

Knowledge-based Estonia



The **CENS-CMA** Project

EU FP6 MARIE CURIE ACTIONS
Marie Curie Host Fellowship
for the Transfer of Knowledge (ToK)
Development Host Scheme
Contract MTKD-CT-2004-013909

Duration 48 months: May 1, 2005 – April 30, 2009



CENS-CMA

Cooperation of
Estonian and
Norwegian
Scientific
Centres within
Mathematics and its
Applications



CENS

Centre for Nonlinear Studies

<http://cens.ioc.ee/cens>

- established in 1999
- incorporates groups at:
 - Institute of Cybernetics
at Tallinn University of Technology (TUT)
 - Tartu University
 - Marine Systems Institute at TUT
 - Biomedical Engineering Centre at TUT
- leader: Jüri Engelbrecht



CMA

Centre of Mathematics for Applications

<http://www.cma.uio.no>

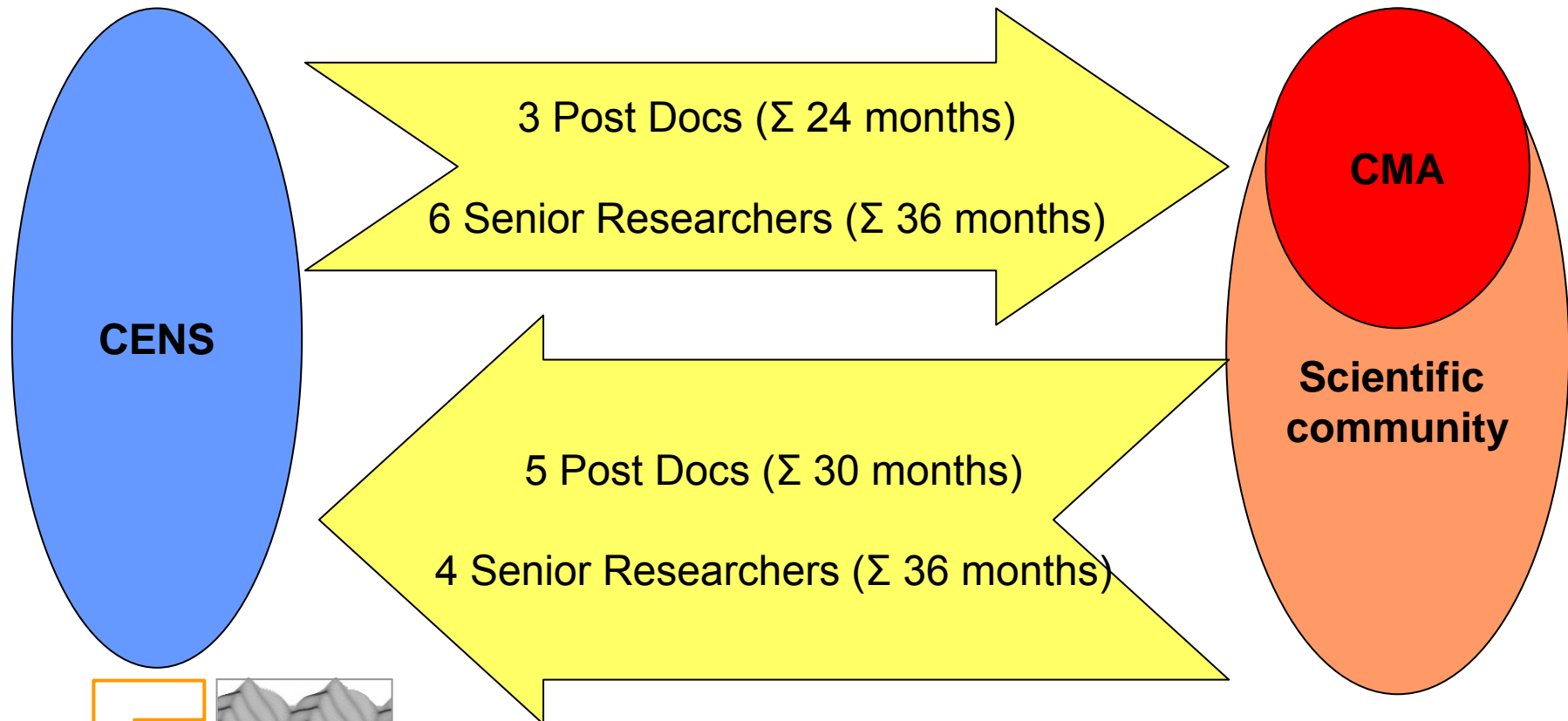
- one of the first 13 Norwegian Centres of Excellence (2003 – 2013)
- located at the University of Oslo
- leader: Ragnar Winther
- industrial relations through the partner:

