

# Curriculum Vitae

**Fabio Nobile**

## Personal Data

Fabio Nobile

Born in Milano (MI) on January 10th, 1974

Nationality: Italian

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## Education

**2001** - Ph.D. in Applied Mathematics at the École Polytechnique Fédérale de Lausanne, Switzerland.

Thesis title: *Numerical approximation of fluid-structure interaction problems with application to haemodynamics*

Advisor: Prof. Alfio Quarteroni

Other members of the dissertation Committee: Prof. Marcus Grote, Prof. Yvon Maday, Prof. Jaques Rappaz.

**1998** - Degree in Electronic Engineering at the Politecnico di Milano, Italy (5 years degree curriculum), with honors (final mark: 100/100 cum laude)

## Professional Experience

**January 2005 - present:** Assistant Professor at the Department of Mathematics, Politecnico di Milano.

**July 4 - August 30, 2005, July 23 - August 12, 2006, July 28 - August 22, 2007, July 16 - August 6, 2008, July 30 - August 14, 2009:** Visiting Faculty Fellow at ICES, University of Texas at Austin.

**October 2004 - December 2004:** Postdoctoral Fellow at the Department of Mathematics, Politecnico di Milano.

**April 2002 - August 2004:** Postdoctoral Fellow at ICES, Institute for Computational Engineering and Sciences, University of Texas at Austin.

Advisors: Prof. J. Tinsley Oden, Prof. Ivo Babuška

**July 1998 - March 2002:** Research Assistant in the chair of Prof. Quarteroni, Département de Mathématique, École Polytechnique Fédérale de Lausanne.

## Honors and Awards

**Plenary speaker at ICOSAHOM'09** (International Conference on Spectral and High Order Methods), June 22-26, 2009, Trondheim, Norway

**International Prize “Amici di Milano per i Giovani” 2009** (awarded every year to young fellows who have brought prestige to the city of Milan)

**Most Cited Author 2005-2008** awarded by the journal “Computer Methods in Applied Mechanics and Engineering” (CMAME). The paper “Added-mass effect in the design of partitioned algorithms for fluid-structure problems” by “P. Causin, J.F. Gerbeau and F. Nobile” has been one of the 10 most cited papers published by CMAME in the period 2005-2008.

**Second Prize at the 12<sup>th</sup> Leslie Fox Prize**, Dundee, UK. (June 2005)

**ICES Postdoctoral Fellowship** (April 2002 - May 2004)

## Membership in Professional Societies

- Society for Industrial and Applied Mathematics (SIAM)
- Italian National Group for Scientific Computing (GNCS)

## Research Fields

- Numerical solution of partial differential equations with random input data. Deterministic and stochastic approaches: Worst-Scenario, Stochastic Galerkin and Stochastic Collocation techniques using anisotropic sparse grids.
- Verification and Validation techniques in Computational Science: development of a systematic framework to validate a computational model with respect to a specific goal; sensitivity analysis, bayesian inference.
- A posteriori error estimation for finite element approximation of elliptic problems, including discretization error, modeling error and estimation of uncertainties.
- Solution of parabolic equations on moving domains in “Arbitrary Lagrangian Eulerian” (ALE) formulation. Stability and convergence analysis of finite elements ALE schemes of first and second order in time.
- Fluid-structure interaction. Analysis and development of partitioned fluid-structure algorithms; applications to haemodynamics and civil engineering.
- Multiscale description of the circulatory system. Analysis and development of simplified models of lower spatial dimension. Set-up of suitable coupling conditions between the different models; development of proper numerical schemes.
- Numerical approximation of the electrical activity of the heart; Bidomain and Monodomain models; modeling error estimates and adaptation.

