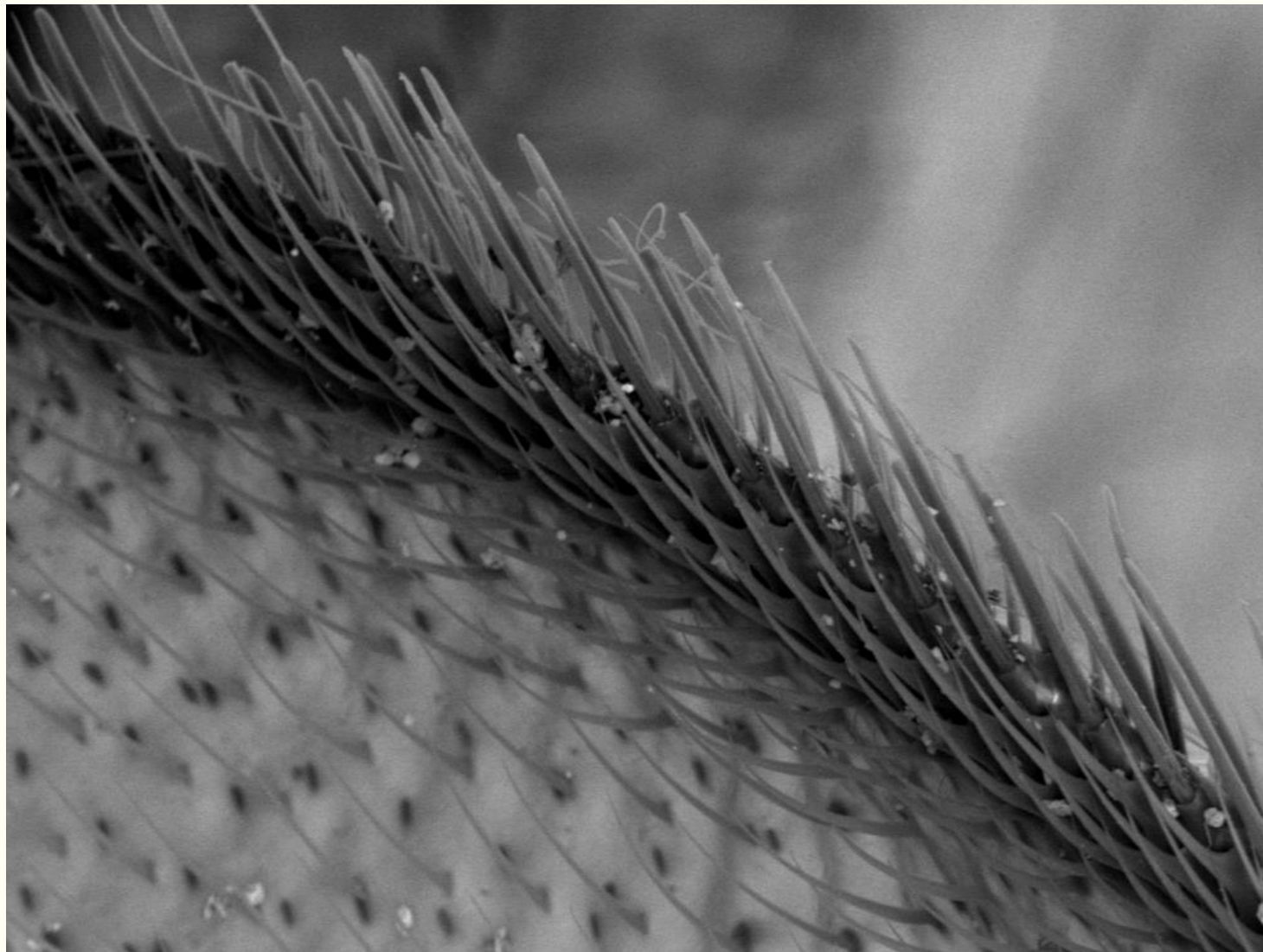
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