Department of Applied Mathematics of the
SINTEF Institute of Information and Communication Technology



The **CENS-CMA** project

Total budget **€853 333** to finance:



Project budget (approximate)

- Salaries and stipends: 565 000 €
- Training expenses: 190 000 €
such as conference travel, equipment, organization of summer schools, field experiments, ...
- Management: 25 000 €
- Overhead: 75 000 €



A short project history

- December 2003 Xmas party at the Estonian Embassy in Oslo
- March 2004 first joint seminar in Tallinn
- May 2004 joint ToK project application
- September 2004 project accepted for negotiations by the EC
- October 2004 information seminar in Brussels
- November 2004 successful project negotiations
- February 2005 draft contract ready
- March 1, 2005 contract signed by **CENS**
- April 8, 2005 contract signed by the EC
- May 1, 2005 official project start
- May 24-25, 2005 project launch seminar in Oslo



The Most Important Project Deliverables

Originally: **126 researcher months**

(Post Doc + Senior Researcher)

66 (30 + 36) **incoming**

60 (24 + 36) **outgoing**

Finally: **130.5 researcher months**

84.5 (48 + 36.5) **incoming**

46 (10 + 36) **outgoing**



Incoming fellows CENS

Senior Researchers (> 10 years experience)

Total planned: 36 months

Total realized: 36.5 months

- Ewald Quak (SINTEF Institute, Oslo, *Norway*)
24 months, in project years 1 & 2
- Peter Van (KFK Institute, Budapest, *Hungary*)
3 months, in project years 1 & 2
- Kevin Parnell (James Cook University, Cairns, *Australia*)
3 months, in project years 3 & 4
- Christina Papenfuss (TU Berlin, *Germany*)
3.5 months, in project years 3 & 4
- Aleksei Chechkin (KIPT, Charkov, *Ukraine*)
3 months, in project year 4



Outgoing fellows **CENS** **CMA**

Senior Researchers (> 10 years experience)

Total planned: **36 months**

Total realized: **36 months**

- Tarmo Soomere 12 months, in project years 1, 2 & 4
- Jaan Kalda 6 months, in project years 1 & 3
- Arvi Ravasoo 3 months, in project year 2
- Andrus Salupere 6 months, in project years 3 & 4
- Arkadi Berezovski 3 months, in project year 4
- Pearu Peterson 3 months, in project year 4
- Anatoli Stulov 3 months, in project year 4



Outgoing fellows **CENS** **CMA**

Post Doc Researchers (4 – 10 years experience)

Total planned: **24 months**

Total realized: **10 months**

14 months of the original 24 transferred to incoming Post Docs

- Maksim Säkki 3 months, in project year 3
- Andres Braunbrück 7 months, in project years 3 & 4



Incoming fellows CENS

Post Doc Researchers (4 - 10 years experience)

Total planned: **30 months + 14 months** from outgoing

Total realized: **48 months**

- Hena Renay (George Mason U, Virginia, *USA*)
4 months, in project year 2
- Heiko Herrmann (TU Berlin, *Germany*)
18 months, in project years 2 & 3
- Tomas Torsvik (U Bergen, *Norway*)
3 months, in project year 3
- Nathalie Béraud (U Grenoble, *France*)
7 months, in project year 4



Incoming fellows CENS

Post Doc/Experienced Researchers (4 - 10 years experience)