## Collaborations

*R. Tempone* (KAUST, Saudi Arabia), *J.T. Oden*, *I. Babuška*, *S. Prudhomme*, *O. Ghattas*, *R. Moser* (ICES, University of Texas at Austin), *A. Quarteroni*, *L. Formaggia* (MOX, Politecnico di Milano), *C. Vergara* (Università di Bergamo), *Santiago Badia* (CIMNE, Barcellona, Spagna), *A. Moura* (Instituto Superior Técnico, Lisbona), *A. Veneziani*, *L. Mirabella*, *M. Perego*, *L. Gerardo Giorda* (Emory University, Atlanta, USA), *T. Paez*, *K. Dowding* (SANDIA National Labs, Albuquerque, USA).

## Research Grants

- Grant FIRB-IDEAS (funded by the Italian Ministry of Education and related to the 2007 ERC-IDEAS Starting Grant call): 4 year project on “Advanced Numerical Techniques for Uncertainty Quantification in Engineering and Life Science Problems” (560K€)

## Collaboration to other research projects

- “Remote sensing”, funded by Eni S.p.A. PIs P. Secchi and L. Formaggia, 2009-2010.
- “Mathematical Modelling and Simulation of the Cardiovascular System” (MATHCARD), project ERC-IDEAS Advanced Grant, PI. A. Quarteroni, 2009-2013.
- “Modellistica numerica per il calcolo scientifico ed applicazioni avanzate” funded by MIUR (Italian Ministry of Education), PRIN 2007, PI. A. Quarteroni, 2008-2009.
- “Modellazione della dinamica di un bacino sedimentario tridimensionale. Modelling di espulsione e migrazione primaria di idrocarburi nella roccia madre”, Eni S.p.A, contract n. 4700006742/DS1. PI. A. Quarteroni and L. Formaggia, 2007-08
- “Mathematical and numerical modeling of the Electro-Fluid-Mechanics of the Heart” funded by INDAM (Italian Institute for High Mathematics), PI. A. Quarteroni, 2006-07
- “Numerical Modeling for Scientific Computing and Advanced Applications” funded by MIUR (PRIN 2005), PI. A. Quarteroni, 2006-07.
- SANDIA grant n. 588685, PI. R. Tempone, 9/05-8/07
- EU grant Haemodel project HPRN-CT-2002-00270, PI. A. Quarteroni, 2002-2006

## Organization of Minisymposia and Workshops

- Organizer (together with C. Canuto) of the workshop *Numerical Solution of Stochastic Partial Differential Equations*, within the INDAM Intensive trimester “Innovative Numerical Methods for PDEs”, to be held at Politecnico di Torino, May 10-13, 2010
- Organizer (together with R.T. Rockafellar, C. Schwab, R. Tempone, R.J-B. Wets) of the IMA Annual Program Year Workshop *Computing with Uncertainty: Mathematical Modeling, Numerical Approximation and Large Scale Optimization of Complex Systems with Uncertainty*, Institute for Mathematics and its Applications (IMA), University of Minnesota, October 18-22, 2010.
- Organizer (together with R. Tempone) of minisymposium *Numerical methods for Stochastic Partial Differential Equations*, (8 participants) at ENUMATH 2009 conference, Uppsala, Sweden, June 29 - July 3, 2009.
- Organizer (together with S. Prudhomme and R. Tempone) of the minisymposium *Validation and robust prediction in computational science*, (8 participants) at MAFELAP 2009, Brunel, UK, June 9-12, 2009.

- Organizer (together with R. Tempone) of minisymposium *Uncertainty Quantification in Computational Science and Engineering*, (20 participants) in ICIAM07 Conference, Zurich, Switzerland, July 16-20, 2007
- Organizer (together with R. Tempone) of minisymposium *Stochastic Galerkin and Stochastic Collocation for SPDEs* (4 Parts, 14 participants) in SIAM-CSE07 Conference, Costa Mesa, California, February 19-23, 2007.
- Co-organizer of 3<sup>rd</sup> *International Symposium on Modelling of Physiological Flows* (MPF2006), Bergamo, Italy, September 25-27, 2006, <http://mox.polimi.it/mpf2006>.

