

Teaching across scientific and geographical borders:

A European Master programme on Nanoscience and Nanotechnology

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Outline:



- **Why nano education?**
- **Erasmus Mundus**
- **EMM-nano**
- **Reflections**
- **Future**



Prof. Guido Groeseneken
KU Leuven/IMEC



Why nano-education?



Today's
nanoscience



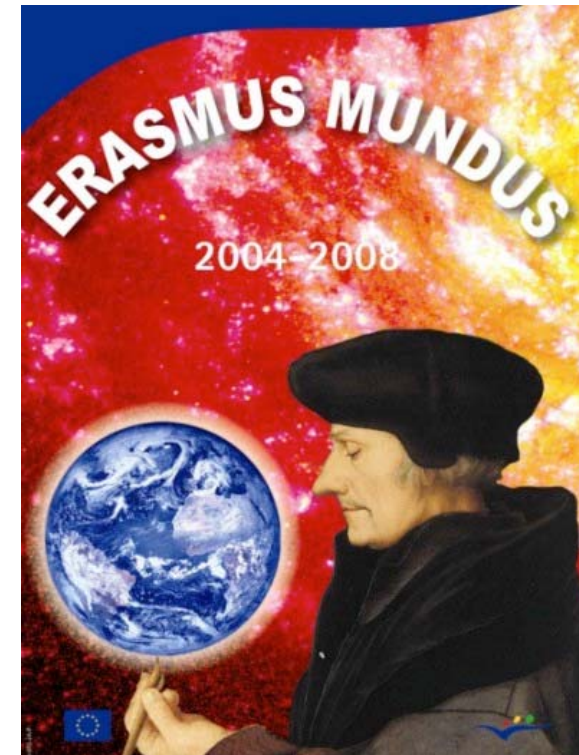
Tomorrow's
nanotechnology

- new type of engineers will be needed
- classic division into physics, chemistry, biology, medicine, etc. less relevant
- build bridges between disciplines
- maybe we need politicians, lawyers, etc, with scientific background
- ambassadors for an enabling new technology

Erasmus Mundus



The Erasmus Mundus programme is a **co-operation and mobility programme** in the field of higher education which promotes the European Union as a centre of excellence in learning around the world. It **supports European top-quality Masters Courses and enhances the visibility and attractiveness of European higher education in third countries.** It also provides **EU-funded scholarships** for third country nationals participating in these Masters Courses, as well as scholarships for EU-nationals studying at Partner universities throughout the world.



Erasmus Mundus, objectives



Erasmus Mundus **2009-2013** is a cooperation and mobility programme in the field of higher education for:

- * the enhancement of quality in European higher education;
- * the promotion of the European Union as a centre of excellence in learning around the world;
- * the promotion of intercultural understanding through cooperation with Third Countries as well as for the development of Third Countries in the field of higher education.