Total planned: 30 months + 14 months from outgoing

Total realized: 48 months

- Tony Dolphin (U East Anglia, Norwich, *UK*)
5 months, in project year 4
- Dmitri Kurennoy (U St. Petersburg, *Russia*)
8 months, in project year 4
- Andreas Fischer (U Chemnitz, *Germany*)
3 months, in project year 4



Work plan of project fellows

Scientific work:

Scientific work related to CENS topics

Continuation/development of collaborations

Local presentation of results

Dissemination at international conferences

Complementary skills, for example:

Build-up of project management know-how

Training of young researchers and students

Compilation of teaching material

Popularization of mathematics



Work plan of project fellows

- Submitted by each fellow at the beginning
(basis of selection for incoming fellows)
- Used for a report by each fellow at the end
(achievements compared to initial expectations)
- Part of the annual activity report
(information for the project officer about the ongoing activities)



CENS-CMA Meetings and Workshops

1. March 2004, Tallinn: team presentations, proposal preparation
2. May 2005, Oslo: project launch, attendance at Abel Prize Ceremony
3. May 2006, Tallinn: first-year evaluation, lectures for students
4. October 2007, Palmse: workshop *Applied Wave Mathematics*, mid-term evaluation and modification of plans
5. March 2008, Tallinn: workshop *Thermodynamics of Slow and Fast Dynamical Processes*



Research lectures

Presentation of project work

- in Europe:
for example in Bulgaria, France, Germany, Greece, Lithuania, Malta, Poland, Portugal, Sweden, UK, Ukraine
- and beyond:
for example in Australia, Hongkong, India, New Zealand, USA



Equipment for experiments

- water waves
- systems biology
- non-destructive materials testing
- piano hammers

... and some computing power



Activities with others in Norway

Collaboration not only with CMA, but also

- SINTEF
- Simula Research Center
- Departments of Mathematics and Physics, University of Oslo
- Centre of Physics of Geological Processes, Oslo
- Bergen Center for Computational Science
- Norwegian team for the International Physics Olympiad for schools
- Det Norske Veritas (through RTN SEAMOCS)



Activities in Estonia

- PhD examiners both in Estonia (E. Quak) and in Norway (T. Soomere)
- FP7 Launching Conference for Estonia, Tartu, March 28, 2007 (E.Quak)
- ETV Television: 15-minute program (January 2008) and educational DVD (planned) for high schools on *Waves and Coastal Processes*



Lectures in Practical Mathematics

- *Aircraft Design*, Thomas Grandine, The Boeing Company (March 2006)
- *The DFG Research Centre MATHEON: Mathematics for Key Technologies – Modelling, Simulation, and Optimization of Real-Life Processes and Cancer Therapy Regional Hyperthermia*

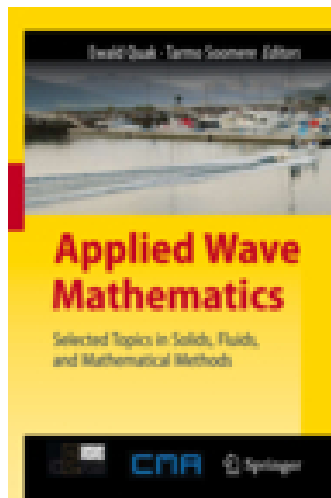
Peter Deuflhard, Co-Founder MATHEON,
President Zuse Institute, Berlin (ZIB) (May 2008)



Project Monograph

Applied Wave Mathematics

Selected Topics in Solids, Fluids, and Mathematical Methods



Edited volume of 12 tutorials,
written by CENS members
and project fellows

To appear in September 2009



Project Monograph

Part I Waves in Solids

- *Deformation Waves in Solids* by J. Engelbrecht
- *The Perturbation Technique for Wave Interaction in Prestressed Material* by A. Ravasoo
- *Waves in Inhomogeneous Solids* by A. Berezovski, M. Berezovski, J. Engelbrecht

