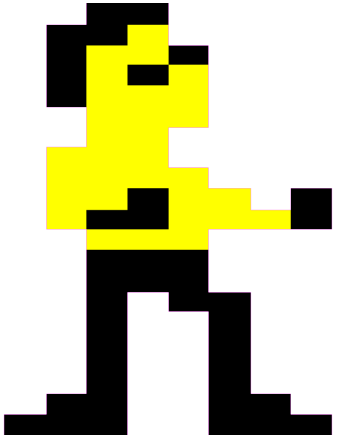


NanoŠmano vs. wetPONG - Experiences in Outreach and Education at the BioNanoInterface

Dr. Marc R. Dusseiller aka dusjagr

www.dusseiller.ch/labs

Marc R. Dusseiller [1,2], Erik Reimhult [3], Špela Petrič [,1,4,8], Gorazd Planinšič [5], Bengt Sjölén [1,6], Urs Gaudenz [1,7], Jurij Krpan [8]

1. International Hackteria Society, Switzerland
2. School for Lifesciences, FHNW, Switzerland
3. Dep of Nanobiotechnology, BOKU Wien, Austria
4. Institue of Biochemistry, Faculty of Medicine, UL, Ljubljana, Slovenia
5. Faculty for Mathematics and Physics, UL, Ljubljana, Slovenia
6. Automata, Stockholm, Sweden
7. Technik & Architektur, HSLU, Switzerland
8. Kapelica Gallery, Ljubljana, Slovenia

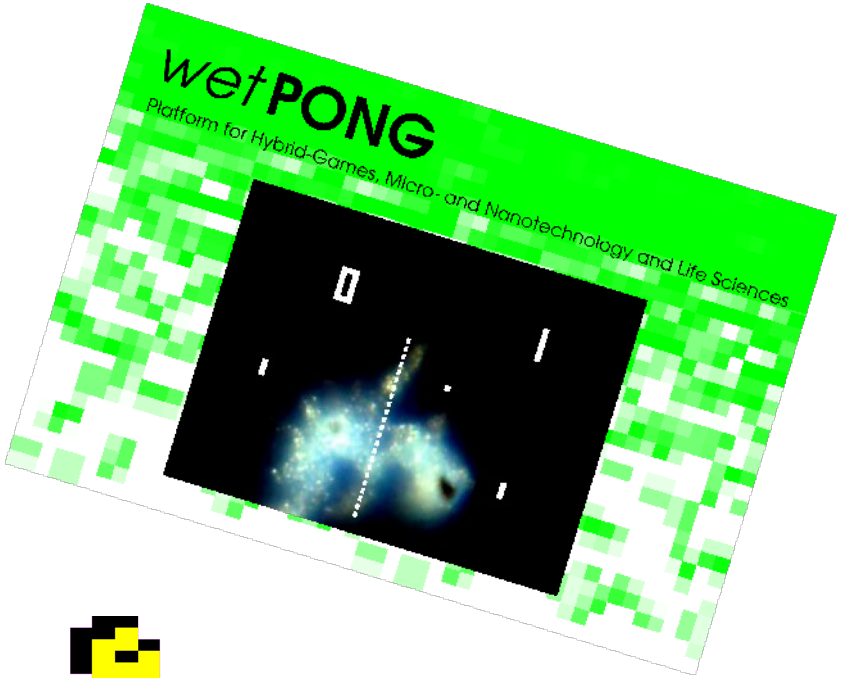
Schweizerische Gesellschaft für Mechatronische Kunst

SGMK

diy 自作…業

Krachmacher bauen mit der Schweizerischen Gesellschaft für Mechatronische Kunst

HACKTERIA



n|w Fachhochschule Nordwestschweiz

Acknowledements

Stefan Doepner, Bostjan Leškovsek, Kapelica Gallery, Ljubljana

Markus Haselbach, Urs Gaudenz, Tobias Hoffmann und alle Mechatroniker

Yashas Shetty, Srishti, Bangalore, Andy Gracie, Gijon, hackteria

René Bauer, GameDesign, ZhdK

DIYbio, Sachiko Hirosue, Spela Petric, Brain Degger et al from HackteriaLab

HONF, House of Natural Fiber, Yogyakarta

Gabor Csucs, Martin Willeke, Marcus Textor, ETH Zürich

Förderungen durch: Migros Kulturprozent, BAK, Pro Helvetia, Stadt Zürich, FHNW, EPFL and more...

Education and Outreach

I hear and I forget
I see and I remember
I do and I understand

Confucius

“Creativity is becoming more important than knowledge.
Knowledge is distributed on the Internet where anyone can find it.”

James Gimzewski

“As the circle of light [scientific knowledge] increases,
the circumference of darkness also increases.”

Albert Einstein

How can I teach creativity? Is there an intuitive understanding of Nanosystems?
Whats the benefit of transdisciplinary projects? How can scientists learn to talk?

Fields of Activity

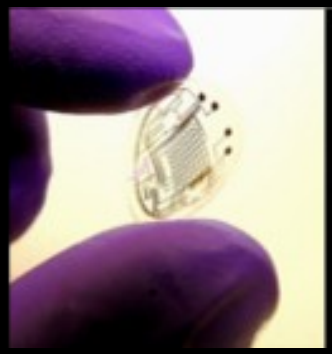
dusjagr labs – transdisciplinary Scholar and Artist

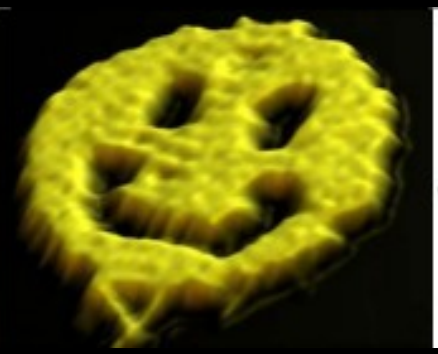
http://www.dusseiller.ch/labs/

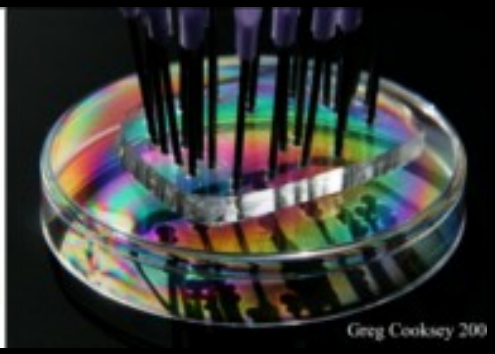
- SGMK | MechArtLab, diy* festival
  - http://www.mechatronicart.ch/
- Hackteria | Open Source Biological Art
  - http://hackteria.org
- PlayAround 2010 - Taipei | DIWO Culture
  - http://2010.playaround.cc
- Dock18 | Raum für Medienkultur
  - http://www.dock18.ch/
- FHNW, HLS | wetPONG - Hybrid Games, Micro- and Nanotechnology and Life Sciences
  - http://wetpong.net
- ZHdK | SlowGames
- ETH Zürich | Traditional Materials

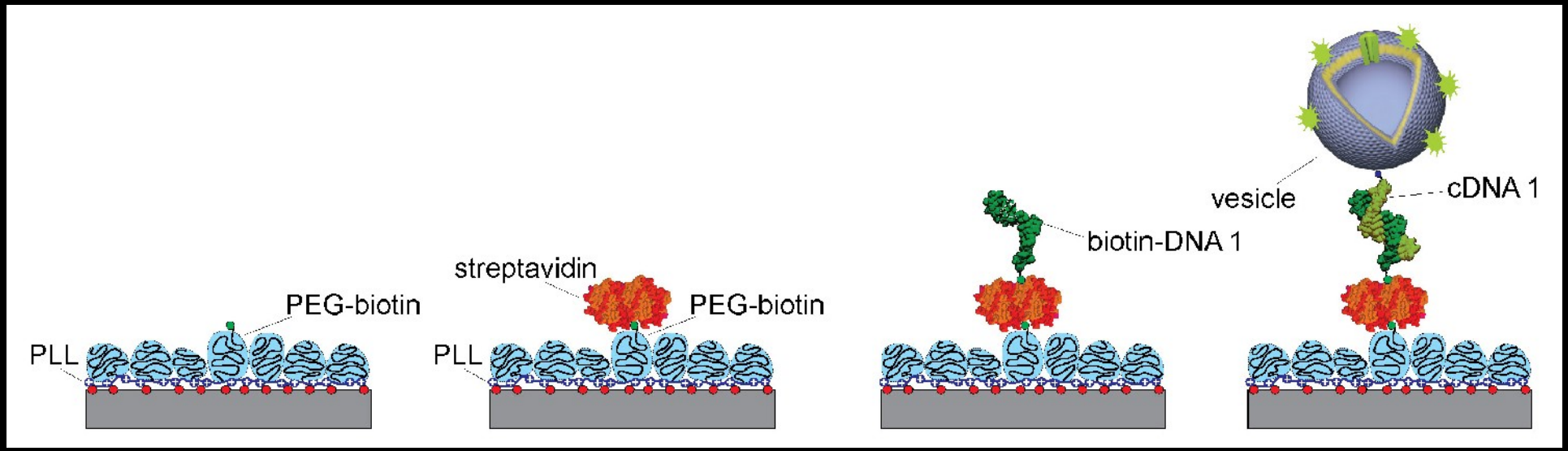
First Transdisciplinary Experiences bridging Materials and Biology

