

# Curriculum Vitae of Daniele Boffi

## **Contacts**

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## **Personal information**

Born in Pavia, Italy, 17 January 1968  
Married with three children  
Home address:  
Daniele Boffi  
Via Sora 47  
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## **BASIC INFORMATION**

### **Present position**

2005.01.01 – to date: Full professor of Numerical Analysis, University of Pavia, Italy

### **Affiliations**

Member of the Dipartimento di Matematica “F. Casorati”, University of Pavia, Italy

Associate Researcher at the Istituto di Matematica Applicata e Tecnologie Informatiche (IMATI-C.N.R.) of CNR, Pavia, Italy

Associate Researcher at the Center for Advanced Numerical Simulation (CeSNA-IUSS) of IUSS, The Institute for Advanced Studies in Pavia, Italy

### **Education**

Ph.D. in Mathematics at the University of Pavia, 21 November 1996. Thesis title: *Elementi finiti misti per il problema di Stokes* (advisor prof. Franco Brezzi)

Degree in Mathematics (*Laurea in Matematica*) given by the University of Pavia, 21 November 1990 (grade *110/110 e lode*, cum laude, with honors). Thesis title: *Criteri di ampiezza su spazi algebrici* (advisor prof. Maurizio Cornalba)

### **Past positions**

2000.10.01 – 2004.12.31: Associate professor of Numerical Analysis, University of Pavia

1995.01.17 – 2000.9.30: Assistant professor (*ricercatore*) of Mathematical Analysis, University of Pavia

1991.11.1 – 1995.10.30: Ph.D. student in Mathematics (joint program at Universities Milano-Pavia-Brescia)

### **Visiting positions**

Here I am only listing visits longer than a week

2013.03.22 – 2013.03.29: Yonsei University, Seoul, Korea (hosts C. Carstensen and Eun-Jae Park)

2012.06.27 – 2012.07.08: University of Buenos Aires, Departamento de Matemática (host R. Durán)

- 2011.08.07 – 2011.08.19: Kunming University, Peking University, Chinese Academy of Sciences, China (hosts J. Xu and J. Hu)
- 2010.10.20 – 2010.11.07: IMA, University of Minnesota, USA (host D.N. Arnold)
- 2009.05.06 – 2009.05.20: IRMAR, Université de Rennes 1, France (hosts M. Costabel and M. Dauge)
- 2008.04.27 – 2008.05.12: ICES, University of Texas at Austin, USA (host L. Demkowicz)
- 2004.05.17 – 2004.05.28: ICES, University of Texas at Austin, USA (host L. Demkowicz)
- 2003.01.20 – 2003.01.31: IRMAR, Université de Rennes 1, France (hosts M. Costabel and M. Dauge)
- 2002.05.01 – 2002.05.31: TICAM, University of Texas at Austin, USA (host L. Demkowicz)
- 1999.10.01 – 1999.10.31: Departamento de Ingeniería Matemática, Universidad de Concepción, Chile (host R. Rodríguez)
- 1998.08.16 – 1999.08.15: Math. Department, Penn State University, USA (host D.N. Arnold)

## RESEARCH

### *Research highlights*

**FEMs FOR MIXED FORMULATIONS AND STOKES PROBLEM.** I’ve worked on the mathematical analysis of the mixed finite element approximation of several partial differential equations (Stokes problem, in particular). I contributed to a book which has been recently sent to Springer for publication in SSCM: D. Boffi, F. Brezzi, M. Fortin “*Mixed Finite Element Methods and Applications*” (extended 2nd edition of Brezzi–Fortin book).

**APPROXIMATION OF EIGENVALUE PROBLEMS AND APPLICATIONS TO ELECTROMAGNETISM.** One of my primary research achievements concerns the methodological study of finite element approximation of eigenvalue problems in mixed form. I contributed to the study of edge finite element approximation of eigenvalue problem arising from Maxwell’s equation (discrete compactness). See, in particular, D. Boffi “*Finite element approximation of eigenvalue problems*, Acta Numer., 19, 2010, pp. 1–120.

