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technische universität
dortmund

Educating Tomorrow's Chemists

Eurobachelor and Euromaster

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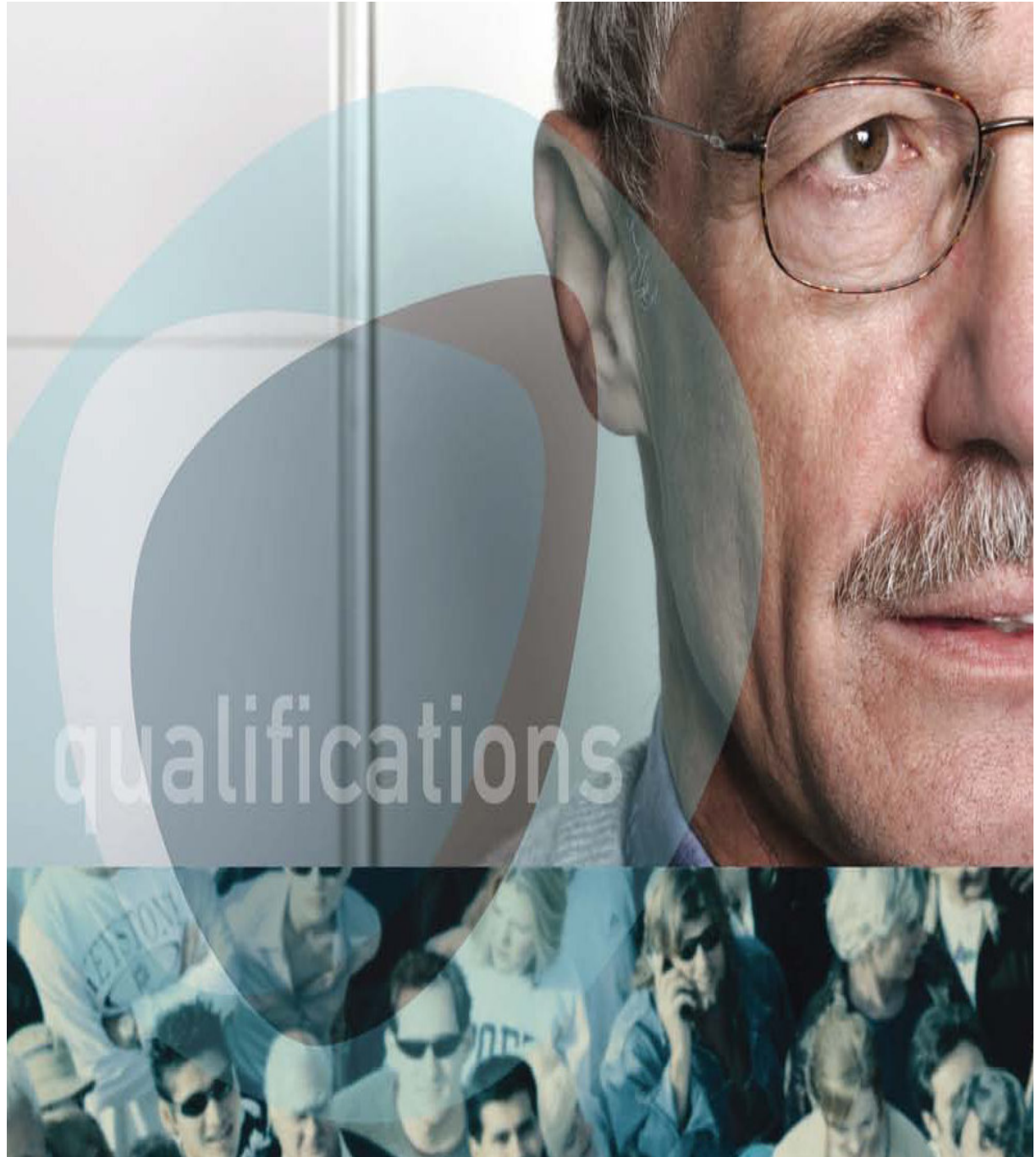
Dublin, 29th August 2008



Slide 1

M1

Mitchell, 10/01/2005



A simple framework:

- Short cycle, ca. 120 ECTS credits
- First cycle, 180/210/240 ECTS credits
- Second cycle, (60)/90/120 ECTS credits
- Third cycle, ? ECTS credits
- For each cycle: Dublin Descriptors

Where do MChem or MSci fit in
here?