The NanoBioInterface







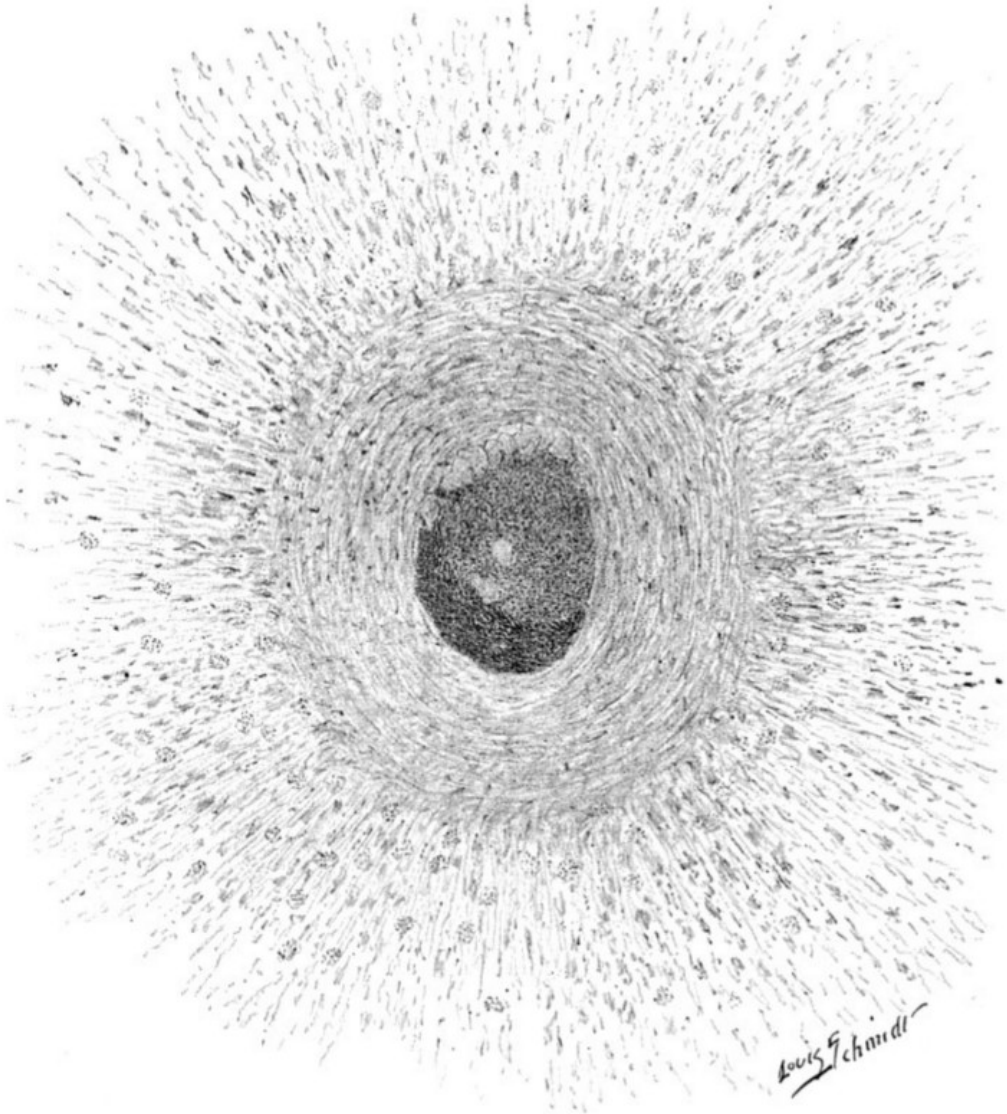


Laboratory for Surface Science and Technology, ETHZ
Janos Vörös, Marcus Textor, Viola Vogel, Nic Spencer

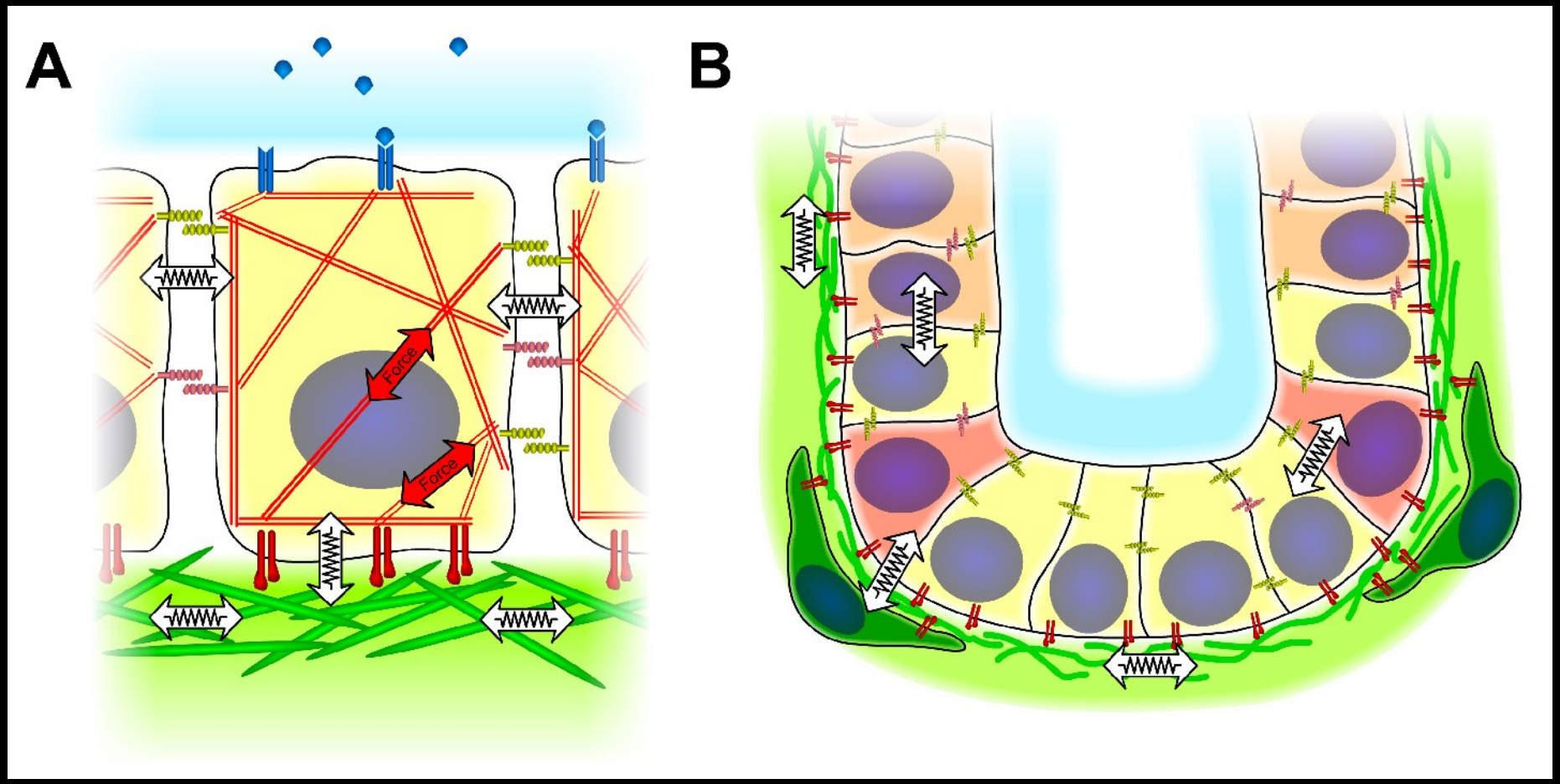
ON THE PERMANENT LIFE OF TISSUES OUTSIDE OF THE ORGANISM.*

By ALEXIS CARREL, M.D.

(From the Laboratories of The Rockefeller Institute for Medical Research, New York.)



µ3D Cellular Environments



Microfabricated three-dimensional environments for single cell studies

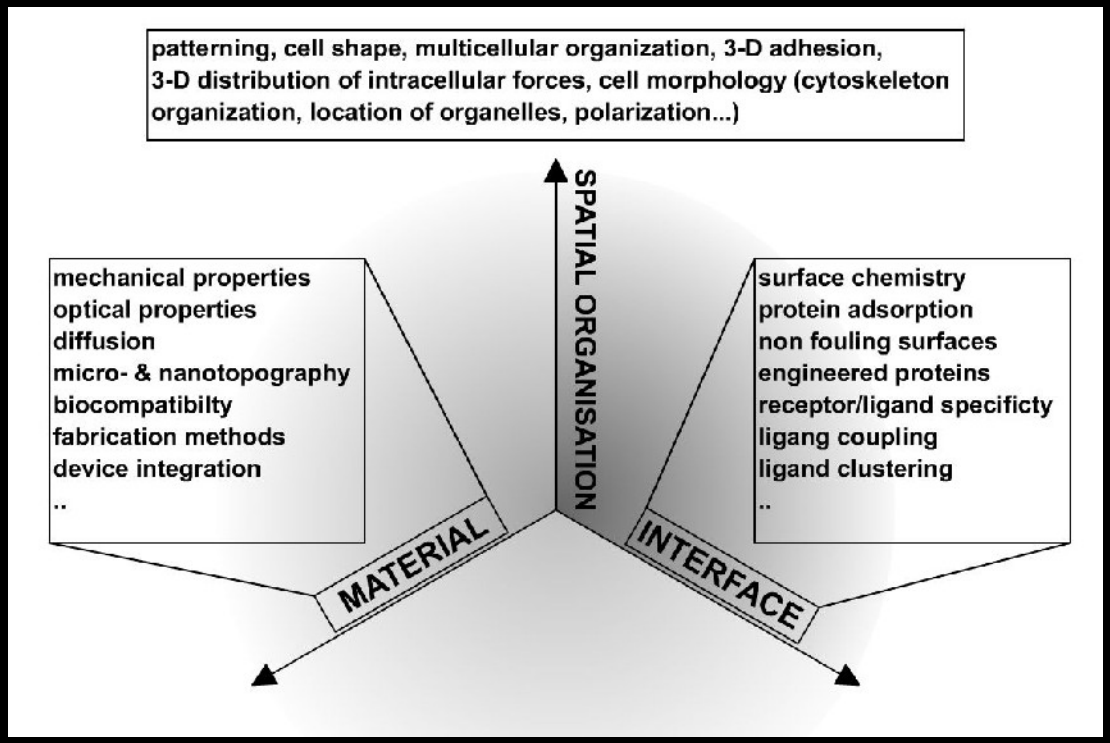
Marc Dusseiller, Michael Smith, Viola Vogel, and Marcus Textor