### *Research interests*

My primary research interests concern with the finite element approximation of partial differential equations. In general, I am working on the finite element approximation of partial differential equations in mixed form. I started during my Ph.D. with the study of **mixed finite elements for Stokes problem**. In particular, I proved the stability for the generalized Hood–Taylor elements in two and three space dimensions, thus giving a final solution to a problem that had been investigated by many researchers, including Bercovier, Pironneau, Verfürth, Stenberg, Brezzi, and Falk.

In 1996, I started working on the application of finite elements to **electromagnetism and eigenvalue problems**. In particular, I made my name with the study of the **discrete compactness property for edge finite elements**. This research topic involved also the analysis of the **discretization of eigenvalue problems in mixed form**, where it has been proved that the classical inf-sup conditions are not the natural hypotheses for the good behavior of the discretized eigenmodes. In 2010 I was invited to write a survey article for Acta Numerica; readers can find there the state of the art of the approximation of eigenvalues and eigenvectors arising from partial differential equations: conforming and nonconforming discretizations, mixed form, eigenvalue problem in the language of differential forms. Collaborators for this research include F. Brezzi, M. Costabel, M. Dauge, L. Demkowicz, and L. Gastaldi. Some parts of this research have strong connections with the **finite element exterior calculus**.

During the same years, I also investigated other topics related to finite elements. In particular, I studied the approximation properties of various quadrilateral elements, showing, for instance, that serendipity elements can only achieve suboptimal approximation properties when the meshes are not affine. The same drawback has been shown for popular vector-valued finite element (Raviart–Thomas, Brezzi–Douglas–Marini). Collaborators for this research include D.N. Arnold and R.S. Falk.

Starting in 2003, I begun studying **fluid-structure interactions**. I started investigating the **Immersed**

**Boundary Method** (IBM) and, in particular, its finite element version. My main collaborator for this research is L. Gastaldi. We showed how to get rid of Dirac delta function, whose approximation is one of the main issues in the framework of the original finite difference version of the IBM. We presented a model capable to describe simple configurations and we performed a stability analysis for the time marching scheme. We have a code (2D and 3D) that can confirm our theoretical results.

I published about 70 **papers**. According to Google Scholar, Web of Knowledge, and Scopus, respectively, my **h-index** is equal to 23, 14, and 14, and the total number of **citations** to my papers is equal to 1579, 692, and 677, respectively.

### *Conference invitations*

Here I am only listing a selection of main invitations to conferences and minisymposia

- JSA 13*           Invited speaker at the Journées Singulières Augmentées en l'honneur de Martin Costabel (Rennes, France, August 2013)
- TH70*            Minisymposium invitation (organizers L. Beirao da Veiga, A. Buffa, G. Sangalli) within the conference Advances in Computational Mechanics (San Diego, USA, February 2013)
- Wonapde 13*    Two minisymposium invitations (organizers A. Bermúdez and R. Rodríguez and E.-J. Park) within the Fourth Chilean Workshop on Numerical Analysis of Partial Differential Equations (Concepción, Chile, January 2013)
- JMM 13*           Minisymposium invitation (organizers D.N. Arnold, A. Gillette, M. Holst) within the Joint Math Meetings 2013 (San Diego, USA, January 2013)
- WCCM 12*        Minisymposium invitation (organizers F. Brezzi, L. Franca, D. Marini) within the Tenth World Congress on Computational Mechanics (San Paulo, Brazil, July 2012)
- O.Wolfach 12*   Invitation to Oberwolfach workshop (organizers O. Allix, C. Carstensen, J. Schröder, P. Wriggers), (Oberwolfach, Germany, February 2012)
- NELIA 11*        Plenary talk at the workshop Numerical Simulation in Electromagnetism and Industrial Applications (Santiago de Compostela, Spain, October 2011)
- SC2011*         Minisymposium invitation (organizers C Carstensen and A. Quarteroni) within the International Conference on Scientific Computing (Santa Margherita di Pula, Italy, October 2011)
- EFSWaves*       Plenary talk at the conference Fast Solvers for Simulation, Inversion, and Control of Wave Propagation Problems (Würzburg, Germany, October 2011)
- UMI 11*          Plenary talk at the XIX Congresso UMI (Bologna, Italy, September 2011)
- MG 11*           Plenary talk at the conference Workshop on Algebraic and Multigrid Methods (Kunming, China, August 2011)
- Banff 10*         Invited speaker at the workshop Nonstandard Discretizations for Fluid Flows (Banff, Canada, November 2010)
- IMA 10*          Invited speaker at the workshop Numerical Solutions of Partial Differential Equations: Novel Discretization Techniques (IMA Minneapolis, USA, November 2010)
- ECCM 10*         Minisymposium invitation (organizers L.E. García-Castillo, D. Pardo) within the Forth European Conference on Computational Mechanics (Paris, France, May 2010)
- O.Wolfach 10*    Invitation to Oberwolfach workshop (organizers R.Hiptmair, R Hoppe, P. Joly, U. Langer), (Oberwolfach, Germany, February 2010)
- Levico 09*        Plenary talk at the workshop Mathematical Physics and PDEs, (Levico Terme Italy, September 2009)
- Enumath 09*     Plenary talk at the conference Enumath 2009, (Uppsala, Sweden, July 2009)
- GNCS 09*         Plenary talk at the Assemblea annuale del GNCS (Montecatini Terme, Italy, February 2009)
- ICCPDE 08*      Plenary talk at the conference Recent Trends in Computational Partial Differential Equations 2008 (Mumbai, India, December 2008)
- O.Wolfach 08*    Invitation to Oberwolfach workshop (organizers S.C. Brenner, C. Carstensen, P Monk), (Oberwolfach, Germany, August 2008)