EMM-nano - programme



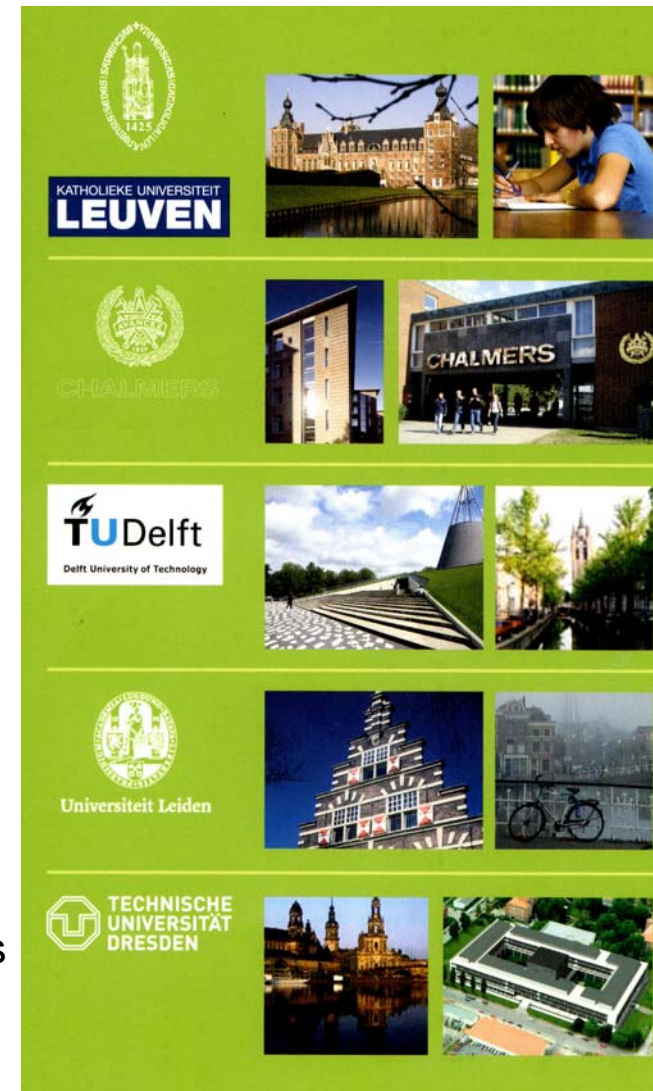
Erasmus Mundus Master Programme

“Nanoscience and Nanotechnology”
(EMM-nano)

Consortium Partners:

- Katholieke Universiteit Leuven, Belgium (Coordinator)
- Chalmers University of Technology, Göteborg, Sweden
- Delft University of Technology/Leiden University, Netherlands
- Technische Universität Dresden Germany

www.emm-nano.org



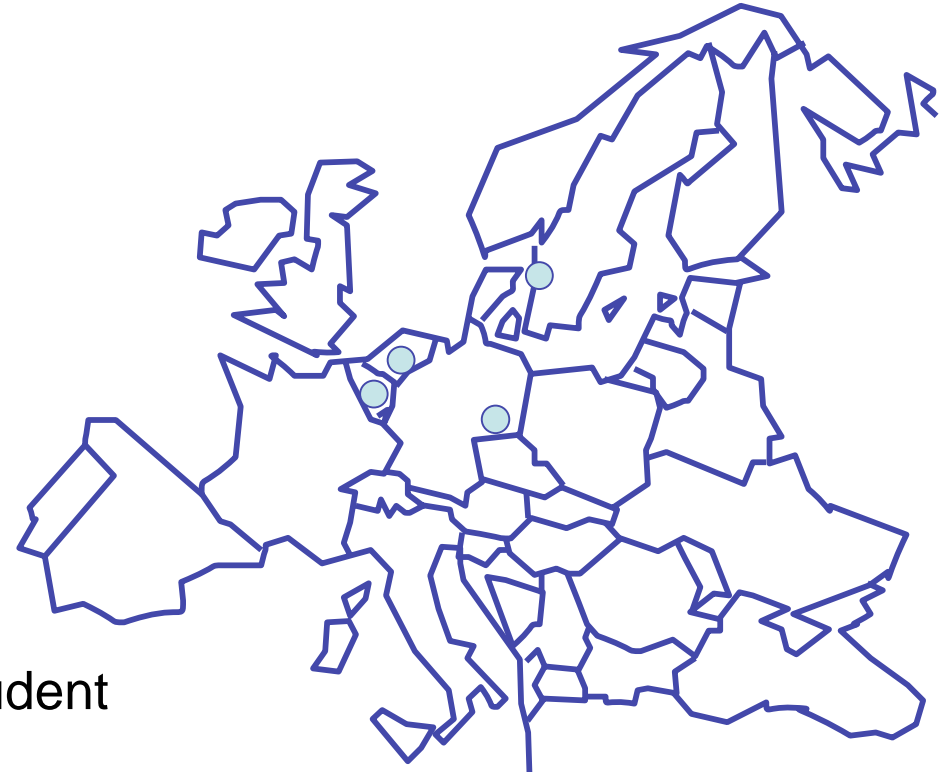
EMM-nano



Organization:

- 2 years,
- 2 locations
- 2 degrees (double degree)

The choice of “**trajectory**” gives **field of specialization** for each student