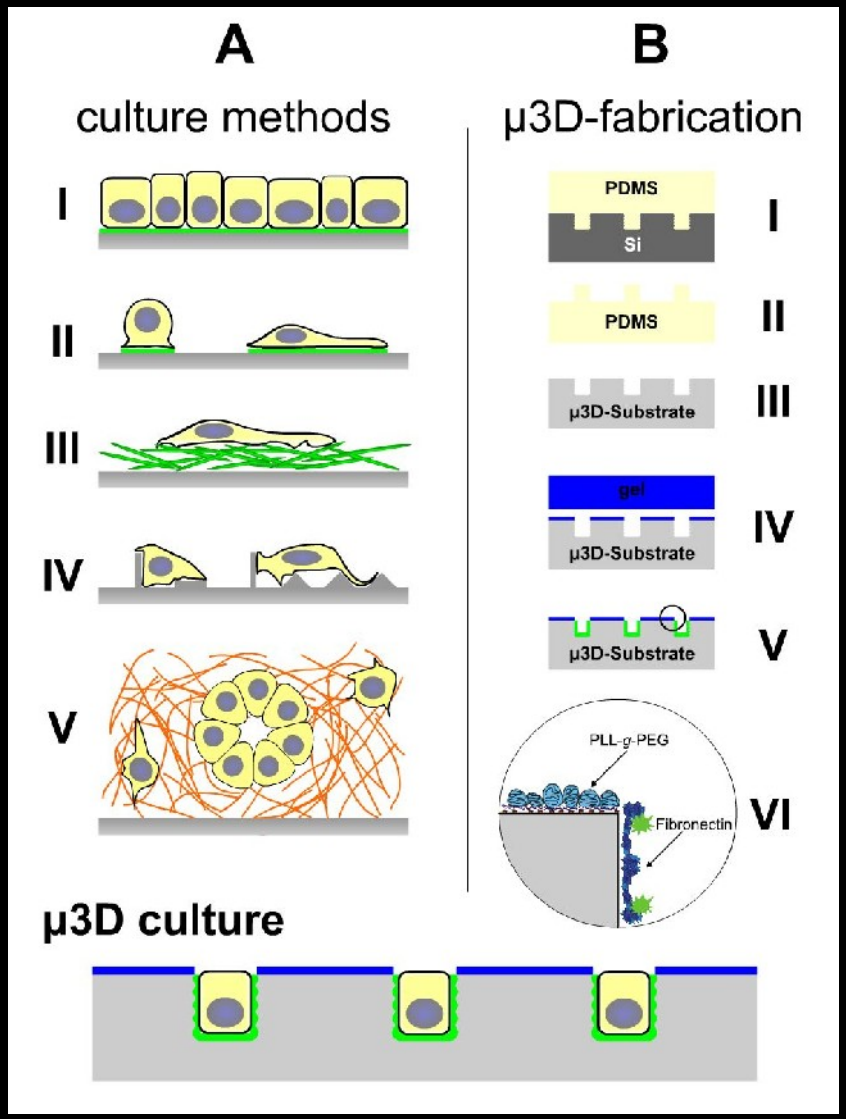
Design of Cellular Patterns 2D

HeLa Cells on patterned substrate, 20 hours timelapse

Alexa Kiss, Gabor Csucs, ETHZ

µ3D Cellular Environments

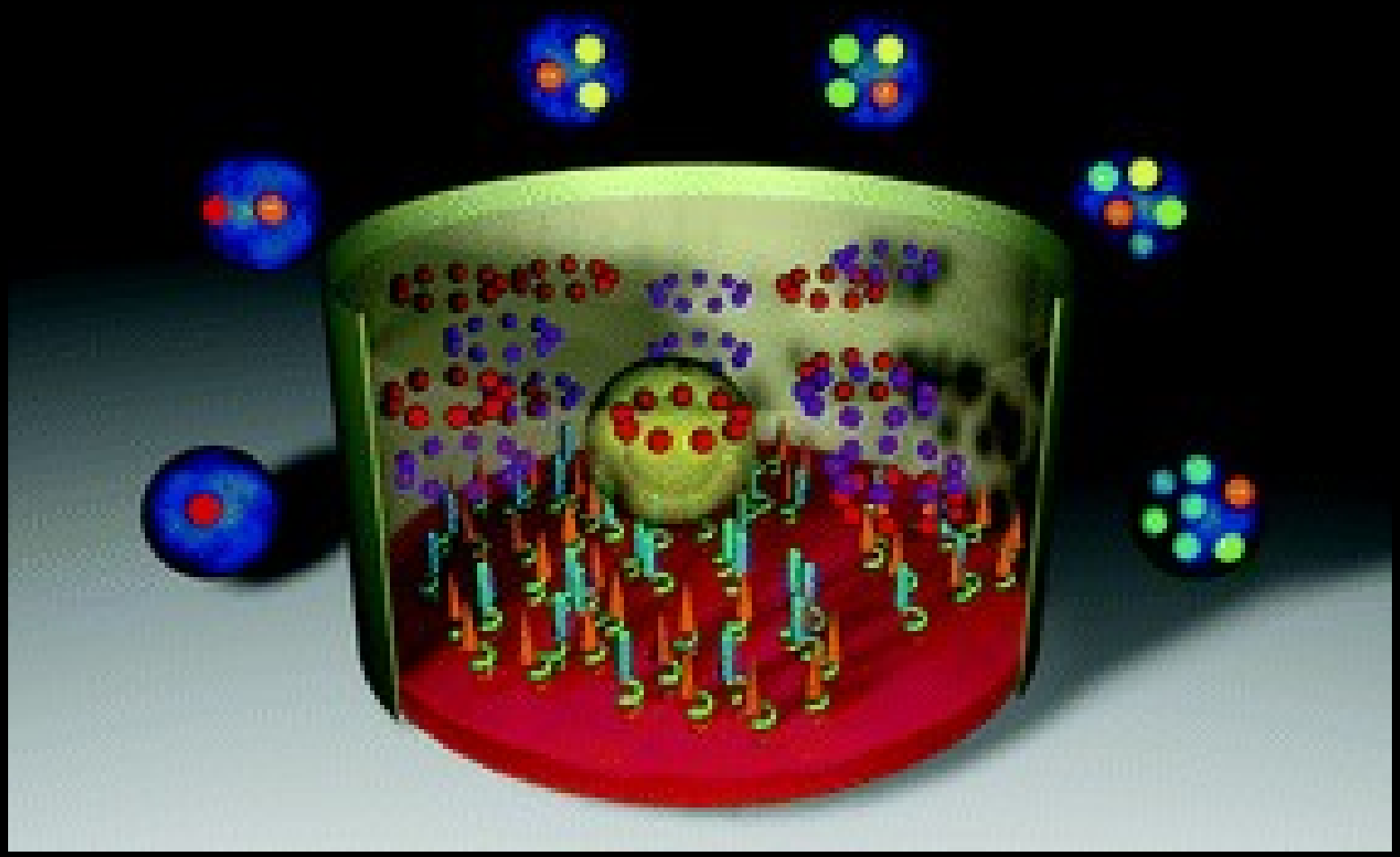




Microfabricated three-dimensional environments for single cell studies

Marc Dusseiller, Michael Smith, Viola Vogel, and Marcus Textor

Meanwhile...