- ECCOMAS* Minisymposium invitation (organizers T.J. Hughes, A. Masud, T. Tezduyar) within the joint WCCM VIII - ECCOMAS V World Congress (Venezia, Italy, June-July 2008)
- USCM09* Minisymposium invitation (organizers L. Demkowicz, P. Devloo, W. Rachowicz) within the Ninth U.S. National Congress on Computational Mechanics (San Francisco, USA, July 2007)
- O.Wolfach 07* Invitation to Oberwolfach workshop (organizers R.Hiptmair, R Hoppe, P. Joly, U. Langer), (Oberwolfach, Germany, February 2007)
- 7WCCM* Minisymposium invitation (organizers H. Matthies and R. Ohayon) within the 7th World Congress on Computational Mechanics (Los Angeles, USA, July 2006)
- Mafelap 06* Minisymposium invitation (organizers I. Aavatsmark and R. Helmig) within Mafelap 2006 (Uxbridge, UK, June 2006)
- MATHEON* Invited speaker at the Matheon Workshop on Computational PDEs (Berlin, Germany, February 2006)
- Oslo05* Invitation to the workshop Compatible Discretizations for Partial Differential Equations (Oslo, Norway, September 2005)
- USCM08* Minisymposium invitation (organizer M Ainsworth) within the Eighth U.S. National Congress on Computational Mechanics (Austin, USA, July 2005)
- O.Wolfach 04* Invitation to Oberwolfach workshop (organizers R.Hiptmair, R Hoppe, U. Langer), (Oberwolfach, Germany, February 2004)
- IMA 04* Invited speaker at the workshop Compatible Spatial Discretization for Partial Differential Equations (IMA Minneapolis, USA, May 2004)
- IT-CHINA 03* Invited speaker at the Convegno Italo-Cinese di Analisi Numerica (Grado, Italy, November 2003)
- ICIAM 03* Minisymposium invitation (organizers H. Kanayama and F. Kikuchi) within ICIAM 2003 (Sydney, Australia, July 2003)
- Mafelap 03* Minisymposium invitation (organizer L. Demkowicz) within Mafelep 2003 (Uxbridge, UK, June 2003)
- LMS 02* Invitation to LMS Durham Symposium on Computational methods for wave propagation in direct scattering (Durham, UK, July 2002)
- NSF-CBMS* Invited speaker within NSF-CBMS conference (Colorado School of Mines, USA, June 2002)
- JEE2* Minisymposium invitation (organizer R. Hoppe) within JEE2 (Toulouse, France, March 2002)
- Enumath 01* Minisymposium invitation (organizers M. Costabel and M. Dauge) within Enumath 2001 (Ischia, Italy, July 2001)
- ECCM 01* Minisymposium invitation (organizer L. Demkowicz) within ECCM-2001 (Krakow, Poland, June 2001)
- Strasbourg 01* Invitation to workshop Numerical Simulation of charged particles (Strasbourg, France, June 2001)
- O.Wolfach 01* Invitation to Oberwolfach workshop (organizers D.N. Arnold, C. Carstensen, R Hoppe), (Oberwolfach, Germany, February 2001)
- ICIAM 99* Minisymposium invitation (organizer J.M. Thomas) within ICIAM 99 (Edinburgh, UK, July 1999)
- Mafelap 99* Minisymposium invitation (organizers M. Costabel and M. Dauge) within Mafelap 99 (Uxbridge, UK, June 1999)
- Plovdiv-98* Plenary speaker at the Ninth International Colloquium on Differential Equations (Plovdiv, Bulgaria, August 1998)
- UMI-95* Keynote lecture (*Conferenza di 30 minuti*) within the XV Convegno UMI (Padova, Italy, September 1995)