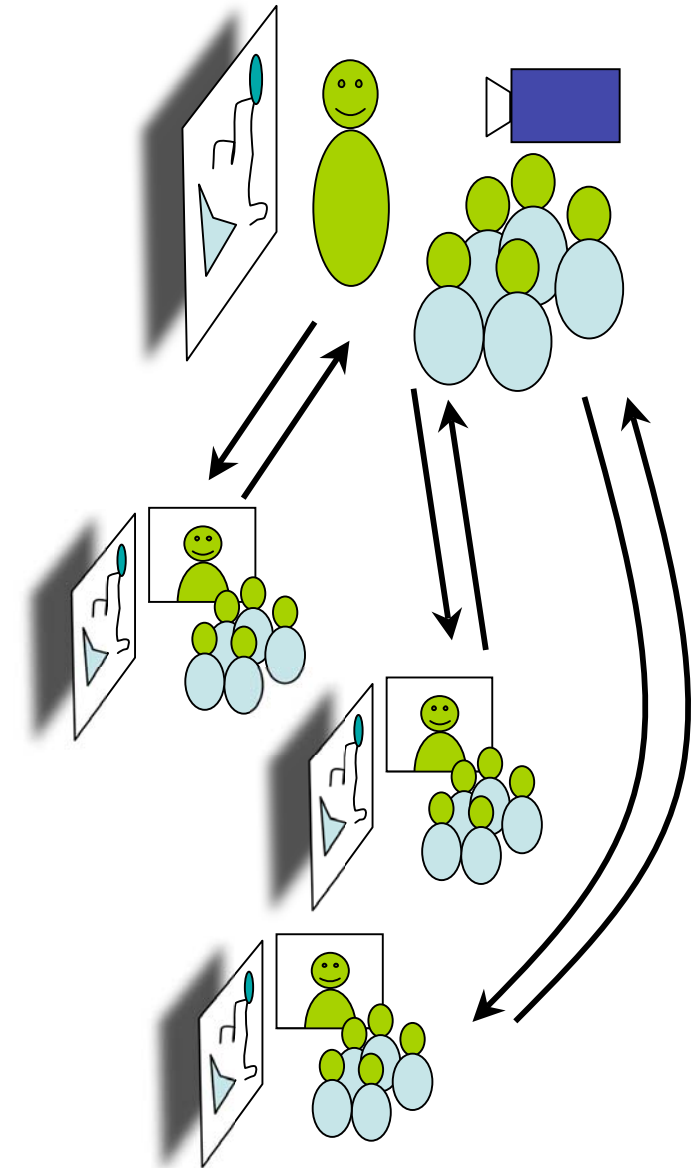
Principal theme per university	Nanotechnology	Nanoscience	Biophysics	Bionanotechnology
K.U.Leuven	Orange bar	Green bar		
Delft/Leiden		Green bar	Yellow bar	
TU Dresden			Yellow bar	Blue bar
Chalmers	Orange bar	Green bar		

- start 2005
- > 150 applications/year
- evaluation of each applicant at all partners
- selection meeting in Leuven - ranking: 1, 2, 3, ...
- ~1/3 is admitted to the program
- scholarships according to EM rules
- almost 50% continues with PhD studies



Common course:
“Erasmus Mundus Lecture Series
on Nanotechnology in Modern Society”

- **Video-broadcasted live** to all partners
- 8 lectures (2 lectures from each partner)
- Scientific presentations, visions,
legal aspects, risks with nanotechnology
- Live discussions after the lecture
- Student reports



Common course for 1st year students: “EMM-nano Spring School on Cleanroom technology”

Chalmers Nanofabrication Laboratory
(Course run by cleanroom staff)

- Safety
- Behavior
- Basic processing
- Characterization



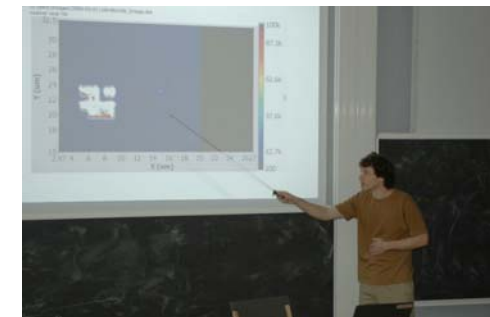
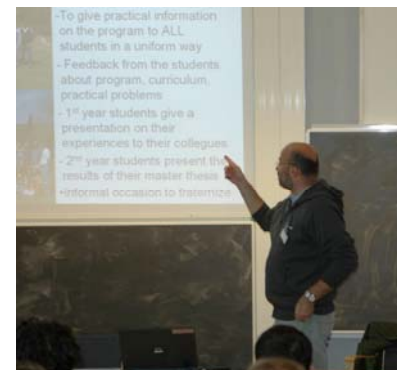
EMM-nano



EMM-May Workshop

All students plus administrators

- Integration (academic and social)
- Information, What if...?
- Mobility issues
- Presentations of MSc projects (mini-conference)