Part II Mesoscopic Theory

- *Dynamics of Internal Variables from the Mesoscopic Background* by C. Papenfuss
- *Towards a Description of Twist Waves* by H. Herrmann

Part III Exploiting the Dissipation Inequality

- *Weakly Nonlocal Non-equilibrium Thermodynamics* by P. Van



Project Monograph

Part IV Waves in Fluids

- *Long Ship Waves in Shallow Water Bodies* by T. Soomere
- *Modelling of Ships Waves from High-speed Vessels* by T. Torsvik
- *New Trends in the Analytical Theory of Long Sea Wave Runup* by I. Didenkulova

Part V Mathematical Methods

- *The Pseudospectral Method and Discrete Spectral Analysis* by A. Salupere
- *Foundations of Finite Element Methods for Wave Equations of Maxwell Type* by S. H. Christiansen
- *An Introduction to the Theory of Scalar Conservation Laws with Spatially Discontinuous Flux Functions* by N. H. Risebro



Project-sponsored events

Summer School

Applications of 3D Shapes:

Ontologies, Software Tools, Industrial Case Studies

Tallinn University of Technology

July 19-26, 2006

organized by E. Quak

48 participants, representing institutions from 11 countries

in collaboration with the

IST Network of Excellence AIM@SHAPE



Applications of 3D Shapes



Project-sponsored events

Summer School

Waves and Coastal Processes

Tallinn University of Technology

August 25 – September 9, 2007

organized by T. Soomere

50 participants, representing institutions from 9 countries

in collaboration with the

Marie Curie Research Training Network SEAMOCS



Waves and Coastal Processes



CENS

Marie Curie Actions
Human resources and mobility

CMA

Waves and Coastal Processes



CENS

Marie Curie Actions
Human resources and mobility

CMA

Waves and Coastal Processes



General Audience

- Humboldt Foundation Colloquium
Innovation Systems in Global Competition
(T. Soomere, E. Quak)
- Scandinavian Shipping Gazette article
(T. Soomere)
- IST Results article (E. Quak)
- Stand at the IST Event 2007 (E. Quak)



Build-up of project management know how

Follow-up projects

Heiko Herrmann

- Feodor Lynen Fellowship of the Alexander von Humboldt Foundation (2008-2010?)
- FP 7 ESTWave Re-Integration Grant (2009-2011), funds for equipment and travel

Ewald Quak

- FP 7 ESTSpline Reintegration Grant (2008-2010), funds for secretary and travel



Build-up of project management know how

One of the project objectives:

apply for (and hopefully get)

a large international research project coordinated from CENS



3 Project Highlights

- International Visitors
- Contributions to CENS research – both established and new
- A new international research project coordinated by CENS



International Visitors

People need to come here and see what it is like and that there is interesting research going on.

Project fellows from

- Norway
- Germany, France, UK
- Ukraine, Russia
- USA, Australia, New Zealand

and even more foreigners for the project events



International Visitors

A new field experiment on water waves in Tallinn Bay in June/July will probably have participants from

Estonia,

Norway, Russia, Lithuania, Germany,

UK, Australia, New Zealand,

Trinidad and Tobago



Project Research for CENS

Supporting established research activities:

Incoming fellows

Peter Van (Hungary),

Heiko Herrmann (Germany),

Christina Papenfuss (Germany),

Aleksei Chechkin (Ukraine),

Andreas Fischer (Germany),

7 outgoing fellows to Oslo



Project Research for CENS

Supporting a new research activity:

Laboratory of Systems Biology

led by Marko Vendelin

based on a Wellcome Trust Grant

Incoming fellows

Hena Renay (Pakistan/USA),

Nicole Béraud (France)

Outgoing fellow to Oslo

Pearu Peterson



Project Research for CENS

Helping to establish a new research activity:

Laboratory for Wave Engineering

started January 1, 2009

led by Tarmo Soomere (outgoing fellow)