### **Seminars**

Here is a list of the most relevant seminars I have given at Italian or foreign institutions

Aug. 2011	Peking University, Beijing, China. School of Mathematical Sciences
Aug. 2011	Chinese Academy of Science, Beijing, China
May 2008	University of Maryland at College Park, USA. Department of Mathematics
Oct. 2007	University of Karlsruhe, Germany. Institut für Angewandte Mathematik II
Jun. 2007	Pennsylvania State University, State College, USA. Department of Mathematics
Apr. 2005	University of Milano, Italy. Dipartimento di Matematica
Jun. 2004	University of Genova, Italy. Dipartimento di Ingegneria Elettrica
Jan. 2003	École Normale Supérieure de Cachan, Antenne de Bretagne, Bruz, France
May 2002	University of Texas at Austin, USA. TICAM Institute
Apr. 2002	University of Brescia. Seminario Matematico
Apr. 2002	Technical University of Milano, Italy. MOX Laboratory
Sep. 1999	University of Padova, Italy. Dipartimento di Matematica Pura e Applicata
May 1999	University of Texas at Austin, USA. TICAM Institute
Nov. 1998	Pennsylvania State University, State College, USA. Department of Mathematics
Nov. 1998	University of Maryland at College Park, USA. Department of Mathematics
Sep. 1998	Pennsylvania State University, State College, USA. Department of Mathematics
Feb. 1996	University of Milano, Italy. Dipartimento di Matematica
Jun. 1994	CRS4, Cagliari, Italy
Dec. 1993	University of Pavia, Italy. Dipartimento di Matematica

## GRANTS

### **Research Grants**

Here is a list of the most recent grants.

2012: GNCS-INDAM (Investigator, PI: A. Veese)

2011-2013: Bilateral project Italy–Argentina (Investigator, PI: P. Marcati, R. Durán)

2011-2012: Bilateral project CNR-CONICET (Investigator)

2011: GNCS-INDAM (PI)

2010-2013: MIUR PRIN 2009 (Investigator, PI: A. Quarteroni)

2010: GNCS-INDAM (Investigator, PI: L. Gastaldi)

2007-2010: MIUR PRIN 2007 (Investigator, PI: A. Quarteroni)

2005-2006: MIUR PRIN 2005 (Investigator, PI: A. Quarteroni)

### **Other Grants**

From 2005 to 2012 I have been the coordinator of the unit of the Department of Mathematics at the University of Pavia within the **Progetto/Piano Lauree Scientifiche**. The aim of the project, named *Orientamento e formazione degli insegnanti - MATEMATICA*, was twofold. From one side, *Orientamento* means to help high school students with their choice for the forthcoming studies. From the other side, *formazione insegnanti* means to provide high school teachers with an opportunity of advanced training in collaboration with university professors. Within this framework I managed a complex network comprising the Department of Mathematics of the University of Pavia and several high schools in Pavia and in the neighboring area.