## Invited Presentations

- *Stochastic polynomial approximations for PDEs with random input data*, Workshop Incertitudes, Institut Élie Cartan, Nancy, France, Dec. 14-15, 2009
- *Sparse Grid Stochastic Collocation methods for Uncertainty Quantification*, 3<sup>rd</sup> workshop OPUS, EADS Suresnes, France, Nov. 25, 2009.
- *Partitioned procedures for fluid-structure problems in hemodynamics based on Robin transmission conditions*, Workshop Mathematical Physics and PDEs, Levico Terme (Trento), Italy, Sept. 6-11, 2009.
- *Stochastic polynomial approximations for PDEs with random input data*, ICOSAHOM'09, June 22-26, 2009, Trondheim, Norway.
- *Fluid structure algorithms based on Robin transmission conditions: application to blood flow in arteries*, Modelisation et calcul scientifique Seminar, INRIA Paris - Rocquencourt, November 14, 2008.
- *Stochastic polynomial approximations for elliptic and parabolic equations with random input data*, Journée Incertitudes du GdR-MoMaS, Institut Henri Poincaré, Paris, November 13, 2008.
- *Stochastic collocation methods for elliptic PDEs with random input data*. Workshop “Numerical Analysis of Stochastic PDEs” (NASPDE), ETH, Zurich, Switzerland, May 16-17, 2008.
- *Numerical treatment of elliptic problems in stochastic domains: application to mechanical-fatigue*. MITACS Workshop on “Methodology of Validation and Verification” (by invitation only), Banff, Alberta, Canada, April 28 - May 1, 2008.
- *Fluid-structure interaction algorithms for vascular dynamics based on Robin interface conditions*. Applied Mathematics and Numerical Analysis Seminar, Departamento de Matemática, Instituto Superior Técnico, Lisbon, Portugal, October 19, 2007.
- *Worst-Case Scenario Tools for Verification and Validation*. Sandia CSRI Workshop on “Mathematical Methods for Verification and Validation” (by invitation only), Hyatt Regency Tamaya Resort, NM, USA, August 14-16, 2007.
- *Recent advances on the geometrical multiscale modelling of the cardiovascular system*. Euro Mediterranean Conference on Biomathematics, French University in Egypt, Cairo, June 26-28, 2007.
- *Sparse stochastic collocation methods for elliptic PDEs with random input data*. Guest lecture, Institut für Mechanik, University of Innsbruck, Austria, May 30, 2007.
- *Simulating fluid-structure interaction between blood and arterial wall*. Numerical Analysis Seminar, NADA, KTH, Stockholm, Sweden, May 7, 2007.
- *Stochastic collocation methods for elliptic partial differential equations with random input data*. Applied Mathematics Seminar, IMATI-CNR and Department of Mathematics, University of Pavia, January 16, 2007.

- *A Verification and Validation (V&V) framework for Computational Science*. Applied Mathematics Seminar, University of Milan, December 19, 2006.
- *Multiphysics in haemodynamics: fluid-structure interaction between blood and arterial wall*. INdAM Workshop on “Multiscale Problems: Modeling, Adaptive Discretization, Stabilization, Solvers” Cortona, Italy, September 18-22, 2006.
- *A stochastic collocation method for partial differential equations with random input data*, Workshop “Numerics for Stochastic Differential Equations with Applications”, SCS, Florida State University at Tallahassee, Florida, USA, February 26 - March 2, 2006.
- *Worst-case scenario analysis of elliptic PDEs with uncertainty*, SCS Seminar, Florida State University, December 7, 2005.
- *Added mass effect in the design of partitioned fluid-structure algorithms*, Mini-workshop “Interface Problems in Computational Fluid Dynamics”, Oberwolfach, Germany, February 20-26, 2005.
- *Some remarks on partitioned fluid-structure interaction algorithms in hemodynamics*, workshop “Fluides et structures”, Mulhouse, France, Novembre 18-19, 2004.
- *On the reliability of computer simulations*, Math. Colloquium, University of Houston, March 16, 2004.
- *Simulating fluid structure interaction mechanisms in context of hemodynamic applications*, Math. Colloquium, Purdue University, March 1, 2004.
- *Some issues in mathematical and numerical modeling of the cardiovascular system*, Scientific Computing seminar, University of Houston, April 24, 2003.
- *A new subdomain-based error estimator for finite element approximations of elliptic problems*, MOX Seminar, Politecnico di Milano, December 16, 2002.
- *Some issues in the mathematical modeling and numerical simulation of the cardiovascular system*, Joint Numerical Analysis/CSCAMM Seminar, Univ. of Maryland, College Park, October 15, 2002.