Imperial College from 2009/2010:

- *Integrated Masters:*
- 4-year (academic year plus additional assessed work outside the academic terms), 270 ECTS. ***This is the standard format for integrated Masters.***
- 4-year (academic year), 240 ECTS. ***This will apply to a very small number of integrated Master programmes. Course details must explain that the course accrues only 240 ECTS and that students will need to do additional work outside the terms in order to gain the extra 30 ECTS required for a Bologna compatible Masters qualification.***
- *The '240' course is therefore Bologna transparent rather than Bologna compatible.*

How will UK institutions treat
3-year Bachelors from
continental Europe who want to
do a PhD?

Back to the so-called Dublin Descriptors: these were formulated in Dublin by an unofficial group, which calls itself the *Joint Quality Initiative*.

(www.jointquality.org).

The group consists mainly of representatives of ministries and QA bodies (e.g. the QAA).

The background of the slide is a classic marbled paper pattern, often used in bookbinding. It features a complex, organic design of swirling, interlocking shapes in shades of light beige, cream, and pale grey, creating a textured, stone-like appearance.

The Dublin Descriptor for the Third, Doctoral Cycle

Qualifications that signify completion of **the third cycle** are awarded to students who:

- have demonstrated a systematic understanding of a field of study and mastery of the skills and methods of **research** associated with that field;
- have demonstrated the ability to conceive, design, implement and adapt a substantial process of **research** with scholarly integrity;
- have made a contribution through original **research** that extends the frontier of knowledge by developing a substantial body of work, some of which merits national or international refereed publication;
- are capable of critical analysis, evaluation and synthesis of new and complex ideas;
- can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;
- can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society.

How about some descriptors for chemistry?

- The so-called „Budapest Descriptors“ were formulated by the Tuning Chemistry Group (consisting of members of the European Chemistry Thematic Network ECTN) in 2004.

The First Cycle

Bachelor Descriptor (1)

- First cycle degrees in chemistry are awarded to students who have shown themselves by appropriate assessment to:
- have knowledge and experience in the core areas of chemistry: inorganic, organic, physical, biological and analytical chemistry; and in addition the necessary background in mathematics and physics
- have basic knowledge in several other more specialised areas of chemistry (such as computational chemistry, materials chemistry, macromolecular chemistry, radiochemistry)

Biological chemistry?

- Or should we say chemical biology?
- Or even biochemistry?
- It really makes no difference, as long as we do not just stick to the traditional division into organic, inorganic and physical.
- Lund University 2007: 26 master theses, 21 in biochemistry or analytical chemistry!

The graduates:

