



EMS Applied Mathematics Committee

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EMS Applied Mathematics Committee

EMS Schools in Applied Mathematics:

- ❖ - Bedlewo (EMS Contact person: Helmut Neunzert): *“Industrial Mathematics”* October 11-18
- ❖ - CIME (EMS Contact person: Maria Esteban): *“Topics in mathematical fluid dynamics”* September 6-11 in Cetraro, Italy.
- ❖ - EMS School in Biomathematics in collaboration with ESMTB (EMS Contact person: Mats Gyllenberg): *“Mathematical Ecology and Evolution”* August 22-29 in Turku (Finland).



EMS Applied Mathematics Committee

- ❖ - Organization of events in the framework of European Science Open Forum ESOF (Barcelona 2008, Torino 2010)
- ❖ - Participation in organization of the Conference Maths in Industry, Sofia.
- ❖ - Cooperation in the preparation of the MATHEI Research Infrastructures project
- ❖ - Presence in major international events (Berlin: forum of the European science funding organizations; Rome: meeting of the math. Representatives in the ESF; etc.).
- ❖ - Website of the Committee
<http://www.ceremade.dauphine.fr/EMS-frames>



Forward Look on “Mathematics and Industry”

Scientific Organizing Committee:

- **Mario Primicerio** - Firenze
- **Maria J. Esteban** - Paris
- **Magnus Fontes** - Lund
- **Yvon Maday** - Paris
- **Volker Mehrmann** - Berlin
- **Gonçalo Quadros** - Coimbra
- **Wil Schilders** - Eindhoven
- **Andreas Schuppert** - Leverkusen
- **Heather Tewkesbury** - London



Forward Look on “Mathematics and Industry”

The three working groups:

WG 1 - Training and Careers

Chair: Magnus Fontes

WG 2 - Academia – Industry interface

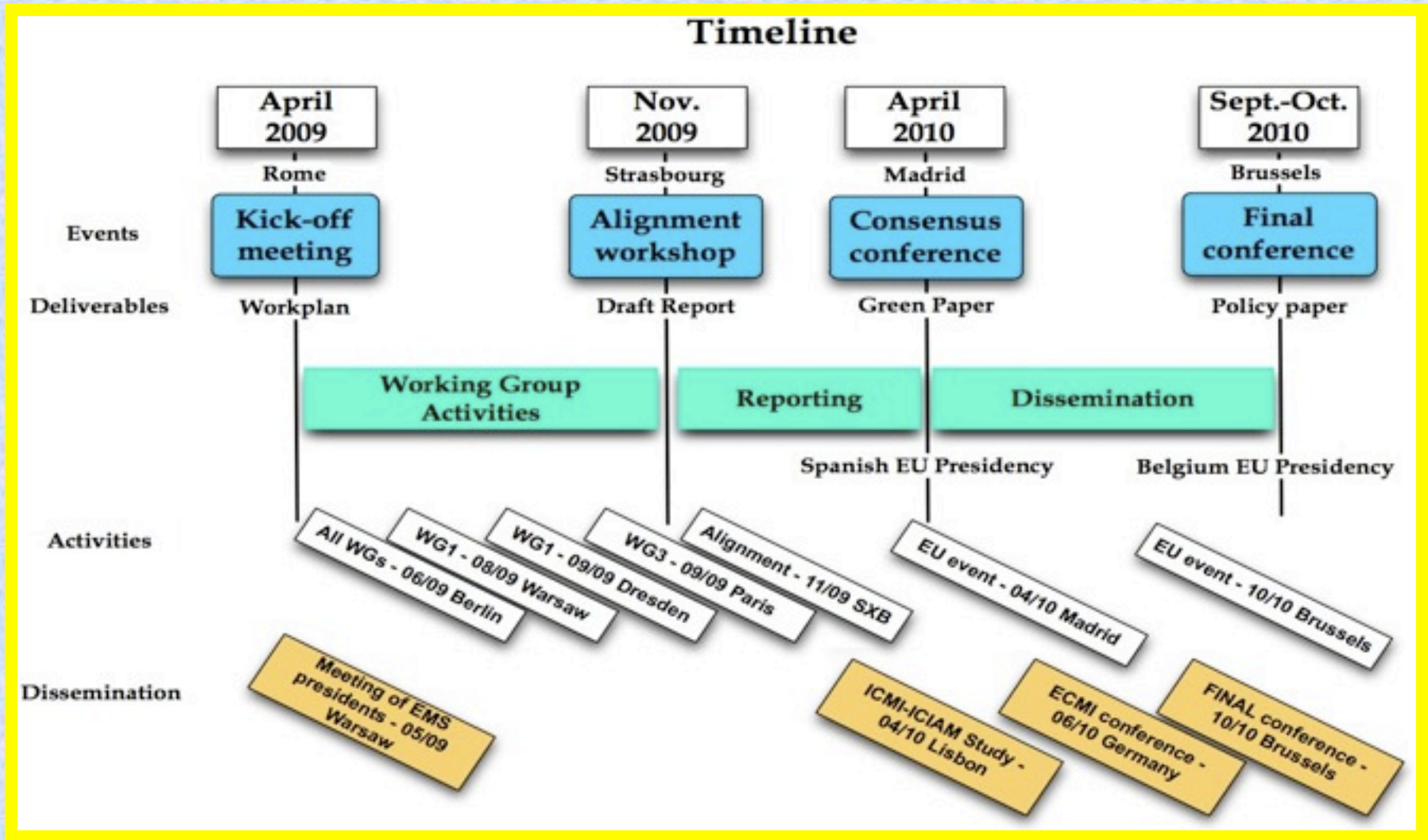
Chair: Volker Mehrmann

WG 3 - Challenges and opportunities

Chair: Yvon Maday



Forward Look on “Mathematics and Industry”



“...development and progress of mathematics have always been driven both by internal forces (to cross the boundary) and by external forces (the need of solving problems arising outside the discipline).