## Contributed Talks in Conferences

- MAFELAP 2009, June 9-12, Brunel, UK  
 Talk: *A general framework for the validation of a computational model*  
 Talk: *Modeling error estimation and adaptivity in electrocardiology applications*
- 8<sup>th</sup> World Congress on Computational Mechanics (WCCM8) and 5<sup>th</sup> European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008), Venice, Italy, June 30, July 4, 2008  
 Talk: *Modeling Error Estimates in the Simulation of the Electrical Activity of the Heart*
- 9<sup>th</sup> U.S. National Congress on Computational Mechanics (USNCCM9), San Francisco, California, July 23-26, 2007.  
 Talk: *Coupling strategies for the numerical simulation of blood flow in deformable arteries by 3D and 1D models*
- ICIAM07, 6<sup>th</sup> International Congress on Industrial and Applied Mathematics, Zurich, Switzerland, July 16-20, 2007.  
 Talk: *Propagating uncertainty in elliptic problems via a worst scenario analysis*

- SIAM Conference on Computational Science and Engineering (SIAM-CSE07), Costa Mesa, California, February 19-23, 2007.  
Talk: *Stochastic Collocation and Stochastic Galerkin for time dependent SPDEs*
- 6<sup>th</sup> International Conference on Structural Dynamics (EURODYN 2005), Paris, France, September 4-7, 2005,  
Talk: *Worst-case scenario analysis of elliptic PDE's with uncertainty*
- 8<sup>th</sup> U.S. National Congress on Computational Mechanics (USNCCM8), Austin, Texas, July 24-28, 2005,  
Talk: *Worst-case Scenario analysis for Elliptic PDEs: Application to Geophysical Flows*
- The Third European Finite Element Fair (EFEF-3), Pavia, Italy, June 3-4, 2005,  
Talk: *Worst-case scenario analysis for elliptic problems with uncertainty*
- 9<sup>th</sup> ASCE Joint Specialty Conference on Probabilistic Mechanics and Structure Reliability (PCM2004), Albuquerque, NM, July 26-28, 2004,  
Talk: *Analysis and Application of PDEs with Uncertainty: the Worst-case Scenario*
- International Conference on Adaptive Modeling and Simulation (ADMOS 2003), Göteborg, Sweden, Sept. 29 - Oct. 1, 2003,  
Talk: *Validation and Verification in Solid Mechanics*
- 7<sup>th</sup> U.S. National Congress on Computational Mechanics (USNCCM7), Albuquerque, New Mexico, July 27-31, 2003,  
Talk: *A posteriori error estimate for the Stokes problem*
- IV World congress on biomechanics, Calgary, Canada, August 4-9, 2002.  
Talk: *Numerical simulation of the cardiovascular system: a multiscale approach*
- First M.I.T. Conference on Computational Fluid and Solid Mechanics, Massachusetts Institute of Technology, Cambridge, U.S.A., June 12-15, 2001.  
Talk: *Fluid flows in compliant vessels: application to hemodynamics*
- IMACS 2000, 16<sup>th</sup> IMACS World Congress, Lausanne, Switzerland, August 21-25, 2000.  
Talk: *Multiscale modeling of vascular flows.*
- SIMAI 2000, V Congresso Nazionale della Società Italiana di Matematica Applicata e Industriale, Ischia, Centro Congressi Hotel Continental Terme, Italia, June 5-9, 2000.  
Talk: *Fluid-structure interaction via ALE techniques and applications.*  
Talk: *Recent results on mathematical modeling in hemodynamics.*
- ICIAM '99, 4<sup>th</sup> International Congress on Industrial and Applied Mathematics, Edimburgh, UK, July 4-9, 1999.  
Talk: *Numerical modeling of fluid-structure interaction problems in hemodynamics.*
- ICTCA '99, 4<sup>th</sup> International Conference on Theoretical and Computational Acoustics, Trieste, Italy, May 10-14, 1999.  
Talk: *Boundary treatment of wave propagation phenomena in vascular models.*
- CNRS, Groupe de Recherche 1135 "Fluide et structure, pollution, chimie", Vandœuvre-lès-Nancy, France, October 12-14, 1998.  
Talk: *Fluid-structure interaction problems in hemodynamics.*
- AMIF International Conference on Applied Mathematics for Industrial Flow Problems, San Feliu de Guixols, Spain, October 1-3, 1998.  
Talk: *Numerical Modeling of Fluid-Structure Interaction Problems in Hemodynamics.*