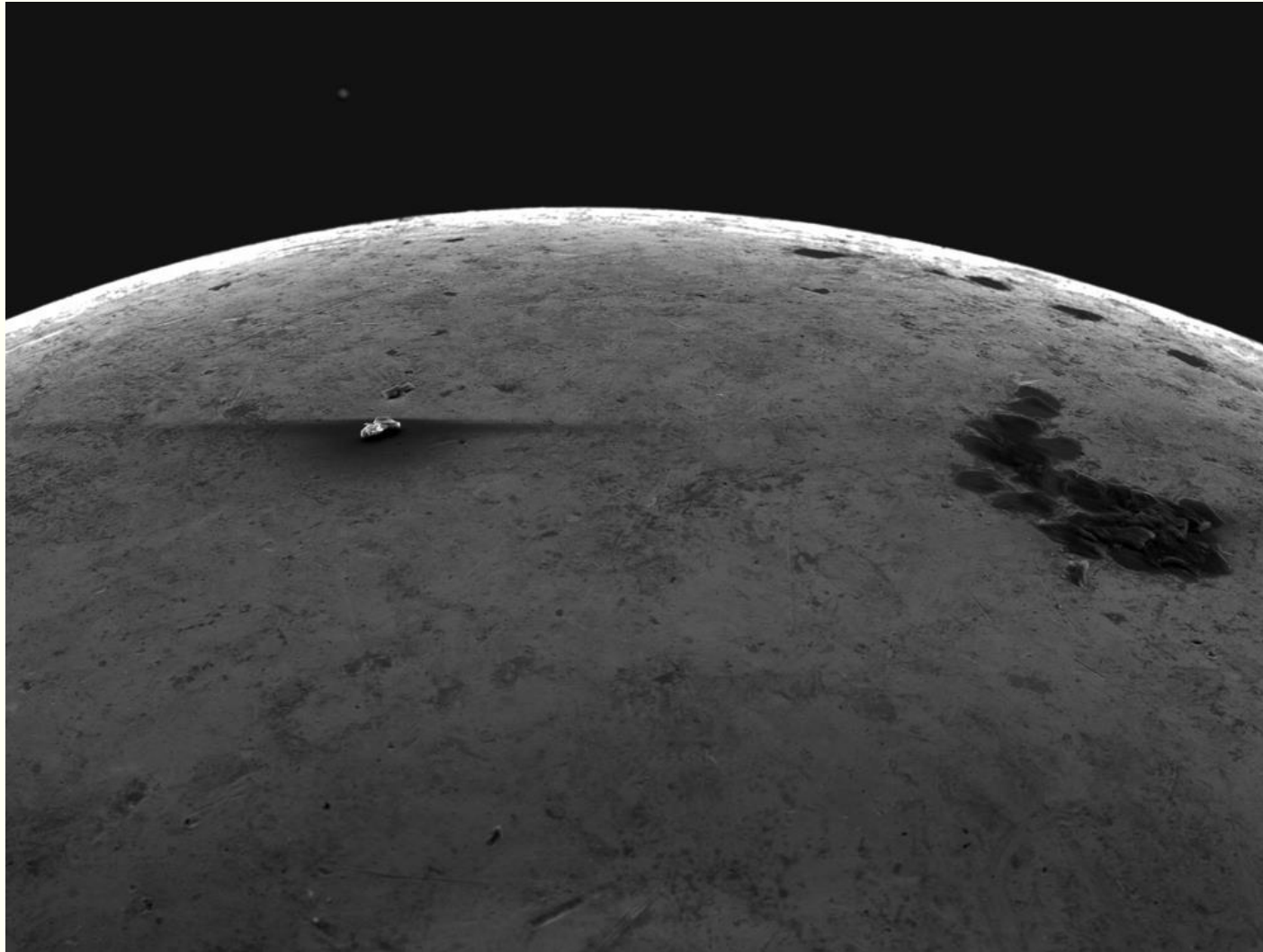
Ghicitoare 3



