# Scientific Computing



# Workshop on the Reduced Basis Method - May 9, 2008

**Center for Biomedical Computing will host a workshop on the Reduced Basis method. The Reduced Basis method is developed for parameter dependent PDEs where the solution is sought for many different choices of the underlying parameters. The key idea is to store the solutions of the PDE for a given set of parameters, and then find the reduced basis approximation for a new parameter as a linear combination of these precomputed solutions. These are the offline and online stages of the method. A lot of work is done in the offline stage, where all the basis functions are computed and stored. In the online stage, a problem with very few degrees of freedom has to be solved. When solving the same problem for many different choices of the underlying parameter, this provides a rapid approximation of the true solution. Useful tools for choosing the initial set of parameters used to compute the basis functions are crucial to the method. Error bounds for some output of interest are used both to certify the quality of the approximations, and to choose the number of basis functions used in the approximation. The focus of the workshop will be on the application of the Reduced Basis method to different problems. This will give an idea of what kind of problems benefit from this method, and how the method is implemented.**

Total number of participants: 39
Number of different nationalities represented: 9
Total number of speakers: 5
Total number of talks: 6

### Invited Speakers:

- Prof. Yvon Maday - Laboratoire Jacques-Louis Lions (LJLL), Paris, France
- Prof. Christopher Johnson - University of Utah (U of U), Salt Lake City, USA
- Prof. Einar Rønquist - Norwegian University of Science and Technology (NTNU), Trondheim
- Dr. Simone Deparis - Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland
- Dr. Gianluigi Rozza - MIT, Boston, USA/Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland

### Program:

### Friday, May 9, 2008

Place: "Storstua" at Simula

09.15-10.15 **Yvon Maday** (LJLL): Introduction to the Reduced Basis Method.

10.15-10.30 *Coffee*

10.30-11.15 **Yvon Maday** (LJLL): Application of the Reduced Basis Method to Maxwell's equations and quantum chemistry.

11.15-12.00 **Einar Rønquist** (NTNU): Reduced basis approximation and a posteriori error estimation for a Boltzmann problem.

12.00-13.00 *Break*

13.00-13.45 **Christopher Johnson** (U of U): Computing and Visualizing the Future of Biomedicine. ( abstract)

13.45-14.30 **Simone Deparis** (EPFL): Application of the reduced basis methods to parameter-dependent Navier-Stokes equations. ( abstract)

14.30-14.45 *Coffee*

14.45-15.30 **Gianluigi Rozza** (MIT/EPFL): Reduced basis approximation and a posteriori error estimation for affinely parametrized partial differential equations: applications to transport and continuum mechanics. ( abstract)

The workshop dinner will be at www.gamleraadhus.no

### Useful reading:

A.T. Patera and G. Rozza, *Reduced Basis Approximation and A Posteriori Error Estimation for Parametrized Partial Differential Equations* , Version 1.0, Copyright MIT 2006–2007, to appear in (tentative rubric) MIT Pappalardo Graduate Monographs in Mechanical Engineering.

### Summer School on Reduced Basis Methods:

June 23–July 4, 2008 — Centre Port-Royal, Saint-Lambert-des-Bois, (near Paris) France.
For more information, see 2008 Numerical Analysis Summer School Website .

Practical information for guests

| What | |
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| **When** | May 09, 2008<br>from 09:00 AM to 04:00 PM |
| **Where** | Storstua |
| **Contact Name** | Alf Emil Løvgren |
| **Add event to calendar** | vCal<br>iCal |