Perturbation of single hematopoietic stem cell fates in artificial niches

M. Lutolf et al, Integrative Biology 2009

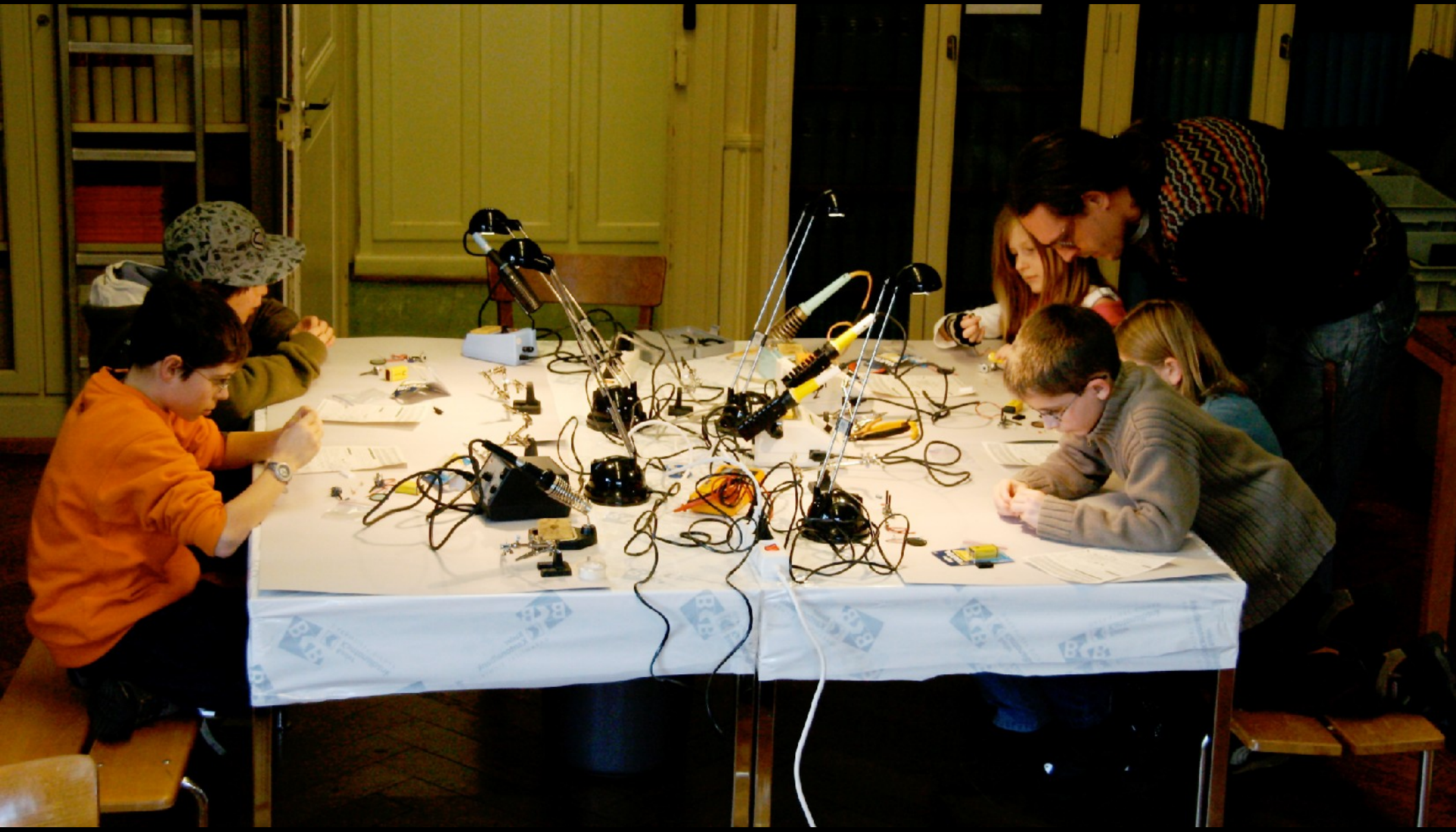
On Teaching to Kids, Geeks and Artists

Workshops for Artists, Kids and Geeks

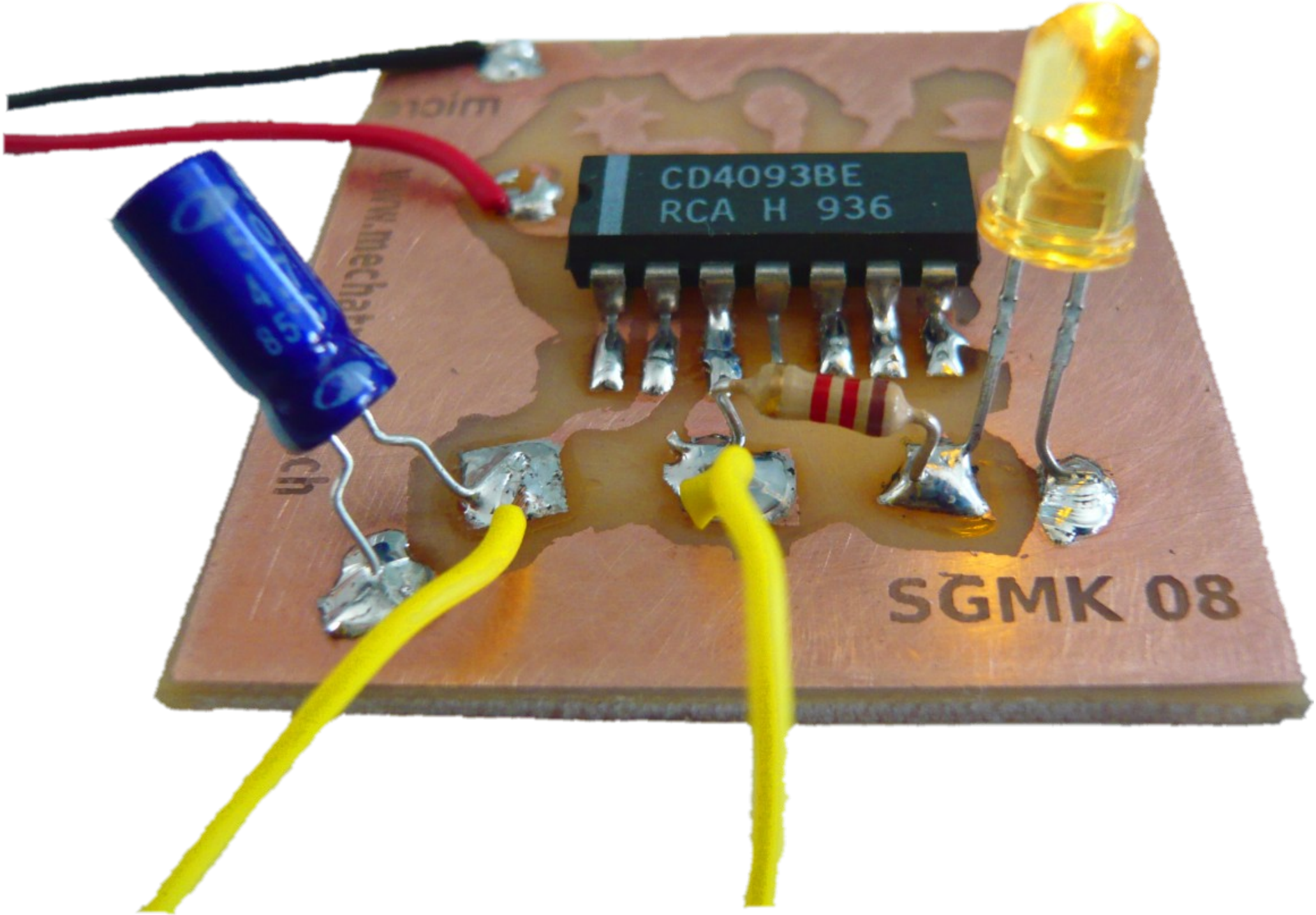
SMAS Swiss Mechatronic Art Society
SSAM Société Suisse d'Art Méchatronique
SGMK Schweizerische Gesellschaft für Mechatronische Kunst
www.mechatronicart.ch

Schweizerische Gesellschaft für Mechatronische Kunst
SGMK


Skematic
BS2



MechArtLab


CD4093BE
RCA H 936
SGMK 08

Hackteria
Open Source Biological Art

HACKTERIA.ORG

Open Source Biological Art, DIY Biology, Generic Lab Equipment

Collaborators
Marc Dusseiller (Switzerland)
Yashas Shetty (CEMA, Bangalore)
Andy Gracie (Spain)
and more....

http://hackteria.org

hackteria is a community based platform and information portal for the open sharing of knowledge, instructions, critical reflections and theoretical articles about open source art project dealing with biology | lifescience | biotechnology

What is a hack?

Originally:
„A quick job that produces what is needed, but not well.“

1950s:
Amateur radio enthusiasts defined the term hacking as creatively tinkering to improve performance.

Today:
"A clever solution to a problem."

„An appropriate application of ingenuity.“

Hacker's Jargon

BioCyberKidzz

Hackteria BioLab // Create Your World | Ars Electronica Festival 2011, Linz

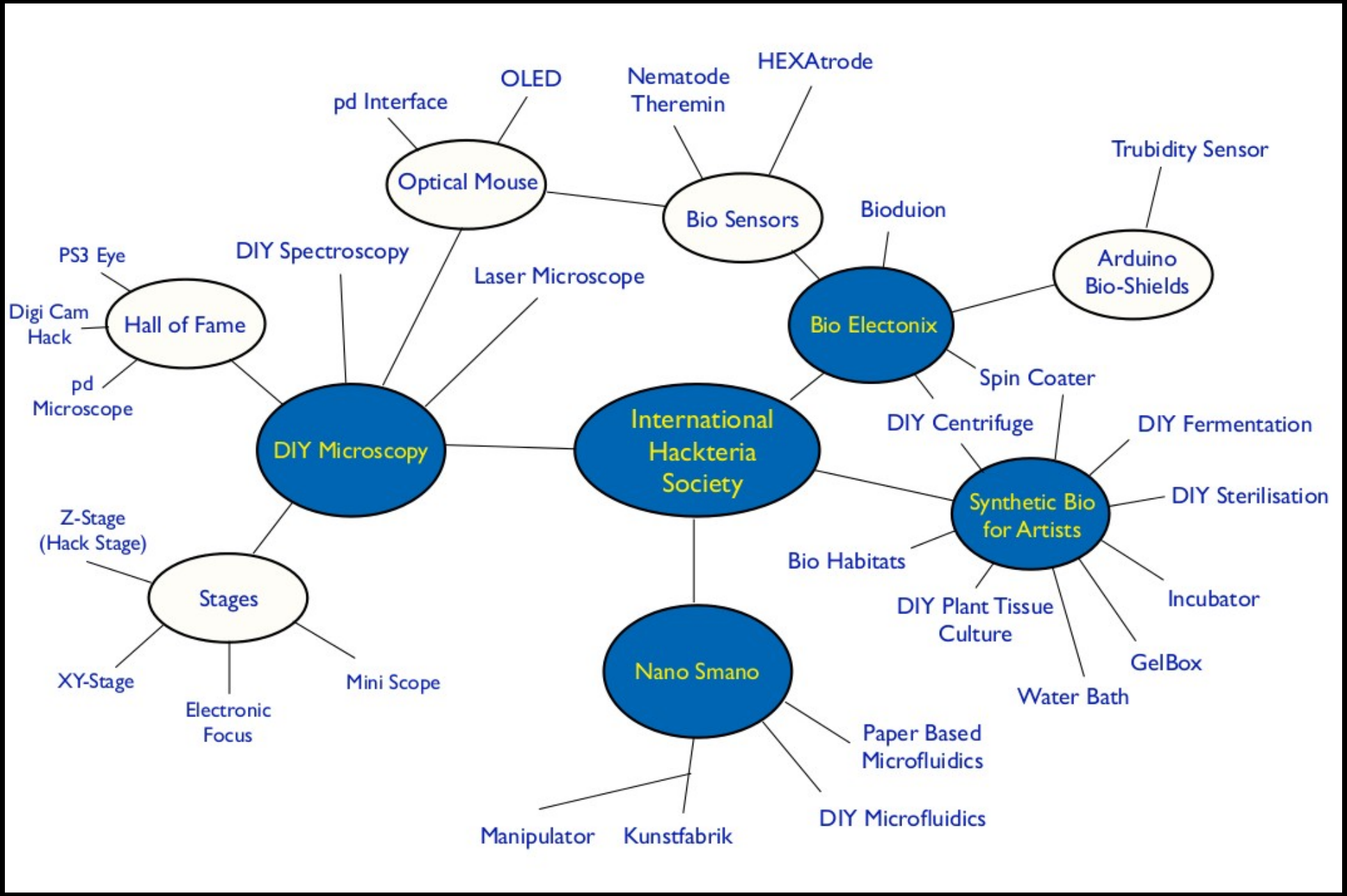
Špela Petrič, Maja Smrekar, Marc Dusseiller

Education at the Art/Sci Interface

Ear on Arm, ongoing project

Stelarc

Overview of Projects



DIY Microscopy – hacked Webcam

Haemocytometer – PS3 Eye Hacks

Collaboration with House of Natural Fiber and UGM, Yogyakarta

NanoŠmano, NanoPunk and the Hacking of Future

Stefan Doepner, Marc Dusseiller, Bostjan Leškovsek
Kapelica Gallery, Ljubljana, SLO | 20.9 – 1.10. 2010