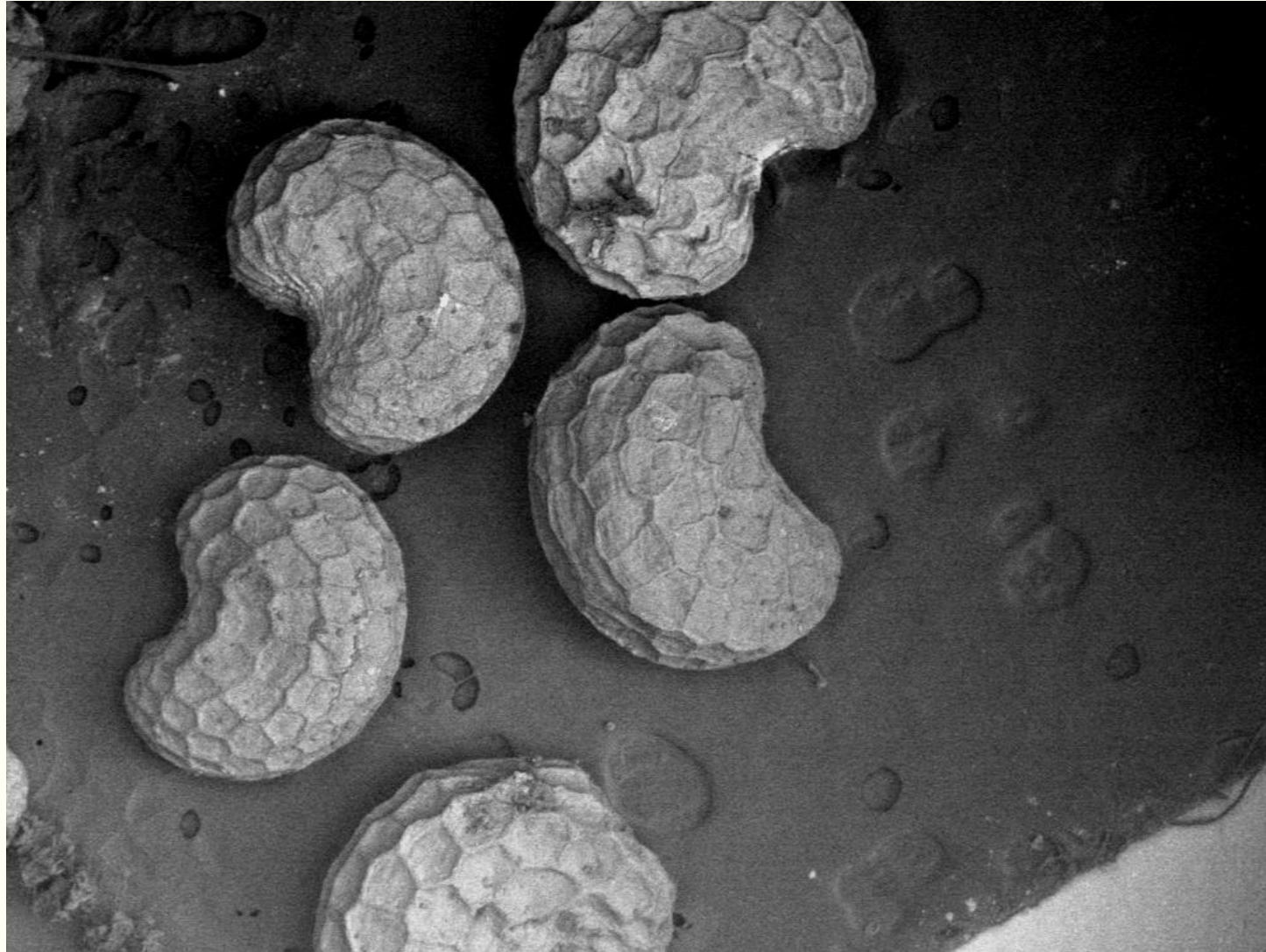
Ghicitoare 4



Ghicitoare 5



Gicitoare 6



Raspunsuri



1



2



3

Raspunsuri



4



5



6