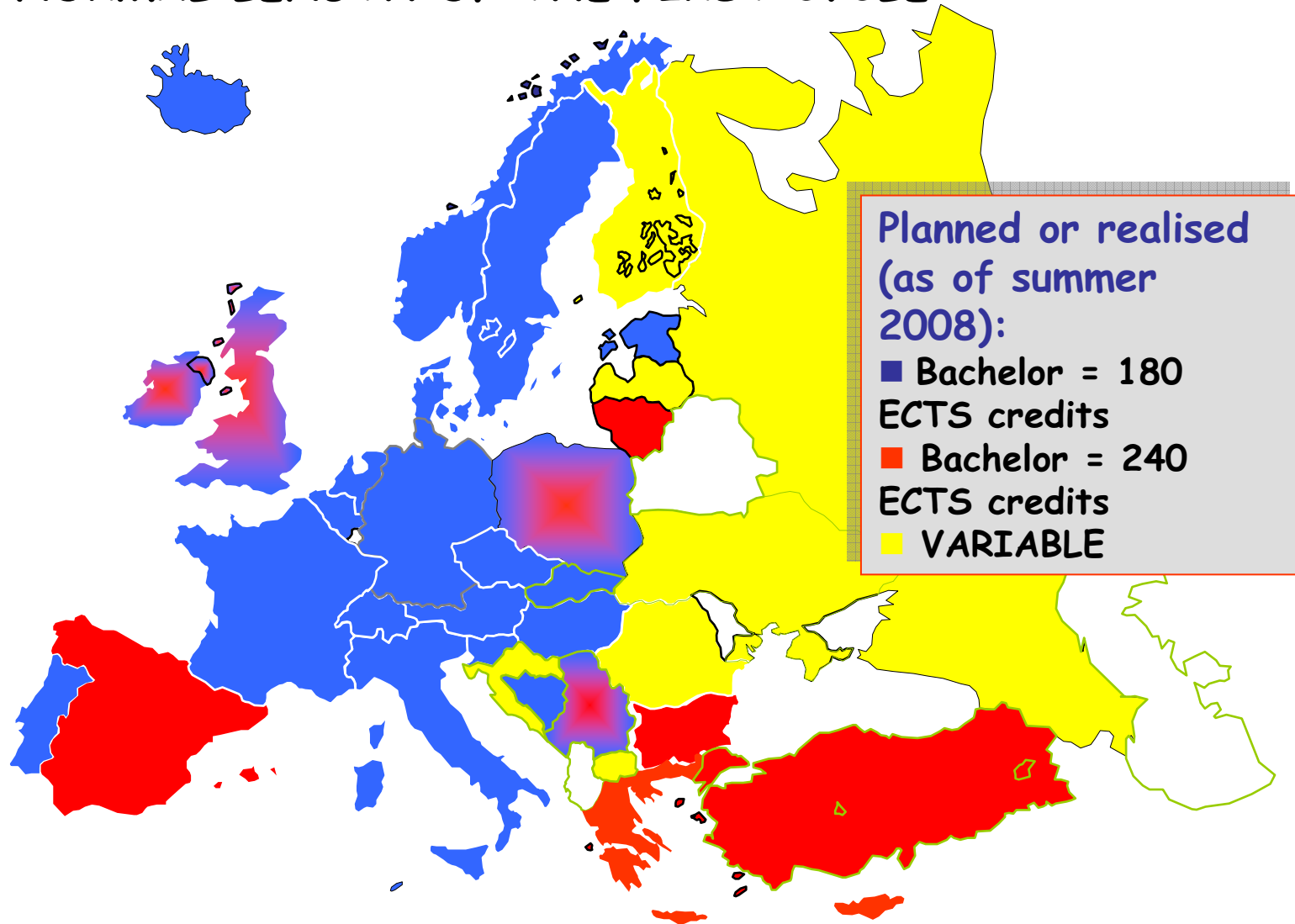
- have built up **practical skills in chemistry** during laboratory courses, at least in inorganic, organic and physical chemistry, in which they have worked individually or in groups as appropriate to the area;
- have developed **generic skills in the context of chemistry** which are applicable in many other contexts;
- have attained a standard of knowledge and competence which will give them **access to second cycle course units or degree programmes**.

Bachelor Descriptor (2)

- **Such graduates will:**
- be able to **apply standard methodology** to the **solution of familiar problems;**
- be able to **work safely in the laboratory** and carry out their own risk assessments;
- be able to **understand and explain the limits of accuracy** in their own experimental data;
- have the ability to **gather and interpret relevant scientific data** and make **judgements** that include reflection on **relevant scientific and ethical issues;**

- have successfully completed a research project, although the outcome may not necessarily be of publishable quality;
- have the ability to communicate information, ideas, problems and solutions to informed audiences;
- have competences which fit them for entry-level graduate employment in the general workplace, including the chemical industry;
- have developed those learning skills that are necessary for them to undertake further study with a sufficient degree of autonomy.

NORMAL LENGTH OF THE FIRST CYCLE



The Second Cycle

Master Descriptor (1)

- Second cycle degrees in chemistry are awarded to students who have shown themselves by appropriate assessment to:
- have knowledge and understanding that is founded upon and extends that of the Bachelor's level in chemistry, and that provides a basis for originality in developing and applying ideas within a research context;
- have competences which fit them for employment as professional chemists in chemical and related industries or in public service;
- have attained a standard of knowledge and competence which will give them access to third cycle course units or degree programmes.

