The Centre of Mathematics for Applications

- An overview of CMA's research activities

Helge Galdal, Administrative Director
NILS Meeting, Madrid, January 21-22, 2010

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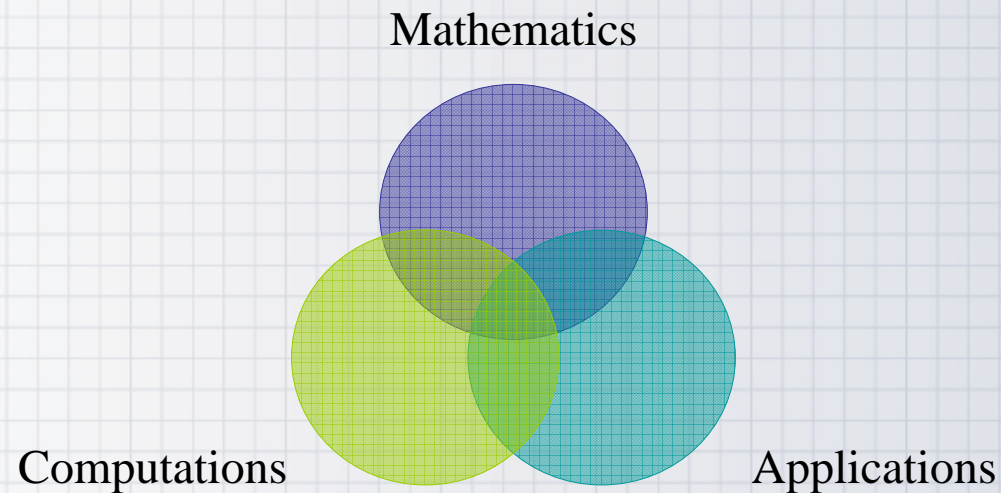CMA — Centre of Mathematics for Applications

CMA

- a "Centre of Excellence", appointed by the Research Council of Norway in 2002, running from 2003 - 2013
- Involving / cooperation between "traditional" departments: Mathematics, computer science, physics, astrophysics
- Also bridging to Economics/Finance/Insurance, Medicine, Biology, Petroleum research
- Mathematics FOR Applications, not necessarily "Applied Mathematics"
- Director: Professor Ragnar Winther

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Vision:

To create significant development in modern mathematics based on an interplay between theory, computations, and applications.
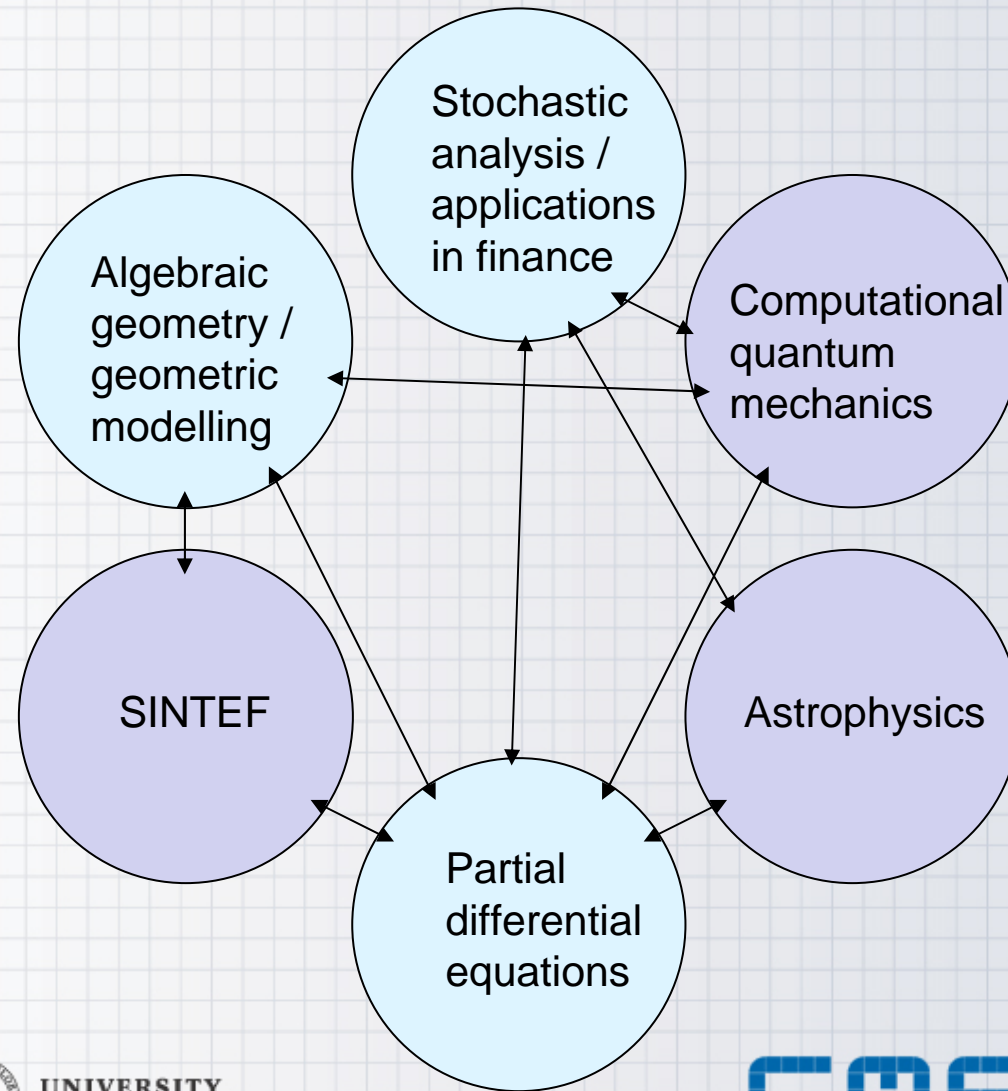
Mathematics