In 2010 I have been the principal investigator for a research contract in collaboration with **7pixel s.r.l.**. The aim of the research was related to a statistical model of an on-line price search engine; more precisely, the Italian title of the research was: *Modello di previsione dei click ricevuti, all'interno di un motore online di ricerca prezzi, da nuovi prodotti*

In 2009 I have been a co-investigator of a research contract with E. Regazzini in collaboration with **R.S. Ricerca Sviluppo s.r.l.**. The aim of the research was to help the company in the development of an automatic image recognition tool; the ultimate goal was to locate, read, and decode the letters and the numbers appearing in car license plates.

## TEACHING AND ADVISING

### *Teaching activity*

From 1991 to 2000 I have been teaching assistant (*esercitatore*) for the following courses at the University of Pavia, Italy: Analisi Matematica 1 (for students of Engineering: five times); Analisi Matematica 1 (for students of Physics, four times).

From 1998 to 1999 I taught the course Math 141 (Analysis, Numerical Analysis, and Geometry) at the Pennsylvania State University (twice).

From 1999 to date I taught the following courses at the University of Pavia, Italy: Analisi Matematica 2 (students of Physics: twice); Metodi di approssimazione (students of Mathematics: three times); Strumenti Informatici e Matematici di Base (students of Mathematics: five times); Complementi di Analisi Matematica di base (students of Physics: three times); Modellistica Numerica (students of Mathematics: once); Metodi Numerici per la Chimica (students of Chemistry: five times); Elementi Finiti (students of Mathematics: three times); Analisi Numerica delle equazioni differenziali (students of Mathematics: once); Analisi Numerica (students of Mathematics: six times); Istituzioni di Matematiche (students of Biology: twice); Matematica (students of Biology: three times); Laboratorio di Matematica Computazionale (students of Mathematics: once).

I am supervising an average of two/three undergraduate theses (*Tesi di Laurea*) per year.

### *Teaching of advanced courses*

Here is a partial list of my activity during the last years

- |                         |  |
|-------------------------|--|
| 2013 March:             | <i>Finite element approximation of eigenvalue problems arising from partial differential equations.</i> Yonsei University, Seoul (Korea).                |
| 2012 March/April:       | <i>Modellistica numerica.</i> IUSS, The Institute for Advanced Studies in Pavia (Italy)  |
| 2011 August:            | <i>Approximation of Maxwell's equations and eigenvalue problems.</i> Summer School at the Peking University (China)                                      |
| 2010 July:              | <i>Finite Element Approximation of Eigenvalue Problems.</i> Summer School in Computational Mathematics and Scientific Computing, Durham (UK)             |
| 2009 March/April:       | <i>Modellistica numerica.</i> IUSS, The Institute for Advanced Studies in Pavia (Italy)  |
| 2008 March/April:       | <i>Classical computational methods.</i> IUSS, The Institute for Advanced Studies in Pavia (Italy)  |
| 2007 June:              | <i>Finite element approximation of eigenvalue problems and applications.</i> Summer School Zaragoza Numerica, Zaragoza (Spain)                           |
| 2007 May:               | <i>Approximation of variationally posed eigenvalue problems,</i> Advanced course More efficiency in finite elements. Marseille-Luminy, France            |
| 2006 November/December: | <i>Fondamenti di calcolo scientifico.</i> IUSS, The Institute for Advanced Studies in Pavia (Italy)  |
| 2006 June/July:         | <i>Finite elements for the Stokes problem.</i> C.I.M.E. Summer Course Mixed Finite Elements, Compatibility Conditions, and Applications. Cetraro (Italy) |
| 2006 May:               | <i>Stability and Geometric Conservation Laws.</i> ECCOMAS Course on Advanced Computational Methods for Fluid-Structure Interaction, Ibiza (Spain)        |
| 2006 March/April:       | <i>Classical computational methods.</i> IUSS, The Institute for Advanced Studies in Pavia (Italy)  |

- 2005 March/April: *Classical computational methods*. IUSS, The Institute for Advanced Studies in Pavia (Italy)
- 2004 June: *Approssimazione di problemi agli autovalori non coercivi*. Ph.D. course. University of Pavia
- 2004 March/April: *Classical computational methods*. IUSS, The Institute for Advanced Studies in Pavia (Italy)