Also supported by the Marie Curie Research and Training
Network SEAMOCS

Incoming fellows

Kevin Parnell (Australia),

Tomas Torsvik (Norway),

Tony Dolphin (UK),

Dmitri Kurennoy (Russia), Ewald Quak



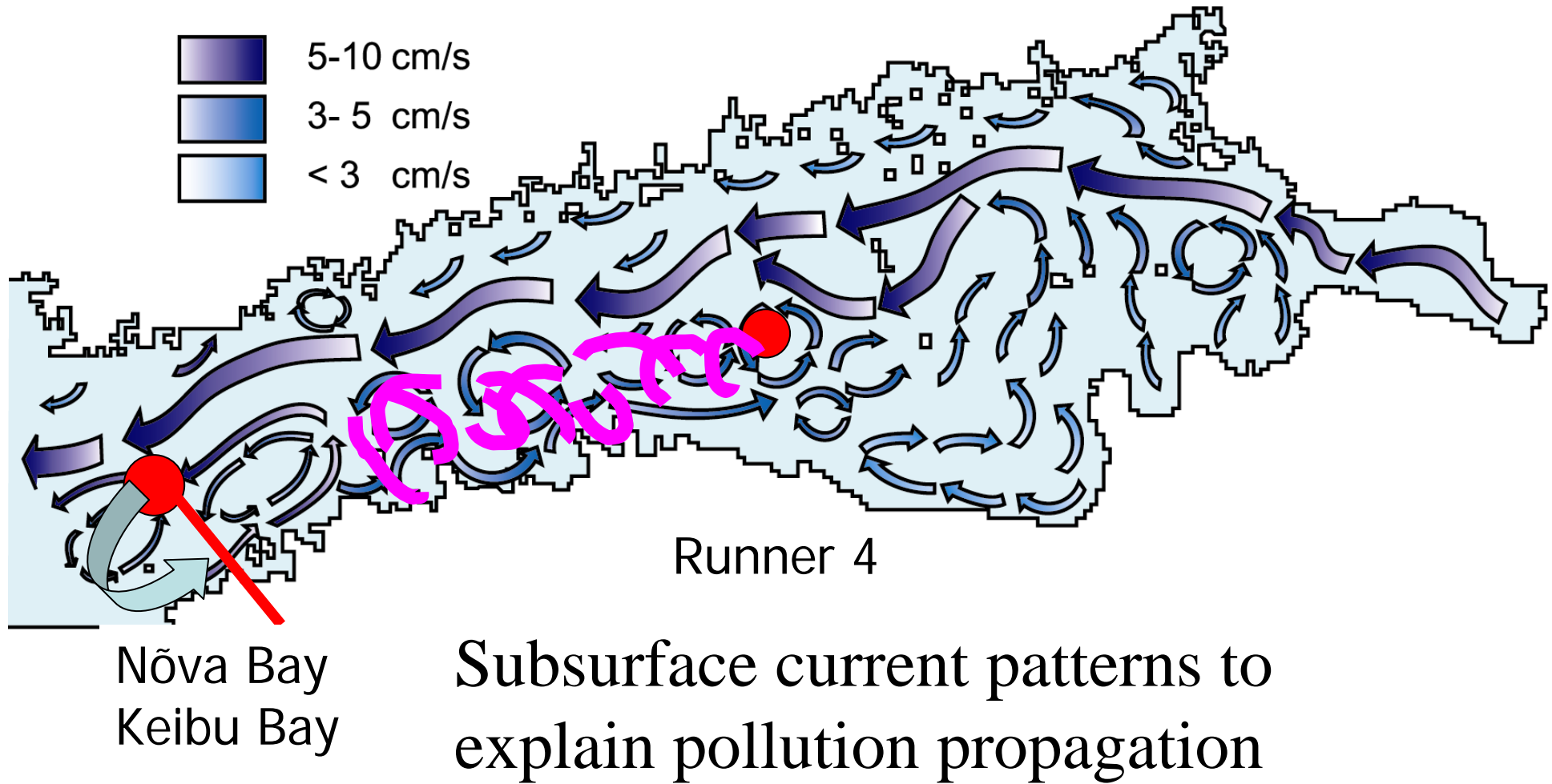
The BalticWay project

The Potential of Currents for Environmental Management of the Baltic Sea Maritime Industry