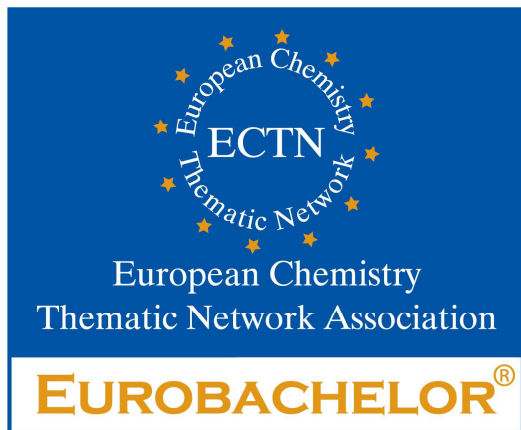
Master Descriptor (2)

Such graduates will:

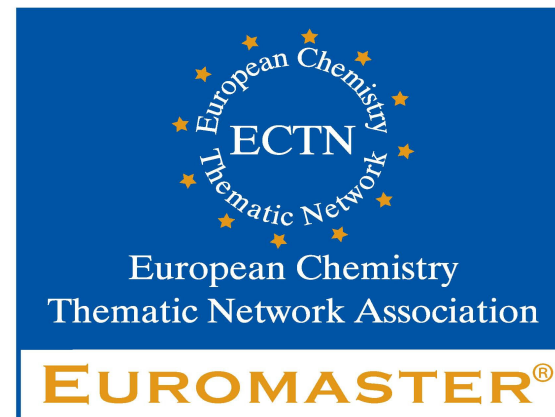
- have the ability to apply their knowledge and understanding, and problem solving abilities, in new or unfamiliar environments within broader (or multidisciplinary) contexts related to chemical sciences;
- have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, and to reflect on ethical responsibilities linked to the application of their knowledge and judgements;
- have the ability to communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;
- have developed those learning skills that will allow them to continue to study in a manner that may be largely self-directed or autonomous, and to take responsibility for their own professional development.

These are the learning outcomes
of programmes.

Suggestions for their realisation
have also been made:



and



„European Quality Labels“

- supported by the EU Commission under SOCRATES
- Eurobachelor[®] Pilot project 2004-2006
- 30 labels, 20 universities, 11 countries
- Euromaster[®] Pilot project 2006-2008
- 20 applications from 12 countries
- including 3 joint programmes

Euromaster Consortia

- ***European Master in Theoretical Chemistry and Computational Modelling (Madrid)***
- ***Measurement Science in Chemistry (Tartu)***
- ***Advanced Spectroscopy in Chemistry (Lille)***

Why a Eurobachelor[®]?

- **Excerpts from the Bologna Declaration of 1999:**
- "Adoption of a system of easily readable and comparable degrees...."
- "Promotion of mobility...."
- "...first cycle studies, lasting a minimum of three years..."
- "...first cycle ... relevant to the European labour market..."
- "Promotion of ... European dimensions in higher education, particularly with regard to curricular development..."



- The Eurobachelor is not about a defined curriculum!
- It has basic points:
- Bachelor Thesis at least 15 credits
- At least 90 credits compulsory „core chemistry“
- At least 150 credits chemistry, physics, maths, biology (including Thesis)
- At least 15 credits semi-optional „specialisation“
- At least 30 credits are „open“!



- The Eurobachelor is about **quality**: defining reference points on an international basis.
- The Eurobachelor is about **autonomy**: not a straitjacket but a framework to be applied as the institution wishes.
- The Eurobachelor is about **flexibility**: it can readily be adapted as the needs of the subject change.
- The Eurobachelor is about **transparency**: together with the Diploma Supplement it is an easily understood qualification.
- The Eurobachelor is based on ECTS and its **correct** application.



- The Eurobachelor is about **mobility**: it makes it possible for the graduate to move easily within Europe, but also almost certainly throughout the world.
- The Eurobachelor is about **recognition**: even if the Lisbon convention is in force, institutions need to apply it.