In the sequel we will often use, for sake of brevity, the term “industrial mathematics” to designate all the research that is oriented at the solution of problems posed by industrial applications.

It cannot be considered as a field disjoint from the counterpart of a so-called “pure mathematics”, since on one hand it uses potentially all fields of mathematics and, on the other hand, it is a continuous source of challenges to the fundamental research on structure and methods of mathematics because it has often to deal with completely new mathematical problems”



Forward Look on “Mathematics and Industry”

Background:

- Europe aims at promoting a *knowledge-based economy*. Indeed, the challenge posed to European industry by nowadays' global competition is as simple as dramatic: *Innovate or perish!*
- Mathematics provides a universal framework and language for *innovation*; mathematicians are natural candidates to coordinate *multidisciplinary* teams aiming at modelling, controlling, optimizing industrial processes. Mathematics is a necessary instrument for innovation, and thus for achieving significant competitive advantages: *mathematics truly gives industry the edge.*
- The interaction between mathematics and industry in Europe is *far from optimal*. Fragmentation is another characteristic. On the other hand the complexity of the situation is such that a strong inter-connected community and a *vision* for Europe are more than ever needed.



Forward Look on “Mathematics and Industry”

Purpose and objectives:

- Explore ways of **stimulating** and/or **intensifying** the collaboration between Mathematics and Industry.
- Identify common issues, questions, and “good practices” between Mathematics and Industry in order to envisage **strategies** for a stronger **interaction** of mathematicians with large companies and SME aimed at technological advancement.
- Indicate **strategic objectives** and formulate **recommendations** addressed to Academia, Industry, Governments and European Institutions, National and international Funding Agencies.



Forward Look on “Mathematics and Industry”

Added values of this Forward Look:

The existence of **several studies** and reports on the same topics (that were the starting point for our Forward Look exercise).

Its **dimension** at European scale and its **right timing** in the framework of the EU “Lisbon strategy”.

The involvement of the European mathematical community, through the **EMS** (and its Applied Mathematics Committee), the national math. societies, and through an **online survey**

The **inclusiveness** through the involvement of mathematicians working in R&D departments of industries, and in research-intensive and consulting companies.



Forward Look on “Mathematics and Industry”

Recommendation 1:

**Policy makers and funding organisations
should unite their efforts and fund**



Forward Look on “Mathematics and Industry”

Recommendation #1: roadmap implementation

- ❖ EU and National funding agencies should coordinate *clusters of excellence* in industrial mathematics and create a *European Institute for Mathematics and Innovation* (EIMI) for mathematicians and users of mathematics.
- ❖ EU and European governments should set up a Strategy Taskforce for Innovation and Mathematics (STIM) in order to develop a European strategy for mathematics.
- ❖ EU must identify industrial and applied mathematics as an independent cross-cutting priority for the Framework Programme 8.
- ❖ Policy makers should put in place a Small Business Act in Mathematics (SBAM) to encourage spin-off companies explicitly using mathematics.



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Recommendation 2:

In order to overcome geographical and scientific fragmentation, academic



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Recommendation #2: roadmap implementation

- ❖ Researchers in academia and industry must adapt their mentalities to the different mathematical and scientific domains they interact with, and disseminate best practises.
- ❖ The mathematical community in collaboration with industry should create a journal and devoted to industrial mathematics, and contribute to a European Digital Mathematics Library.
- ❖ Academic institutions and industry must facilitate the employment mobility between academic institutions and companies.



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Recommendation 3:

Mathematical Societies and academic institutions must harmonise the **curriculum**



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Recommendation #3: roadmap implementation

- ❖ Academia must create a European Curriculum for industrial mathematics and set up a pool of industrial mathematics engineers.
- ❖ Academia must develop new criteria to assess and recognise careers in industrial mathematics.



Forward Look on “Mathematics and Industry”

- ❖ **WHITE PAPER**
- ❖ **On-line SURVEY** open to academia and companies
- ❖ **Collection of EXTENDED ABSTRACTS** of previous documents.
- ❖ **Publication of a booklet** collecting over 100 **SUCCESS STORIES** of collaboration

Consensus Conference (Madrid April 2010) an OFFICIAL EVENT of the Spanish Presidency of EU

Final Conference (Brussels December 2010) an OFFICIAL EVENT of the Belgian Presidency of EU with the participation of the EU Commissioner for Industry

- To access the questionnaire, please go the website <http://esf.icm.edu.pl/?hid=71adc6c3b064161bdbfa63b3da767011>
username: questionnaire (WITH ONE N !)
password: questionnaire (WITH ONE N !)
- To send comments/criticism/suggestions to the Final Report, please download it from the website
<http://www.ceremade.dauphine.fr/FLMI/FLMI-frames-index.html>
- Contribute a **SUCCESS STORY** of