- Funding 1.6 M€
- Start date: January 1, 2009
- Duration: 3 years
- 8 partners from 5 countries
(EE, FI, SE, DK, GE)
- CENS coordinator (T. Soomere)



Motivation



BalticWay Objectives

- ***Smart use of*** the existence of statistically heterogeneous semi-persistent ***current patterns***
- ***Determination of*** the probability of ***current-induced transport of dangerous substances to vulnerable regions*** (such as coastal spawning, nursing, tourist areas)
- ***Identification of areas of reduced risks***, where this probability is low, and ***to where traffic should be directed*** or high-risk offshore



structures be located



Project Sponsor - BONUS

- **Baltic Organizations' Network**
for **Funding Science** www.bonusportal.org
- Partnership of key funding agencies to finance
research for
science-based management of
environmental issues
in the Baltic Sea



BONUS+ Call 2007

Decisions made by

an **International Evaluation Panel**,

(appointed by the BONUS EEIG Steering Committee), and

an **Advisory Board** (HELCOM, WWF, DG MARE, ...)

- 149 short proposals submitted in December 2007
- 55 full proposals invited to submit by April 14, 2008
- June 18, 2008: 16 proposals to be funded, coordinated by institutions in Sweden (8), Finland (4), Danmark (2), Germany (1), *Estonia* (1).



3 Project Lowlights

- Finding fellows: Money
- Having fellows: Money
- The new project: Money



Money: finding fellows

Advance warning by the EC:

getting people to come is difficult !

Some good projects could not be fully realized because suitable and willing candidates could not be found.

Turned out **NOT** to be the case for the **CENS-CMA project**.



Money: finding fellows

Outgoing Estonian PostDocs to Oslo hard to find
(finally for only 10 months instead of the 24 originally planned)

Problem of part-time research:

average researcher salaries are not competitive as a full-time income

Young researchers typically have other full-time positions to generate sufficient income for a (growing) family, which also poses additional side conditions.

That makes long-term visits difficult to arrange with the main employer (and the family).



Money: having fellows

Marie Curie salaries are high compared to local ones in a lot of new member countries

Main problem apparently for the EC: local administrators want to pay only salaries at the local level, which is a breach of the contract with the EC.

This was never an issue here, all people were paid in full. Still it is a strange situation when Post Doc visitors get more money than local senior researchers, and Senior visitors more than the institute's director.



Money: having fellows

Due to the high fellow salaries the strain on the local budget is high, especially in these days, and certainly if the EC does not pay on time.

Main problem here: the EC is currently establishing the Research Executive Agency for administering the People program. This creates a shortage of staff everywhere, also in the financial departments processing claims.

So a payment of 170 000 € was ca. 6 months late, which was a real problem for the institute's cash flow.

Entirely not our fault, but still ...



Money: the new project

The financing scheme for BONUS is more complicated than for EC projects, as it involves both EC and local money.

System to be used: each partner gets a contract not with BONUS itself but with its national funding agency.

Only for Estonia things became different and difficult. The ETF decided not to follow this system, putting the financial dealings with the BONUS secretariat, which did not foresee they had to do this, causing further delays.



Money: a new project

Result: 5 months into the project, there is no payment to the Estonian partners yet and their work is already way behind.

All other partners have received their payments and have started their work.

Due to the financial crisis, no project activity can be paid before the funds have arrived.