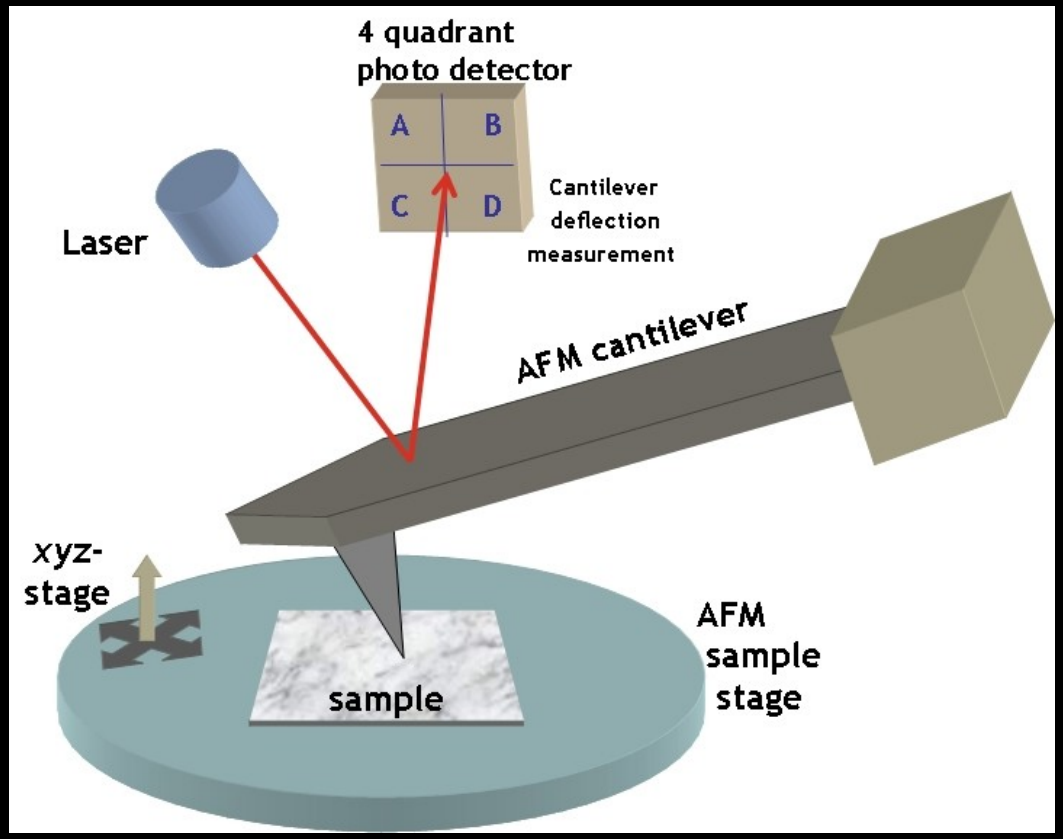
NanoŠmano - Šmall Matter

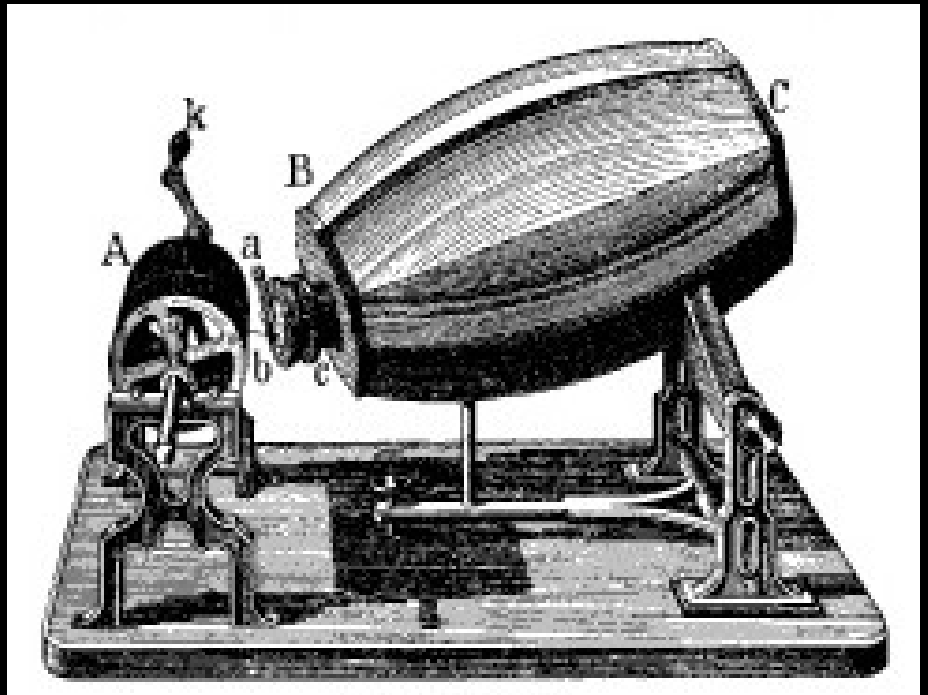
Stefan Doepner, Marc Dusseiller, Boštjan Leskovšek, Bengt Sjölén, Erik Reimhult
Kapelica Gallery, Ljubljana, SLO | 21. – 30.4. 2011

How to start a NanoLab in a Garage

Mestni trg 15, Ljubljana, Slovenia / Presented by: Kapelica Gallery

Atomic Force Microscope (AFM)





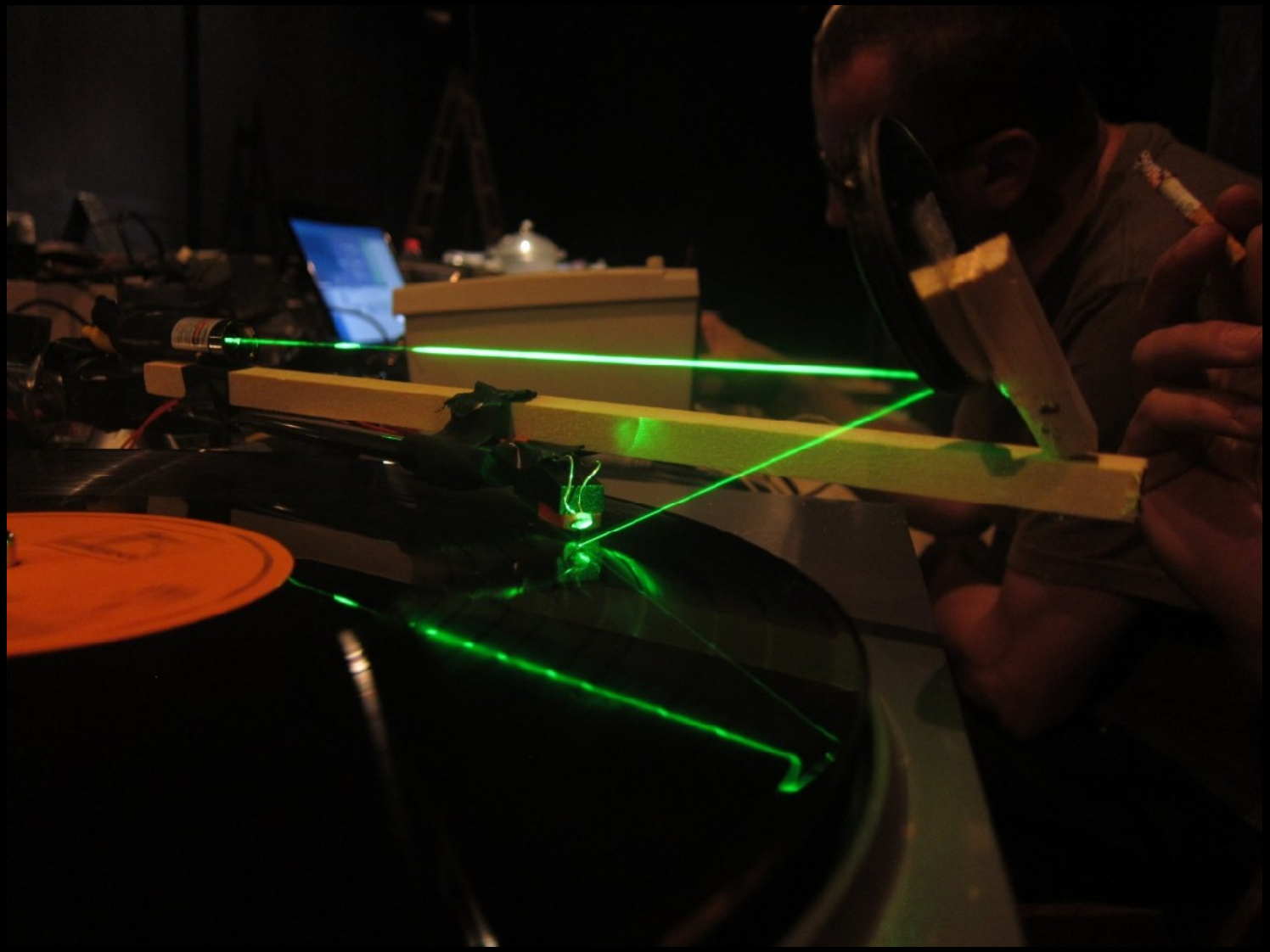
Phonautograph.

BC, barrel with opening at *C*; *c*, brass tube with membrane and style at *b*, and movable piece *a*, by which the position of the nodal points can be regulated; *k*, handle to turn cylinder (*A*) covered with lampblacked paper.

Typical AFM setup. A microfabricated cantilever with a sharp tip is deflected by features on a sample surface, much like in a phonograph but on a much smaller scale.

from Wikipedia

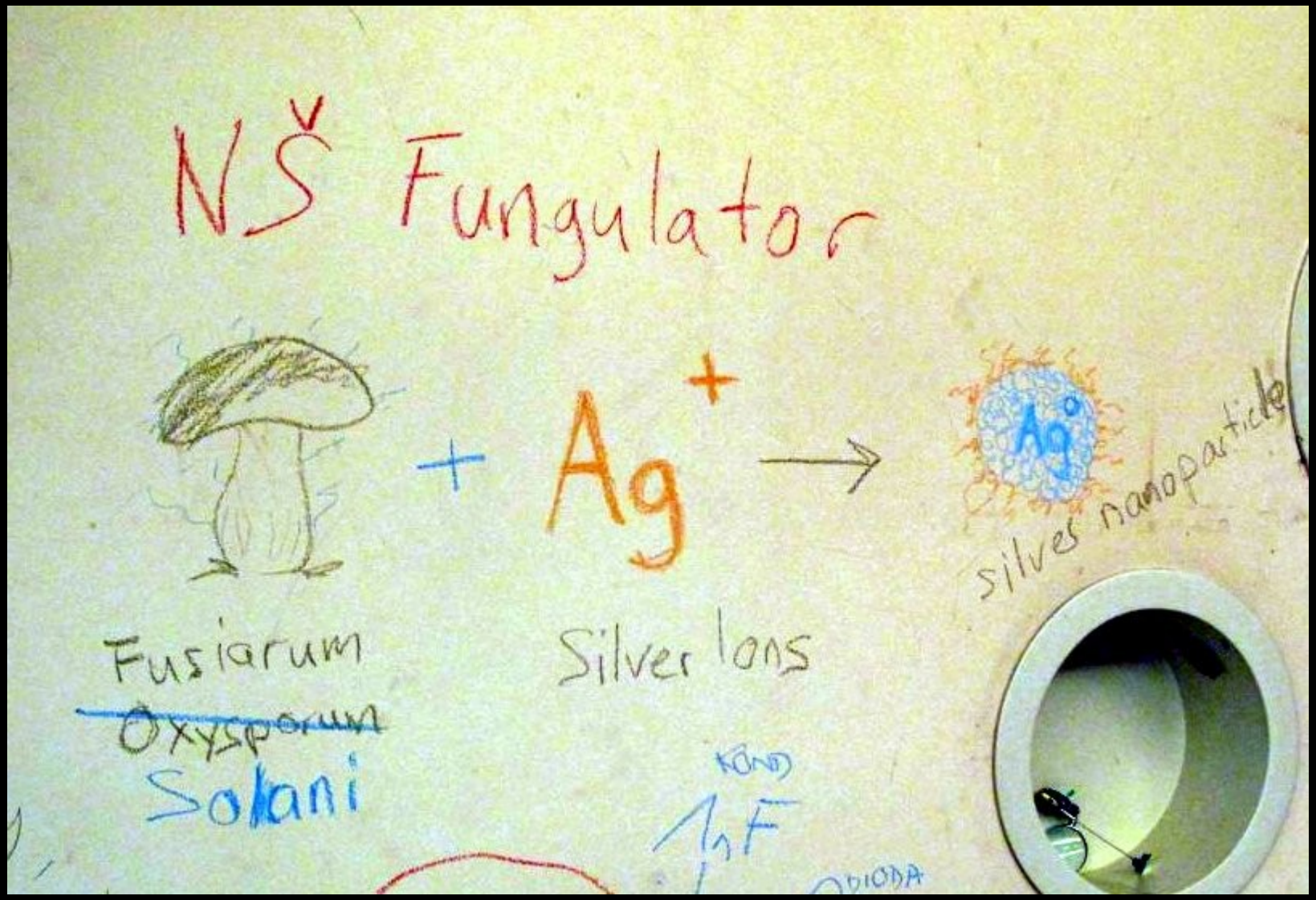
NanoŠmano Turntable



Accoustic Fuck Microsope (AFM)