Challenges - scientific borders

- Nanoscience is extremely broad
- Physics - Biology (too little physics, too little biology...)
- Too much focus on nanoscale physics (quantum physics)?
- How to meet the needs interests from students from other disciplines than physics?
- Most applicants are from other fields than physics
- Requirements from coupling to existing programs/degrees

Challenges - geographical borders

- National/local traditions in higher education
- National/local legislation
- Grading systems, number of retakes, different academic years, master thesis, size of courses, exams, registration procedures, degree/diploma procedures, tuition fees...
- Coupling to local programs
- 60+60 ECTS, 54+66 ECTS, 66+54 ECTS.
- Joint programme but no joint degree

What is common for “all nano”?

- How do we make things on the nano-scale?
- How can we “see” things on the nano-scale?
- What happens with the physics at the nano-scale?
- Where/when are the nano-scale dimensions important?
- What can we do with it?

Design a programme that provides

**1) A broad common base of knowledge
to be able to work in nanoscience**

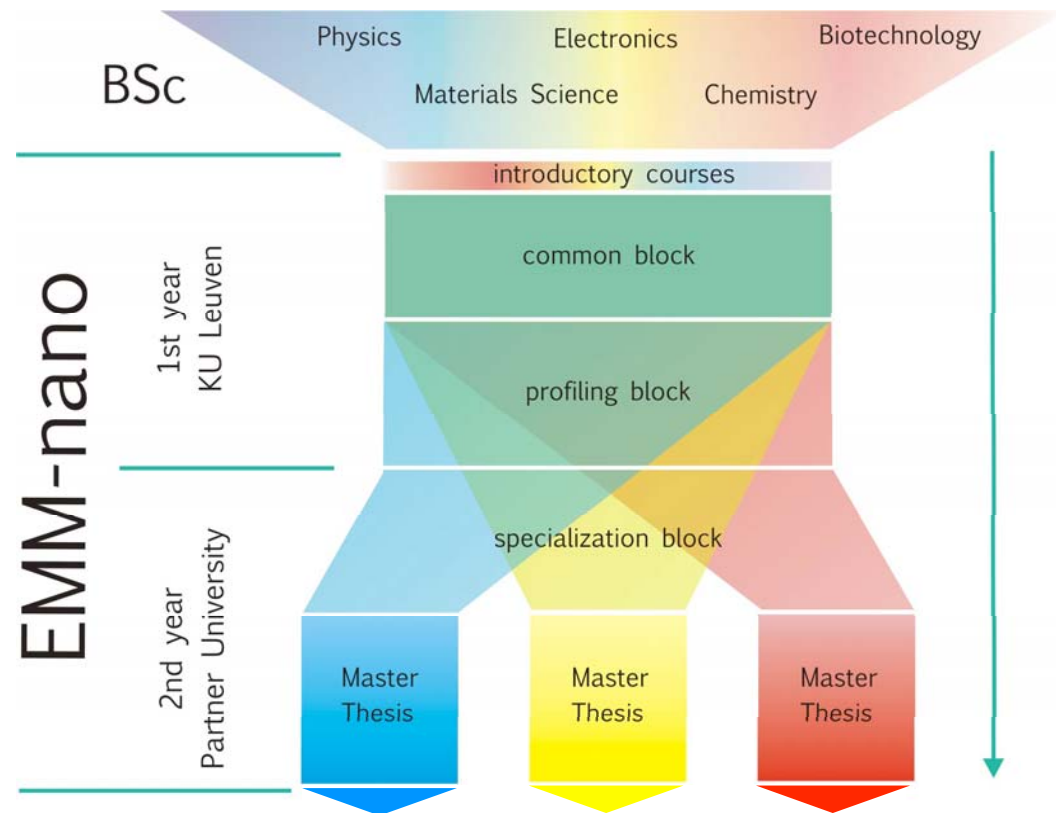
**2) A strong specialization in your field of choice
to be able to contribute to nanoscience**

New programme structure

First year in KULeuven for all students

Second year at chosen partner university for specialization and master thesis

Increased added value.



Concluding comments



EMM-nano attracts good students
(but we have to fight for them)

~20% European students
(how to encourage Europeans to study abroad?)

Scholarships
(how to attract students without scholarships?)

Administration
(admission, examination, exchange of results, ...)

Integration of European higher education
(Still a long way to go, joint degrees necessary?)