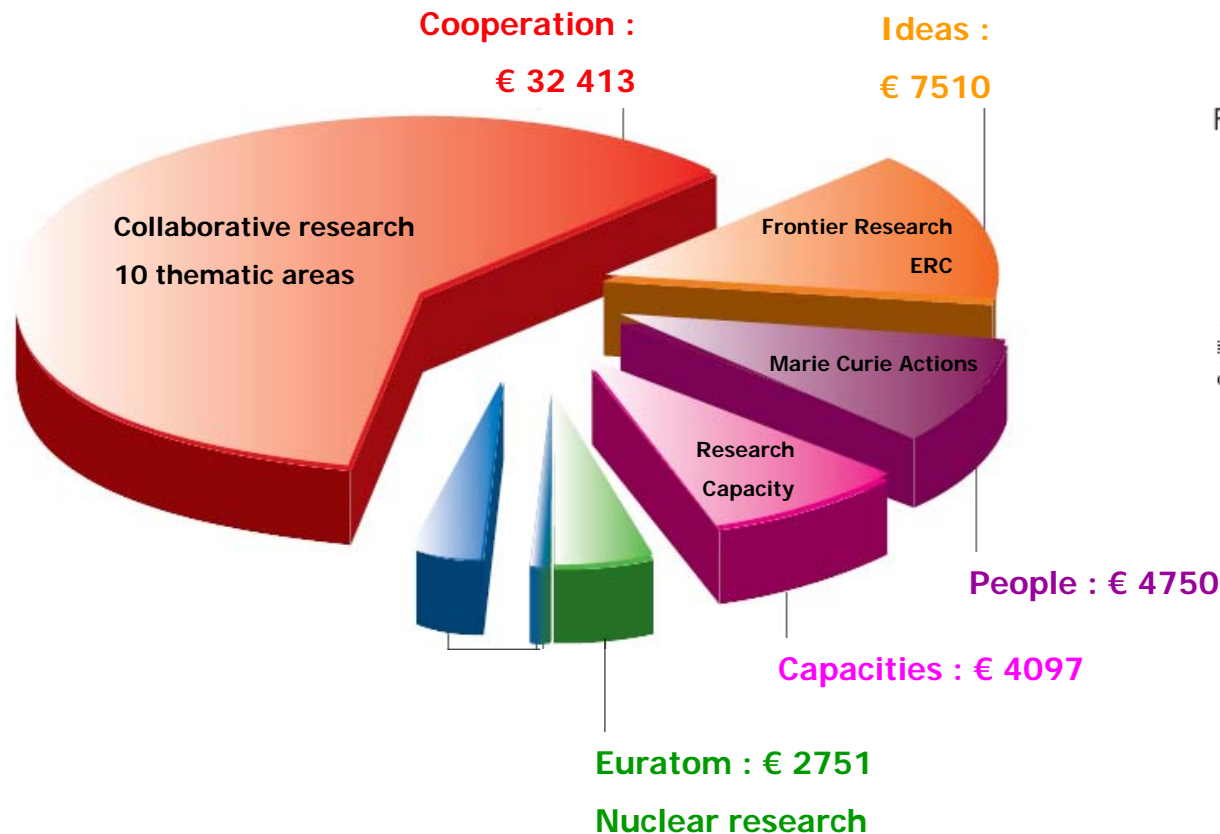
While the senior scientists involved can still work without pay, no new personnel that was foreseen in the project plan can be hired, and no expenses paid, not even the software for a project web site.



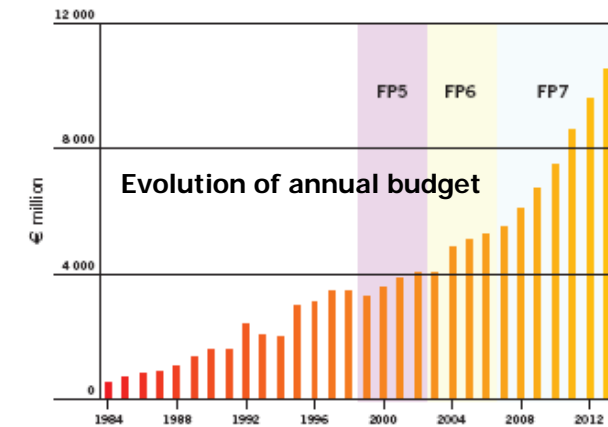
FP7 overview (2007-2013)

EU's main instrument for funding research

Aim : Contribute to the Union becoming the world's leading research area



Framework programme budget (1984-2013)



FP7 PEOPLE Program

- Initial Training Network (ITN) *host-driven*
- Industry Academia Partnerships (IAPP) *host-driven*
- International Research Staff Exchange (IRSES)
host-driven
- Life-long training and career development – IEF, ERG *individual*
- International dimension – IIF, IOF, IRG *individual*
- Transfer of Knowledge Development Scheme (ToK-Dev) no longer exists



Question:

Are young scientists in Estonia adequately prepared to apply for outside funding?