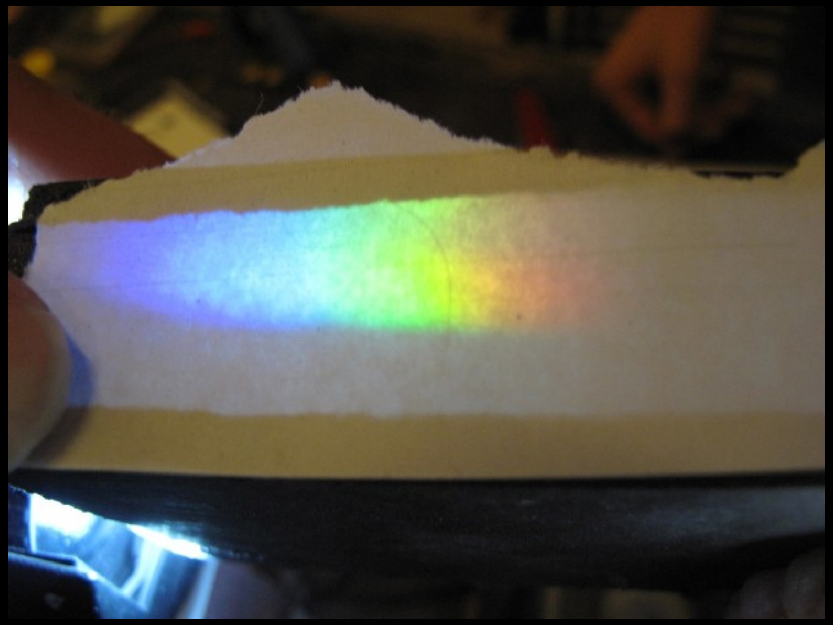
Bostjan Leškovsek

NanoŠmano Fungulator

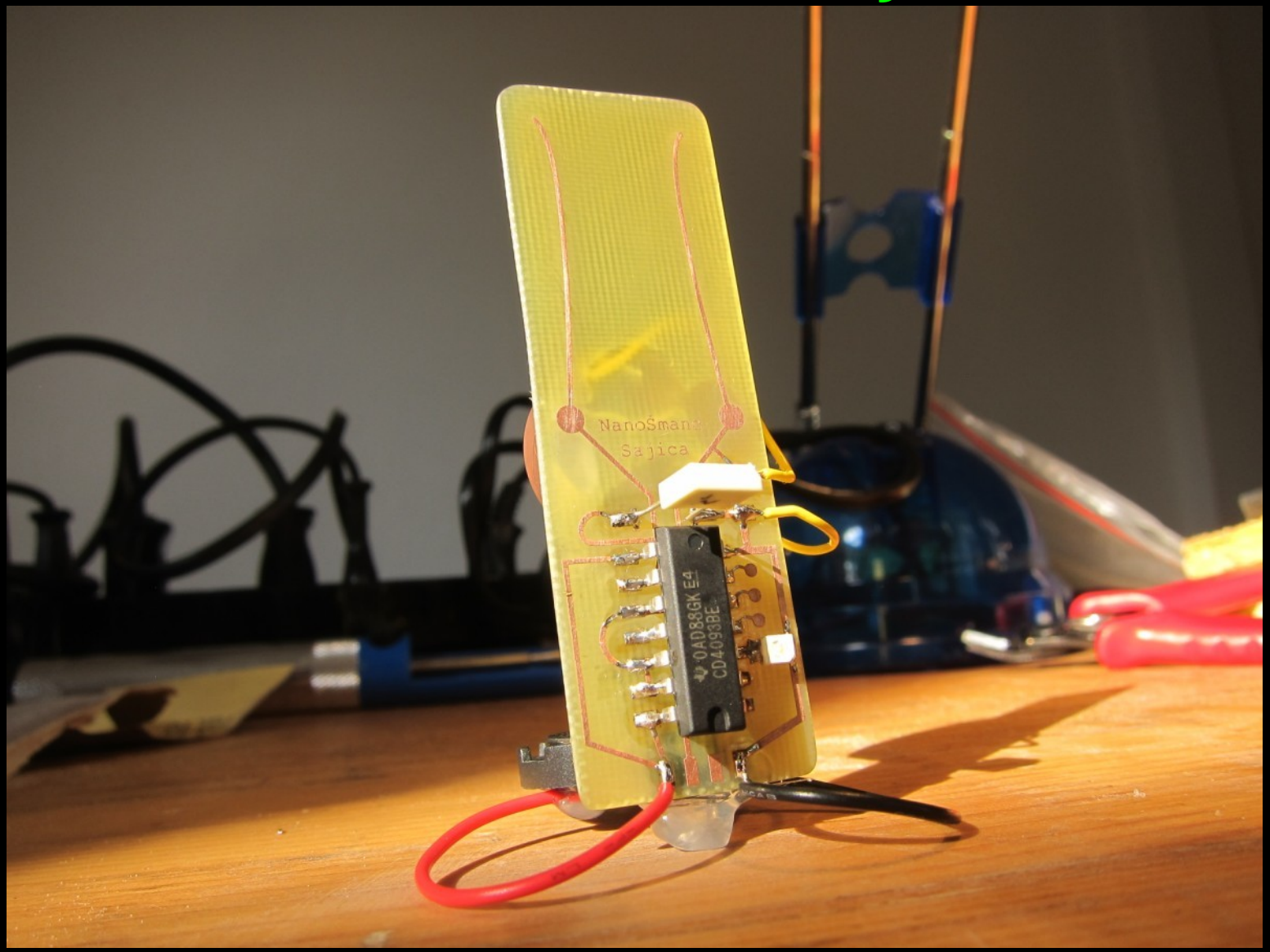


Extracellular biosynthesis of silver nanoparticles using the fungus Fusarium oxysporum
Absar Ahmad et al, Pune, India, Colloids and Surfaces B: Biointerfaces 28 (2003)