## Committees and Services

- December 2008: Member of PhD Committee for Annalisa Quaini, PhD in Mathematics, CMCS, EPFL.
- October 2008: Member of the search committee for the selection of the PhD candidates in the PhD program “Mathematical Models and Methods for Engineering”, Politecnico di Milano.
- reviewer of the PhD thesis by T.T. Cuc Bui, Université Pierre et Marie Curie, Paris VI. Supervisors: P. Frey and B. Maury.

## Referee activity

SIAM J. Sci. Comp. (SISC); SIAM J. Numer. Anal (SINUM); SIAM J. Matrix Anal. Appl. (SIMAX); Comput. Methods Appl. Mech. Engrg. (CMAME); Modèles Math. Anal. Num. (M2AN); Int. J. Num. Meth. Engrg. (IJNME); J. Comp. Phy. (JCP); Appl. Num. Math. (APNUM); Water Resour. Res. (WRR); Comm. Num. Meth. Engrg (CNM); Math. Comp. Simul.; J. Fluids Struct.; Adv. Comput. Math. (AiCM); Comp. Rendues Math.; Multisc. Modeling Sim. (MMS)

## Teaching Activity

### Courses taught

- A.Y. 2009-2010 : Undergrad. course *Metodi Analitici e Numerici per l’Ingegneria Aerospaziale*, Aerospace Engineering, Politecnico di Milano.
- A.Y. 2007-08, 2008-09 : Master course *Calcolo Scientifico per la Fluidodinamica*, Mathematical Engineering, Politecnico di Milano.
- A.Y. 2005-06, 2006-07 : Undergrad. course *Algebra lineare e Calcolo Numerico*, Mechanical Engineering, Politecnico di Milano.
- A.Y. 2004-05 : Undergrad. course *Calcolo Numerico*, Mechanical Engineering, Politecnico di Milano.

### Teaching Assistant & responsible for Laboratory sessions

- A.Y. 2005-06, 2006-07, 2007-08, 2008-09 : undergrad. course *Modelli stocastici e simulazione*, Mathematical Engineering, Politecnico di Milano. Prof. M. Fuhrman and G. Guatteri.
- A.Y. 2004-05, 2006-07 : Master course *Calcolo Scientifico per la fluidodinamica*, Mathematical Engineering, Politecnico di Milano. Prof. A. Veneziani.
- A.Y. 2001-02 : Master course *Approximation Numérique par Décomposition de Domaines*, École Polytechnique Fédérale de Lausanne. Prof. A. Quarteroni.
- A.Y. 1999-2000, 2000-01, 2001-02 : Master course *Calcul Scientifique*, master in “Ingenierie Mathematique”, EPFL-École Polytechnique (France). Prof. A. Quarteroni, Dr. L. Formaggia.
- A.Y. 1998-99, 1999-2000, 2000-01 : undergrad. course *Analyse Numérique*, École Polytechnique Fédérale de Lausanne. Prof. A. Quarteroni.