**Students** (chronological order)

Here I am giving some information about my students who are carrying on their research in Italian or foreign research institutions

**Stefano Gianì** has been a student in Pavia and I supervised his Master thesis in 2003. The title of his thesis is “Calcolo degli Autovalori della Cavità Risonante” (Eigenvalue computation in a resonant cavity): after he got his degrees, he moved to England (Oxford until 2004, Bath until 2008) where he is now research fellow at the University of Nottingham (School of Mathematical Sciences). He published several interesting papers; among those, let me highlight his research on the convergence of adaptive method for the approximation of eigenvalue problems. In 2009, he was awarded with a second Leslie Fox Prize. More information is available from

<http://www.maths.nottingham.ac.uk/personal/pmzsg3/>

**Francesca Gardini** has obtained her Ph.D. degree in 2006 from the University of Pavia under my supervision. She wrote a thesis on “A posteriori error estimates for eigenvalue problems in mixed form”. During her undergraduate studies, she proved a discrete compactness property for quadrilateral finite elements for the approximation of  $H(\text{div})$ . Recently, she has started working with me on fluid-structure interactions. She is now Assistant Professor (*ricercatore*) at the University of Pavia, Italy. More information is available from

<http://www-dimat.unipv.it/gardini>

**Luca Heltai** has obtained his Ph.D. degree in 2007 from the University of Pavia under my supervision. He wrote a thesis on “The finite element immersed boundary method”. He is the author of the first 3D code we have been using for the approximation of fluid-structure interactions. He is an active contributor to the opensource deal.II project and contributed to the project with a module for the IBM. He is now Assistant Professor (*ricercatore*) at the International School for Advanced Studies (SISSA) in Trieste, Italy. More information is available from

<http://people.sissa.it/~heltai>

**Paolo Gatto** has been a student in Pavia and I supervised his Master thesis in 2003. In his thesis he carried on research on the approximation properties of finite elements on distorted hexahedra. His results contributed to a joint paper with R.S. Falk and P. Monk. He is now concluding his Ph.D. in Austin (ICES institute) under the supervision of L. Demkowicz.

**Francesca Bonizzoni** has been a student in Pavia and I supervised her Master thesis in 2009. She has obtained interesting result on the topic of Finite Element exterior calculus and we are now concluding a paper in collaboration of D.N. Arnold on this topic. She is working on the approximation of stochastic partial differential equations and she has just defended her Ph.D. at MOX, Milano.

**Nicola Cavallini** came to Pavia in 2009 as a Post-Doc. Since then, he has been working with my group on fluid-structure interactions. Before coming to Pavia, he obtained his Ph.D. from the University of Ferrara and, during the Ph.D., visited for two years the University of Houston, where he worked with R. Glowinski and collaborators. He has been involved with the latest computations with the finite element immersed boundary method. More information is available from

<http://www-dimat.unipv.it/~cavallini>

**Marco Artina** has been a student in Pavia and I supervised his Master thesis in 2012. He obtained interesting results on the optimization of the linear solver involved with a fluid-structure interaction carried on with the Immersed Boundary Method. He is now involved within a Ph.D. project at the TU Munich (working with M. Fornasier). More information is available from