NanoŠmano Fungulator



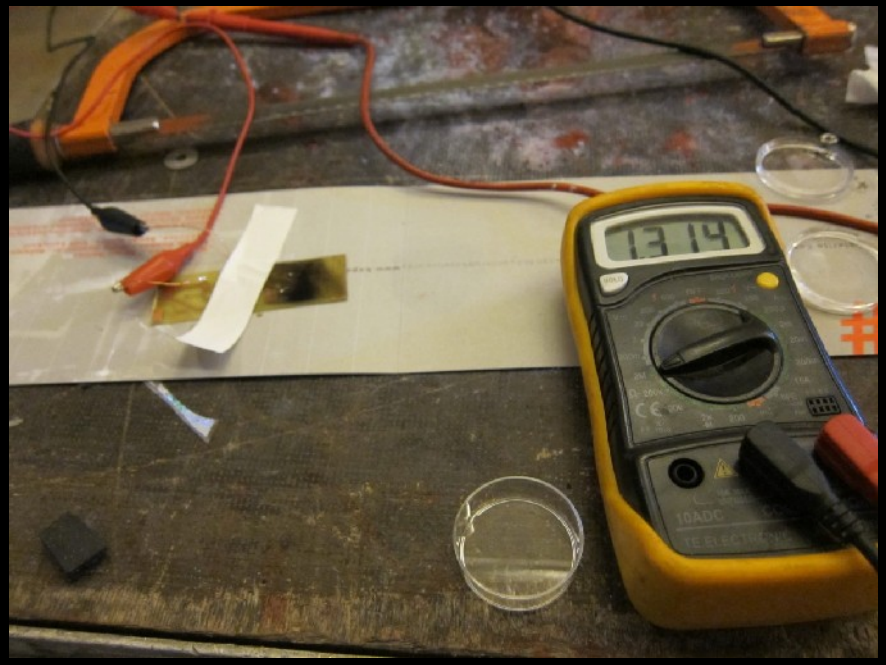
NanoŠmano Sajica

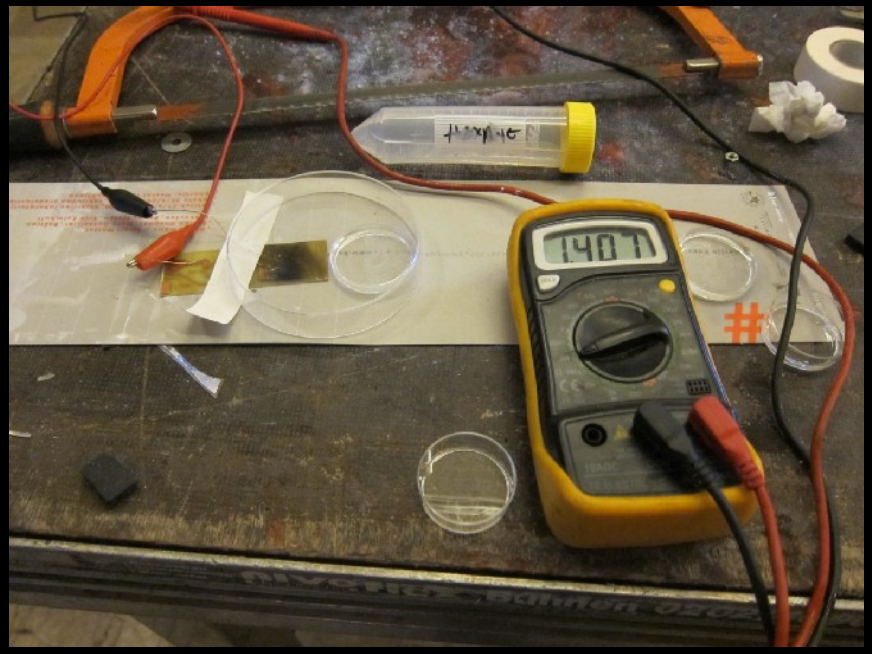


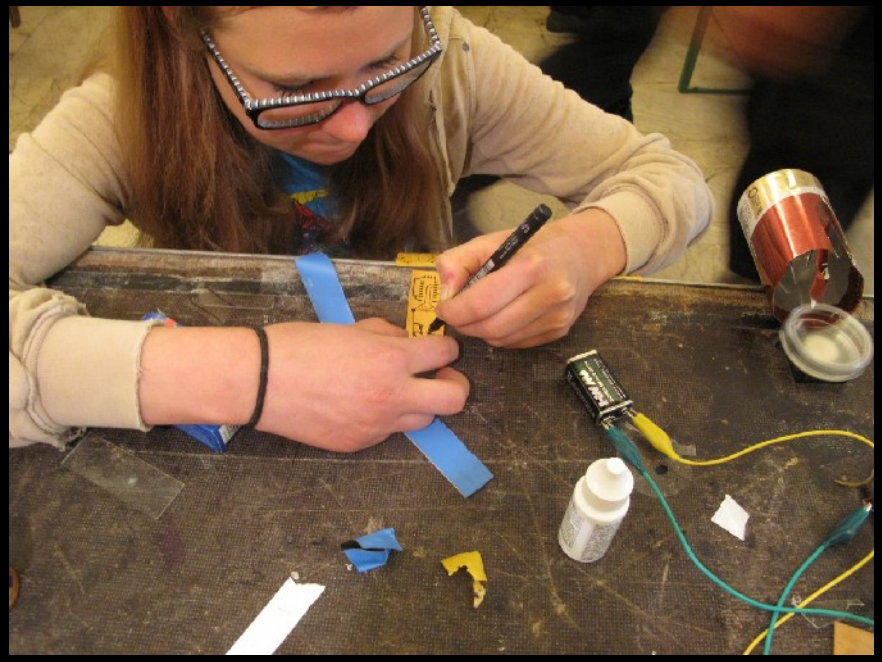
Nanošmano Vive la Resistance aka Nanošmano Sajica