### Other teaching activities

- May 22, 2009 : 4 hours of lecture on *MAT2 - Programming Tools: Monte Carlo Methods for option pricing in Matlab*, within the “Corso di Alta Formazione in Energy Finance Renewables & Commodity Trading”, MIP School of Management, Politecnico di Milano.

- 16-31 August 2009: 3 hours of lecture on *Fluid structure interaction in hemodynamics*, EMS-SMI Summer School on “Mathematical and Numerical Models for the Cardiovascular System”, organized by D. Chapelle, P. Colli-Franzone, A. Quarteroni, Cortona, Italy.
- May 30 and June 27, 2008 : 6 hours of lecture on *MAT2 - Programming Tools: Monte Carlo Methods for option pricing in Matlab*, within the Course “IMEF-3: Corso di Alta Formazione in Energy Finance & Commodity Trading”, MIP School of Management, Politecnico di Milano.
- March 12, 2008 : 4 hours of lecture on *Stochastic Finite Elements: theory and applications* within the Short Course on “Advanced Computational Methods in Earthquake Engineering and Engineering Seismology”, European School for Advanced Studies in Reduction of Seismic Risk (ROSE School), Pavia, March 10-14, 2008.
- February 25<sup>th</sup> - March 1<sup>st</sup>, 2002 : course on *Systèmes différentiels continus et discrets* within the “DEA Informatique et Modélisation”, Université Libanaise, Beirut, Lebanon.

## Computer Skills

- *Languages* : FORTRAN 90, Matlab, elements of C++, FreeFem++
- *Utilities* : Latex, AVS, Tecplot, PowerPoint.
- *Operating Systems* : UNIX, Linux, WindowsNT

## Languages

- mother tongue : Italian
- good knowledge of spoken and written English and French

## List of Publications

Some of the following papers can be downloaded from <http://mox.polimi.it/~nobile>

### Refereed Journal Publications

- [1] F. Nobile and R. Tempone, “Analysis and implementation issues for the numerical approximation of parabolic equations with random coefficients,” *Int. J. Num. Methods Engrg.*, vol. 80, no. 6–7, pp. 979–1006, 2009. Special Issue: Uncertainty Quantification in Computational and Prediction Science.
- [2] S. Badia, F. Nobile, and C. Vergara, “Robin-Robin preconditioned Krylov methods for fluid-structure interaction problems,” *Comput. Methods Appl. Mech. Engrg.*, vol. 198, no. 33-36, pp. 2768–2784, 2009.
- [3] L. Gerardo-Giorda, L. Mirabella, F. Nobile, M. Perego, and A. Veneziani, “A model-based block-triangular preconditioner for the bidomain system in electrocardiology,” *J. Comput. Physics*, vol. 228, no. 10, pp. 3625–3639, 2009.
- [4] F. Nobile, “Coupling strategies for the numerical simulation of blood flow in deformable arteries by 3D and 1D models,” *Mathematical and Computer Modelling*, vol. 49, no. 11–12, pp. 2152–2160, 2009. Special Issue “Trends in Application of Mathematics to Medicine”, D. Bresch, F. Flori, and B. Di Martino, Eds.
- [5] S. Badia, F. Nobile, and C. Vergara, “Fluid-structure partitioned procedures based on Robin transmission conditions,” *J. Comput. Physics*, vol. 227, no. 14, pp. 7027–7051, 2008.
- [6] F. Nobile, R. Tempone, and C. Webster, “An anisotropic sparse grid stochastic collocation method for partial differential equations with random input data,” *SIAM J. Numer. Anal.*, vol. 46, no. 5, pp. 2411–2442, 2008.
- [7] F. Nobile, R. Tempone, and C. Webster, “A sparse grid stochastic collocation method for partial differential equations with random input data,” *SIAM J. Numer. Anal.*, vol. 46, no. 5, pp. 2309–2345, 2008.
- [8] I. Babuška, F. Nobile, and R. Tempone, “Formulation of the static frame problem,” *Comput. Methods Appl. Mech. Engrg.*, vol. 197, no. 29–32, pp. 2496–2499, 2008. Special Issue “Validation Challenge Workshop”.
- [9] I. Babuška, F. Nobile, and R. Tempone, “A systematic approach to model validation based on Bayesian updates and prediction related rejection criteria,” *Comput. Methods Appl. Mech. Engrg.*, vol. 197, no. 29–32, pp. 2517–2539, 2008. Special Issue “Validation Challenge Workshop”.
- [10] F. Nobile and C. Vergara, “An effective fluid-structure interaction formulation for vascular dynamics by generalized Robin conditions,” *SIAM J. Sci. Comp.*, vol. 30, no. 2, pp. 731–763, 2008.
- [11] L. Formaggia, A. Moura, and F. Nobile, “On the stability of the coupling of 3D and 1D fluid-structure interaction models for blood flow simulations,” *ESAIM: Math. Mod. Numer. Anal. (M2AN)*, vol. 41, no. 4, pp. 743–769, 2007.
- [12] I. Babuška, F. Nobile, and R. Tempone, “Reliability of Computational Science,” *Numer. Meth. Partial Diff. Eqs.*, vol. 23, no. 4, pp. 753–784, 2007.
- [13] I. Babuška, F. Nobile, and R. Tempone, “A stochastic collocation method for elliptic partial differential equations with random input data,” *SIAM J. Numer. Anal.*, vol. 45, no. 3, pp. 1005–1034, 2007.
- [14] I. Babuška, F. Nobile, and R. Tempone, “Worst-case scenario analysis for elliptic problems with uncertainty,” *Numer. Math.*, vol. 101, pp. 185–219, 2005.