Computations

Applications

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Research groups

Geometric Modelling

- Splines and mesh-based modelling
- Applied algebraic geometry
- Optimization and linear algebra

- EU FP7 "SAGA"
- Medical imaging,
- Isogeometry
- Utilizing GPUs in computers to accelerate computations

Key persons:

Ragni Piene, Tom Lyche, Michael Floater, Geir Ellingsrud, Knut Mørken, Geir Dahl, and Tor Dokken

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Stochastic Analysis

- Stochastic control theory, Malliavin calculus on Levy processes, SPDEs. Applications in Finance (insider trading detection, optimization theory)
- Modelling and analysis of electricity markets
- Insurance Mathematics

- ERC Advanced Grant "Innostoch"
- ESF network of excellence "AMaMeF"
- Developing program in the Southern Africa region

Key persons: Bernt Øksendal, Fred Espen Benth, Tom Lindstrøm, Giulia Di Nunno

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Differential Equations

- Analysis of PDEs and of numerics of PDEs
  - Hyperbolic conservation laws
  - Degenerate parabolic equations
  - Wave Equations
- Finite element exterior calculus

- EURYI award on geometric wave equations
- Collaborations with astrophysics group on MHD-equations
- Electromagnetic Seabed Logging

Key persons:

Ragnar Winther, Nils Henrik Risebro, Kenneth Karlsen, Snorre Christiansen, Helge Holden

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Computational Quantum Mechanics

- The nuclear many-body problem, Coupled Cluster theory
- Numerical methods
- Analysis and numerics of the Schrödinger equation

- Exchange Program with North-American sites

Key persons:
Morten Hjorth-Jensen, Eivind Osnes, David Dean

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Astrophysics

- Modelling the outer solar atmosphere
  - Gas transportation, MHD equations, numerical simulations
- Cosmology
  - Analysis of the cosmic microwave background radiation

Key persons:

Mats Carlsson, Viggo Hansteen, Per Lije, Hans Kristian Eriksen

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CMA – key figures 2010

- ~ 90 persons: 20 "full time" senior researchers, 13 adjunct researchers, 30 PhD-students, 20 postdoctoral og 6 other
- Ca. 60 person-years
- Budget 2010: Ca. € 7 mill.
- Gender balance 80%-20%. However better among the PhD-students
- More than 20 nationalities represented
- Numerous visitors each year, high level of seminar/workshop activities in the centre

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Thanks for your attention

More information available at
http://www.cma.uio.no/