<http://www-m15.ma.tum.de/Allgemeines/MarcoArtina>

## ADMINISTRATION AND EVALUATION

### *Administrative duties*

Here I am listing some of the most relevant activities I am involved with

- ItaCds* I am the National Coordinator of the Studies in Mathematics (*Coordinatore dei Corsi di Studio in Matematica*) since 2012
- Con.Sci* I am a member of the executive board (*Consiglio Direttivo*) of the *Conferenza Nazionale dei Presidenti e dei Direttori delle Strutture Universitarie di Scienze e Tecnologie* since 2012
- 15* In 2011 I was a member of the *Commissione dei 15* (committee for the new University statute) of the University of Pavia
- NuV* I am a member of the *Nucleo di Valutazione* (University evaluation committee) of the University of Pavia since 2006
- PLS* I served as the coordinator of the *Progetto/Piano Lauree Scientifiche* from 2005 to 2012 at the University of Pavia, Dipartimento di Matematica. From 2008 to 2012 I have been the coordinator of the unit at the University of Pavia (Chemistry, Mathematics, and Physics)
- CCL* I served as *Presidente del Consiglio Didattico in Matematica* (dean responsible for the studies in mathematics) at the University of Pavia from 2004 to 2010
- CCL* I served as *Vicepresidente del Consiglio Didattico in Matematica* (vice-dean responsible for the studies in mathematics) at the University of Pavia from 2001 to 2004
- COR* I have been a university curriculum counselor (*delegato per l'orientamento universitario*) for the Department of Mathematics of the University of Pavia from 2000 to 2004
- AMS* I have been organizer of the Applied Mathematics Seminar at the Department of Mathematics of the University of Pavia and IAN-IMATI/CNR from 2000 to 2003
- IT* I served as a member of the IT Committee (*Commissione informatica*) of the Department of Mathematics of the University of Pavia from 1999 to 2004 and from 2010 to date. I am in charge of the computer classroom of the Department since 2000. I served as a member of the IT Committee (*Commissione informatica*) of the faculty of Science of the University of Pavia from 2006 to 2009 and of the University of Pavia from 2006 to 2007
- Giunta* I served as a member of the *Giunta del Dipartimento di Matematica* (Executive Committee of the Department of Mathematics) at the University of Pavia from 1998 to 2004

### *Conference organization*

Here I am listing the more relevant scientific events that I contributed to organize during the last years

- EFEF* I am a founder member of the European Organizing Committee of the EFEF Conference Series (European Finite Element Fair). More information on the event can be retrieved, for instance, from  
<http://www.math.chalmers.se/~stig/efef.html>  
The series started in 2003 in Cambridge and continued in Berlin (2004), Pavia (2005), Zürich (2006), Marseille (2007), Göteborg (2008), Helsinki (2009), Warwick (2010), Paris (2011), and Bilbao (2012). The 2013 edition will take place in Heraklion, Crete (Greece)
- COUPLED* I am member of the Scientific Committee of Coupled Problems in Science and Engineering (Ibiza, Spain, June 2013)
- COUPLED* I am organizing an invited session (with L. Gastaldi) within Coupled Problems in Science and Engineering (Ibiza, Spain, June 2013)
- CST2012* I was a member of the Editorial Board of The Eleventh International Conference on Computational Structures Technology (Dubrovnik, Croatia, September 2012)
- 3INDAMPV* In 2010 I organized an international workshop in Pavia (with A. Buffa, C. Lovadina, I. Perugia, G. Sangalli) on “Non-Standard Numerical Methods for PDE’s”. More information can be retrieved from



The workshop had over 100 participants. Invited speakers included D.N. Arnold, F. Brezzi, E. Cohen, L. Demkowicz, T. Dokken, R. Hiptmair, K. Lipnikov, P. Monk.

- ECT2010* I was a member of the Editorial Board of The Seventh International Conference on Engineering Computational Technology (Valencia, Spain, September 2010)
- COUPLED* I contributed to the organization (with L. Gastaldi) of an invited session within Coupled Problems in Science and Engineering (Ischia, Italy, June 2009)
- CST2008* I was a member of the Editorial Board of The Ninth International Conference on Computational Structures Technology (Athens, Greece, September 2008)
- ICIAM 07* I contributed to the organization (with L. Zikatanov) of a minisymposium within the 6th International Congress on Industrial and Applied Mathematics (Zürich, Switzerland, July 2007)
- CIME 06* In 2006 I organized (with Lucia Gastaldi) a C.I.M.E. summer school on “Mixed finite elements, compatibility conditions, and applications”. The main lecturers were D. Boffi, F. Brezzi, L. Demkowicz, R. Durán, R.S. Falk, and M. Fortin.
- MIT 05* I contributed to the organization (with L. Gastaldi) of a minisymposium within the Third M.I.T. Conference on Computational Fluid and Solid Mechanics (MIT Cambridge, USA, June 2005)
- COUPLED* I contributed to the organization (with L. Gastaldi) of an invited session within Coupled Problems in Science and Engineering (Santorini, Greece, June 2005)
- MIT 03* I contributed to the organization (with L. Gastaldi) of a minisymposium within the Second M.I.T. Conference on Computational Fluid and Solid Mechanics (MIT Cambridge, USA, June 2003)
- MIT 01* I contributed to the organization (with L. Gastaldi) of a minisymposium within the First M.I.T. Conference on Computational Fluid and Solid Mechanics (MIT Cambridge, USA, June 2001)
- AMIF 00* I contributed to the organization (with L. Gastaldi) of a minisymposium within the AMIF conference (Il Ciocco, Italy, October 2000)