- [15] P. Causin, J. F. Gerbeau, and F. Nobile, “Added-mass effect in the design of partitioned algorithms for fluid-structure problems,” *Comput. Methods Appl. Mech. Engrg.*, vol. 194, pp. 4506–4527, 2005.
- [16] J. T. Oden, I. Babuška, F. Nobile, Y. Feng, and R. Tempone, “Theory and methodology for estimation and control of errors due to modeling, approximation and uncertainty,” *Comput. Methods Appl. Mech. Engrg.*, vol. 194, pp. 195–204, 2005.
- [17] L. Formaggia and F. Nobile, “Stability analysis of second order time accurate schemes for ALE-FEM,” *Comput. Methods Appl. Mech. Engrg.*, vol. 193, pp. 4097–4116, 2004.
- [18] S. Deparis, M. Fernández, L. Formaggia, and F. Nobile, “Modified fixed point algorithm in fluid-structure interaction,” *C.R. Mécanique*, vol. 331, pp. 525–530, 2003.
- [19] S. Prudhomme, F. Nobile, L. Chamoin, and J. T. Oden, “Analysis of a subdomain-based error estimator for finite element approximations of elliptic problems,” *Num. Meth. Partial Diff. Eqs.*, vol. 20, no. 2, pp. 165–192, 2003.
- [20] L. Formaggia, J. F. Gerbeau, F. Nobile, and A. Quarteroni, “Numerical treatment of defective boundary conditions for the Navier-Stokes equations,” *SIAM J. Numer. Anal.*, vol. 40, no. 1, pp. 376–401, 2002.
- [21] L. Formaggia, J. F. Gerbeau, F. Nobile, and A. Quarteroni, “On the coupling of 3D and 1D Navier-Stokes equations for flow problems in compliant vessels,” *Comput. Methods Appl. Mech. Engrg.*, vol. 191 (2001), pp. 561–582, 2001.
- [22] L. Formaggia, F. Nobile, A. Quarteroni, and A. Veneziani, “Multiscale modelling of the circulatory system: a preliminary analysis,” *Comput. Visual. Sci.*, vol. 2, pp. 75–83, 1999.
- [23] L. Formaggia and F. Nobile, “A stability analysis for the Arbitrary Lagrangian Eulerian formulation with finite elements,” *East-West Journal of Numerical Mathematics*, vol. 7, pp. 105–132, 1999.