The Chemistry Eurobachelor - A framework for a European first-cycle degree in chemistry

Outcomes

Define which competences a programme seeks to develop, or what its graduates should be able to **know**, to **understand**, and to **do**

Chemistry Eurobachelor[®] - defined as a programme of 180 credits based on outcomes, but also applicable to institutions using 240 credits.



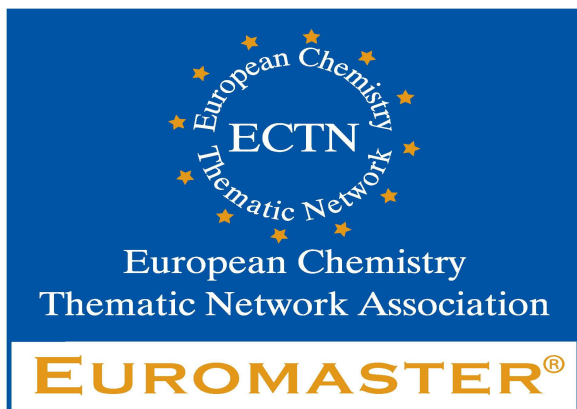
Generic Skills: the Key to Employability of the Bachelor!

- The capacity to **apply knowledge in practice**, in particular **problem-solving** competences, relating to both qualitative and quantitative information
- **Numeracy and calculation skills**, including such aspects as error analysis, order-of-magnitude estimations, and correct use of units.
- **Information-management competences**, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.
- Ability to **analyse material** and **synthesise concepts**.
- The capacity to **adapt to new situations** and to **make decisions**.

- **Interpersonal skills**, relating to the ability to interact with other people and to engage in team-working.
- **Ethical commitment**
- **Communication competences**, covering both written and oral communication, in one of the major European languages (English, German, Italian, French, Spanish) as well as in the language of instruction.
- **Study competences** needed for continuing professional development. These will include in particular the **ability to work autonomously**.

We may pay lip service to
competence-based learning,
but do we really assess
competences?

Including the generic
competences?





- The Euromaster (normally 90-120 credits) has no compulsory „core“
- The Thesis should normally carry at least 30 credits
- Courses are judged on „fitness for purpose“ with respect to the Descriptor
- An example of one relevant point, language:



Language

At Euromaster level, where the research component forms a main component of the programme, language proficiency must be developed further and *must* include *communication competences* in a second language (which for chemists will logically be English).

Partners

- Royal Society of Chemistry, UK/Ireland
- ASIIN, Germany
- Società Chimica Italiana
- Polish Accreditation Council UKA

RSC | Advancing the
Chemical Sciences




Società Chimica Italiana



**ECTN has also published
detailed recommendations on
the third cycle.**

for information see:

www.eurobachelor.eu

Finally some remarks on Bologna from the US:

- Clifford Adelman
- Senior Associate
- Institute for Higher Education Policy (IHEP)
- Inside Higher Ed audio conference
- February 26, 2008

Why do we need to pay attention, Part I?

- A lot of Bologna is about accountability and quality assurance.
- Our European colleagues have struggled to bring the components of a more transparent system of higher education into being. They are addressing our problems, too.
- We can learn from their efforts. If we bother to look beyond our borders, we will get ideas. We may not do things exactly the same way, but we should at least learn how to sing in the same key.

So why do we need to pay attention, Part II?

- ECTS (which actually started in 1989) as a major component of the Bologna Process, is a model of borderless transfer.
- The two-cycle degree structure offers clear steps in the completion of undergraduate study .
- Qualification frameworks are the clearest public statement of what we guarantee to students, the economy, and the society.
- The transparency of these components has already drawn imitative processes in Latin America (Tuning), the North Africans are moving to the 3+2 cycles, the Australians have introduced Diploma Supplements, and other former colonial countries in Africa and Asia will not be far behind.

Prediction. . .

- **By 2030, what started as European will be global, providing transfer without borders.**
- **The US will either join or be left behind.**
- **It is a challenge unlike any other issued to our system of higher education, and we've been soundly asleep to date.**
- **We had better get started---and in more positive ways than simply rejecting degree equivalencies!**

Does this last point apply to the
UK and Ireland too?

I hope not.