In Norway, they are currently thinking about a system of identifying early promising talents that need to be groomed.

Already now, coaching sessions for people invited to hearings for ERC Starting Grants are being organized.

How many young Estonians will be encouraged to apply for such grants in the next call and what help will they get?



BalticWay Consortium

- **IoC**: Institute of Cybernetics, Tallinn, EE, Tarmo Soomere
- **FIMR**: Finnish Institute of Marine Research, Helsinki, FI, Kai Myrberg
- **MISU**: Department of Meteorology, U Stockholm, SE, Kristofer Döös
- **SMHI**: Swedish Meteorological and Hydrological Institute, Norrköping, SE, Markus Meier
- **DMI**: Danish Meteorological Institute, Copenhagen, DK, Jun She
- **GKSS**: Institute for Coastal Research, Geesthacht, GE, Emil Stanev
- **IFM-GEOMAR**: Leibniz Institute of Marine Sciences, Kiel, GE, Andreas Lehmann
- **LDI**: Laser Diagnostics Instruments, Tallinn, EE, Sergei Babitchenko

BalticWay Practical Targets

- **To identify areas of reduced risk and establish their basic properties** (persistence, seasonal and interannual variability, etc.) in target regions
- **To provide a prototype of an environmental management technology** using the concept of areas of reduced risk in a specific setting
- **To formulate a concrete implementation plan for the practical adoption** of the technology as well as blueprints for further research and development
- **To develop an independent method for assessing whether such a technology is applicable and economically feasible for a given sea area**

Transfer of Knowledge (ToK)

- **General Objectives** (Work programme section 2.3.1.3.):
These [Fellowships] will be directed at European organisations (universities, research centres, enterprises, etc.) in need of developing new areas of competence, as well as furthering the development of research capabilities in the less-favoured regions of the EU and in the Associated Candidate Countries.
Knowledge transfer fellowships will allow experienced researchers to be hosted at such organisations for the transfer of knowledge, research competencies and technology.



Transfer of Knowledge (ToK)

- **Specific Aims** (Work programme section 2.3.1.3.):

The reinforcement of the research potential of host entities, with priority to entities situated in Less Favoured Regions of the Member States and in the Associated Candidate Countries, in need of new areas of competence (**Marie Curie Development Scheme**)

the creation and development of real strategic and durable partnerships between the academic world and the world of enterprises, in particular SMEs, aiming at the establishment of lasting collaborations of mutual interest (**Marie Curie Industry-Academia Strategic Partnership Scheme**)



CENS-CMA project management

- Steering Committee
 - Jüri Engelbrecht **CENS** (chairman)
 - Ragnar Winther **CMA**
 - Tarmo Soomere **CENS**
 - Helge Galdal **CMA**
- Project office in Tallinn
- Annual **CENS-CMA** meetings
in Tallinn or Oslo



CENS-CMA SC responsibilities

- Hiring and sending decisions
- Evaluation of the fellows' work plans
- Changes in the work plan, esp. the budget
- Arrangement of audit certificates
- Preparation of project deliverables
- Organization of project events



ToK plan for **CENS-CMA** fellows

- Research results
 - interdisciplinary co-operation of the fellows with CENS and CMA members
 - integration of modelling, theoretical and computational aspects
 - focussed projects related to biomechanics, cardiac mechanics, cell energetics as well as nonlinear wave modelling, extreme waves, solitons, microstructured solids.
- Transfer of scientific knowledge to CENS in identifiable areas of need
 - example area: geometry, and specifically geometric modelling and processing
 - not limited to that particular topic



CENS-CMA

Cooperation of
Estonian and
Norwegian
Scientific
Centres within
Mathematics and its
Applications

Let us make it so !