## Publications in Lecture Notes, Book Chapters

- [1] J. T. Oden, J. Browne, I. Babuška, C. Bajaj, L. Demkowicz, L. Gray, J. Bass, Y. Feng, S. Prudhomme, F. Nobile, and R. Tempone, “A dynamic data driven computational infrastructure for reliable computer simulations,” in *Computational Science – ICCS 2004, Part III* (P. S. M. Bubak, G. Dick van Albada and J. Dongarra, eds.), Lecture Notes in Computer Science, Springer, 2004. Proceedings of the 4<sup>th</sup> International conference , Kraków, Poland, June 6-9, 2004.
- [2] L. Formaggia, F. Nobile, and A. Quarteroni, “A one dimensional model for blood flow: Application to vascular prosthesis,” in *Mathematical Modeling and Numerical Simulation in Continuum Mechanics* (I. Babuška, P. G. Ciarlet, and T. Miyoshi, eds.), vol. 19 of *Lecture Notes in Computational Science and Engineering*, pp. 137–153, Springer Berlin, 2002. Proceedings of the International Symposium on Mathematical Modeling and Numerical Simulation in Continuum Mechanics, September 29 - October 3, 2000, Yamaguchi, Japan.

## Publications in Conference Proceedings

- [1] L. Formaggia, A. Moura, F. Nobile, and T. Passerini, “The interplay of different models in the simulation of the cardiovascular system,” in *Proceedings of APCOM07, in conjunction with EPMESC XI – CDROM*, (Kyoto, Japan.), December 3-6 2007.

- [2] I. Babuška, F. Nobile, and R. Tempone, “Spectral collocation for partial differential equations with random coefficients,” *Oberwolfach Rep.*, vol. 2, no. 4, pp. 2824–2827, 2005. Abstract from the workshop ”Reactive flow and transport through complex systems”, held October 30–November 5, 2005, organized by C.J. van Duijn, A. Mikelić and C. Schwab.
- [3] I. Babuška, F. Nobile, and R. Tempone, “Worst-case scenario analysis for elliptic PDE’s with uncertainty,” in *Structural Dynamics EUROODYN 2005* (C. Soize and G. Schuëller, eds.), Millpress, Rotterdam, 2005. Proceedings of the 6<sup>th</sup> international Conference on Structural Dynamics, Paris, September 4-7, 2005.
- [4] P. Causin, J. F. Gerbeau, and F. Nobile, “Added mass effect in the design of partitioned fluid structure algorithms,” *Oberwolfach Rep.*, vol. 2, no. 1, pp. 487–490, 2005. Abstract from the Mini-workshop ”Interface Problems in Computational Fluid Dynamics”, held February 20–26, 2005, organized by E. Bänsch, L. Tobiska and N.J. Walkington.
- [5] S. Deparis, M. Fernández, L. Formaggia, and F. Nobile, “Acceleration of a fixed point algorithm for fluid-structure interaction using transpiration conditions,” in *Computational Fluid and Solid Mechanics 2003* (K. Bathe, ed.), Elsevier Science, 2003. Proceedings of the Second M.I.T. Conference on Computational Fluid and Solid Mechanics, held in Cambridge, Massachusetts, USA, June 17 - 20, 2003.
- [6] L. Formaggia, F. Nobile, and A. Quarteroni, “Fluid flows in compliant vessels: application to hemodynamics,” in *Computational Fluid and Solid Mechanics* (K. Bathe, ed.), vol. 2, Elsevier Science, 2001. Proceedings of the first MIT Conference on Computational Fluid and Solid Mechanics, held in Cambridge, Massachusetts, USA, June 12-15 2001.
- [7] L. Formaggia, F. Nobile, A. Quarteroni, A. Veneziani, and P. Zunino, “Advances on numerical modeling of blood flow problems,” in *Proceedings of ECCOMAS2000, Barcelona, Spain, September 11-14, 2000 - CDR0M*, 2000.
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