Borut Savski, Marc Dusseiller, Gorazd Planinšič

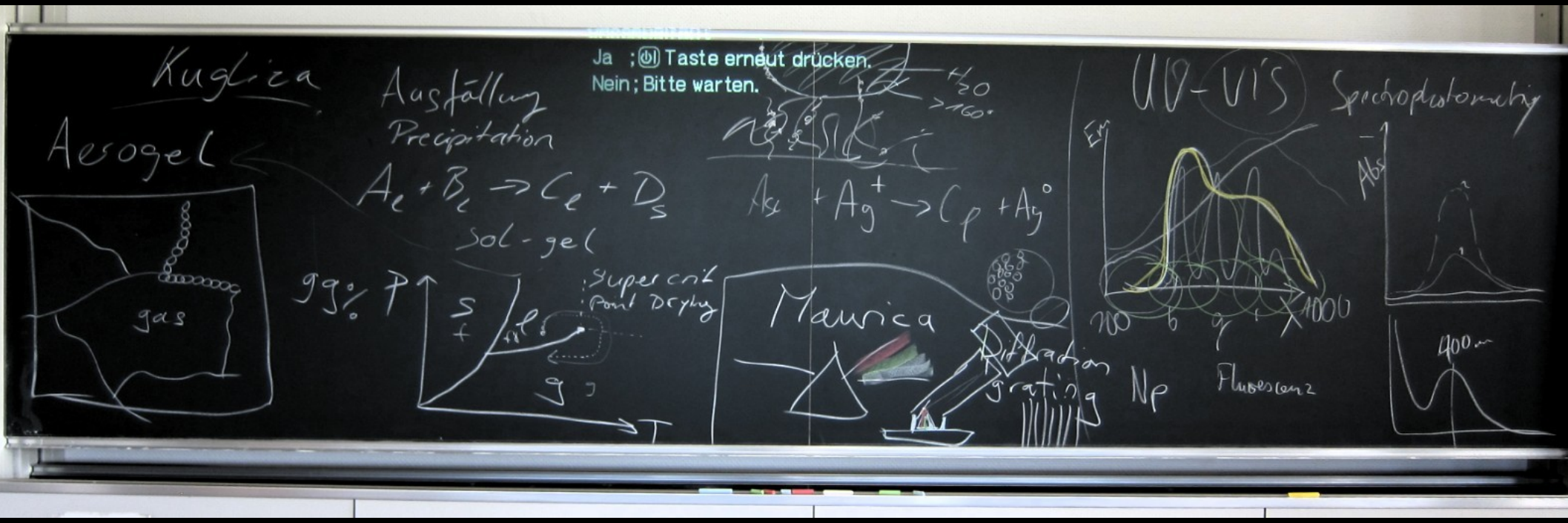
Vive-la-Resistance



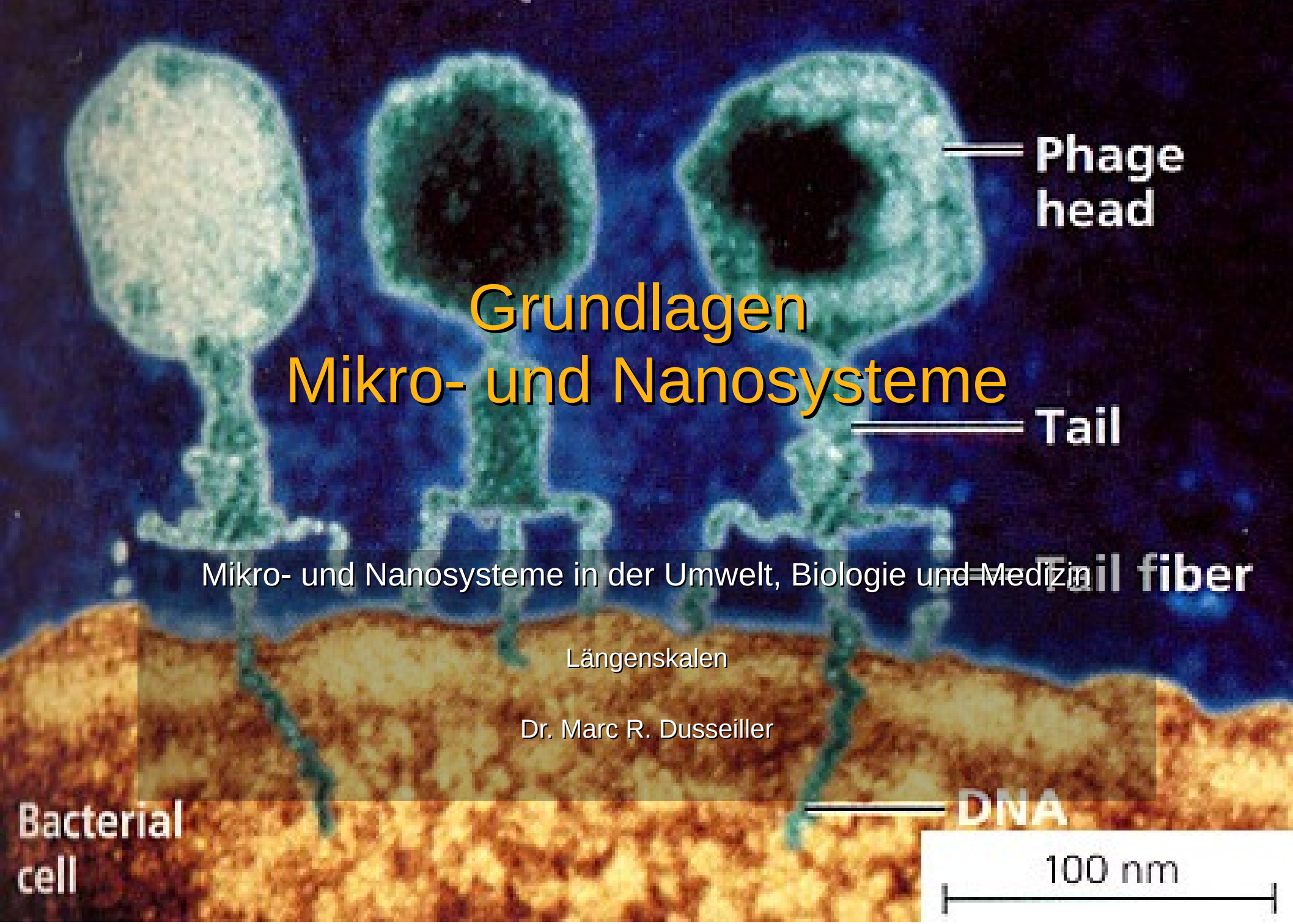




Teaching to Students



Micro- and Nanosystems for Life Scieces



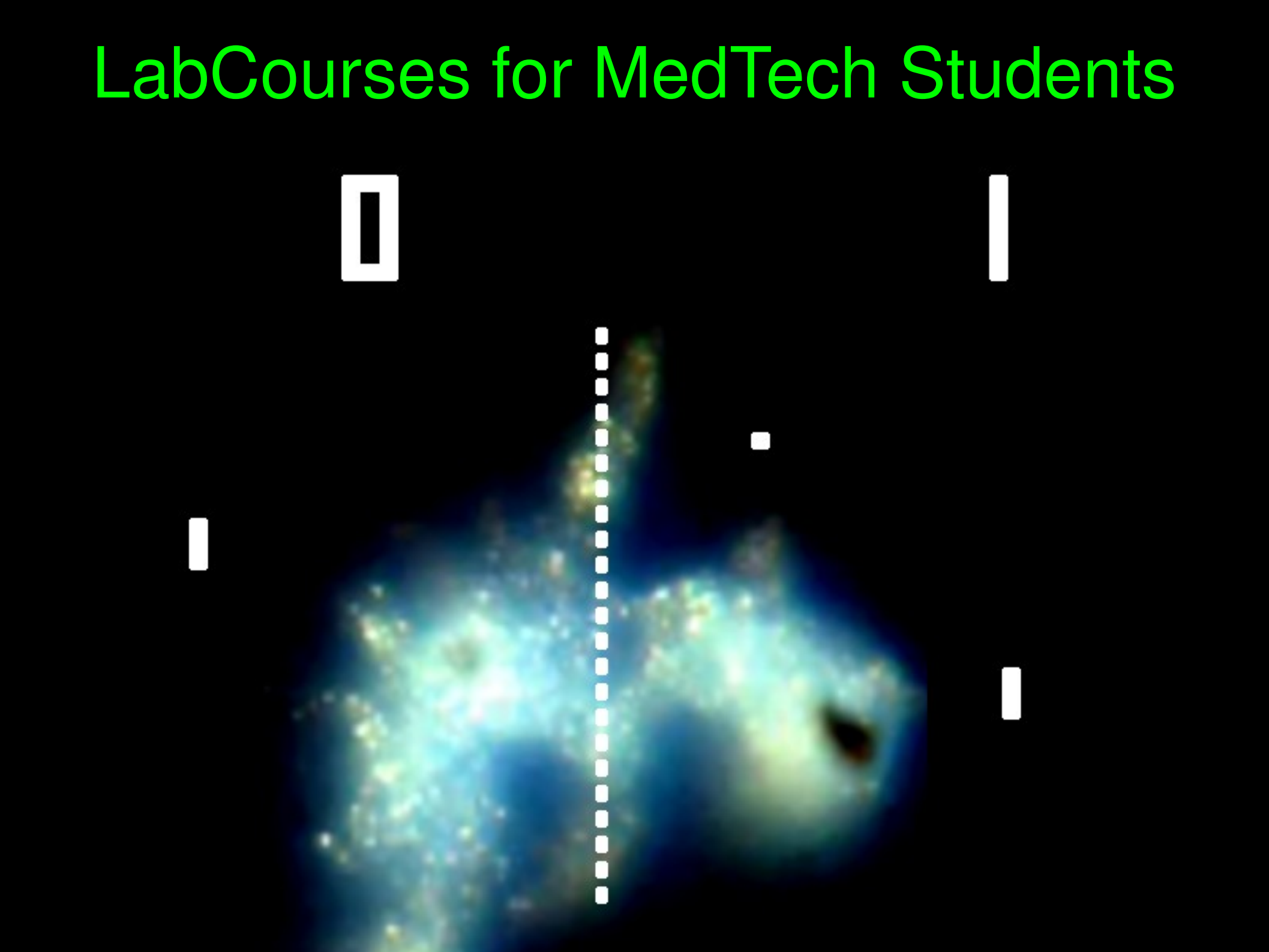
Grundlagen Mikro- und Nanosysteme

Mikro- und Nanosysteme in der Umwelt, Biologie und Medizin

Längenskalen

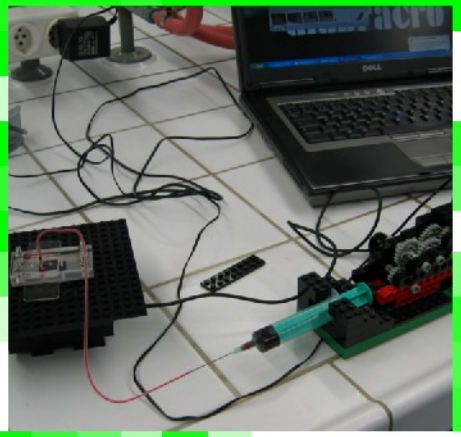
Dr. Marc R. Dusseiller

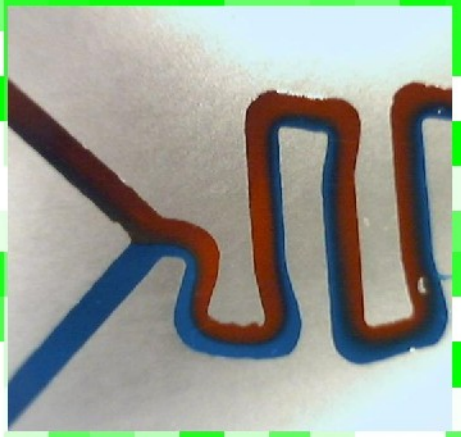
LabCourses for MedTech Students



*wet*PONG

Platform for Hybrid-Games, Micro- and Nanotechnology and Life Sciences





"Creativity is becoming more important than knowledge,
Knowledge is distributed on the Internet where anyone can find it."

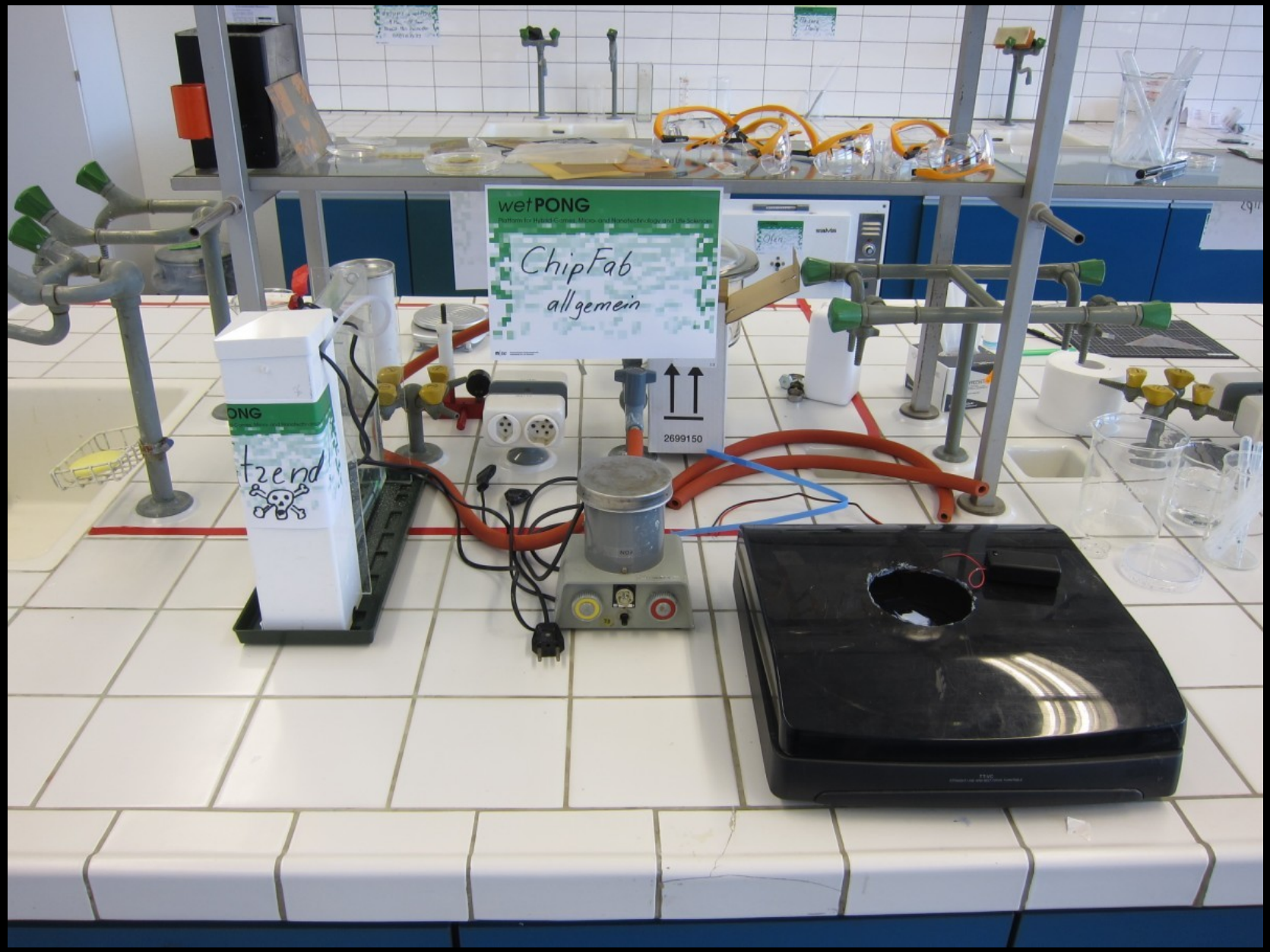
James Gimzewski, UCLA Distinguished Professor of Chemistry and Biochemistry

wetPONG is an international student competition based on a creativity approach in project based learning in microfluidics. The goal of the project is to design and build a prototype system of a playful game-concept that combines components of micro- and nanotechnology and living organisms. Interdisciplinary thinking, team collaboration and creativity are the main learning objectives. The entered projects will be presented at an international meeting and awarded by a jury of invited experts.

 http://wetpong.net

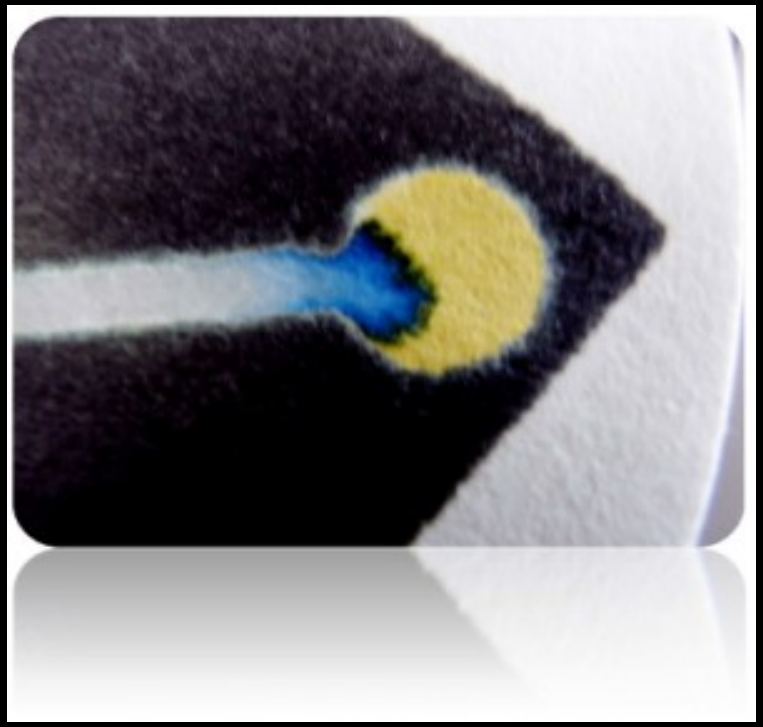
HomeMade Microfluidics

ChipFab



All Projects online on Wiki

- Projekt 1 | Paper µFluidics Diagnostics
- Projekt 2 | Worm Chips II
- Projekt 3 | FlexPrint/PhotoResist µFluidics
- Projekt 4 | Maizena Mania
- Projekt 5 | Aschenbrödel Fluidics



http://www.dusseiller.ch/mis_wiki/index.php?title=%CE%9C-wetPONG
FHNW, School for Life Sciences, Muttenz

Open Questions

- How can we teach creativity?
- How can artists/scientists profit from collaborations with each other?
- Is a transdisciplinary education crucial for innovation, especially in Nanotechnology?

Thanks for listening