### ***Editorial activities and research evaluation***

I am managing editor of *Computers & Mathematics with Applications* since 2012, when Leszek Demkowicz became Editor in Chief of this journal. Together with three other managing editors (A. Düster, J. Gopalakrishnan, and W. Rachowicz) we are supporting L. Demkowicz in redirecting the journal towards new and redefined Aims & Scopes.

I am serving as a reviewer for most journals in the field (including, SINUM, Math. Comp., CMAME, JCP, M<sup>3</sup>AS...).

I have been asked to assess several research project. Institutions asking me to assess projects or people include: Chalmers University of Technology in Sweden, National Council for Research and Development of Romania, ISCRA Italian SuperComputing Resource Allocation, ANVUR, Netherlands Organisation for Scientific Research, US NSF, University of Rutgers Math. Department, University of Padova Italy, University of Cagliari Italy.

## **BIBLIOGRAPHY**

### ***Papers in refereed journals (reverse chronological order)***

- [1] D. N. Arnold, D. Boffi, and F. Bonizzoni, “Tensor product finite element differential forms and their approximation properties,” *arXiv preprint 1212.6559*, 2012.

- [2] D. Boffi and L. Gastaldi, “Some remarks on finite element approximation of multiple eigenvalues,” *Applied Numerical Mathematics*, 2012. To appear.
- [3] D. Boffi, A. Buffa, and L. Gastaldi, “Convergence analysis for hyperbolic evolution problems in mixed form,” *Applied Numerical Mathematics*, 2012. To appear.
- [4] D. Boffi, N. Cavallini, F. Gardini, and L. Gastaldi, “Stabilized Stokes elements and local mass conservation,” *Bollettino U.M.I.*, vol. 9, no. V, pp. 543–573, 2012.
- [5] D. Boffi, “The immersed boundary method for fluid-structure interactions: mathematical formulation and numerical approximation,” *Bollettino U.M.I.*, vol. 9, no. V, pp. 711–724, 2012.
- [6] D. Boffi and L. Gastaldi, “Some remarks on quadrilateral mixed finite elements,” *Computers & Structures*, vol. 87, pp. 751–757, 2009.
- [7] D. Boffi, N. Cavallini, F. Gardini, and L. Gastaldi, “Local mass conservation of Stokes finite elements,” *J. Sci. Comput.*, vol. 52, no. 2, pp. 383–400, 2012.
- [8] D. Boffi, N. Cavallini, and L. Gastaldi, “Finite element approach to immersed boundary method with different fluid and solid densities,” *Math. Models Methods Appl. Sci.*, vol. 21, no. 12, pp. 2523–2550, 2011.
- [9] D. Boffi, M. Costabel, M. Dauge, L. Demkowicz, and R. Hiptmair, “Discrete compactness for the  $p$ -version of discrete differential forms,” *SIAM J. Numer. Anal.*, vol. 49, no. 1, pp. 135–158, 2011.
- [10] D. Boffi, “Finite element approximation of eigenvalue problems,” *Acta Numer.*, vol. 19, pp. 1–120, 2010.
- [11] D. Boffi, F. Brezzi, and M. Fortin, “Reduced symmetry elements in linear elasticity,” *Commun. Pure Appl. Anal.*, vol. 8, no. 1, pp. 95–121, 2009.
- [12] D. Boffi, L. Gastaldi, L. Heltai, and C. S. Peskin, “On the hyper-elastic formulation of the immersed boundary method,” *Comput. Methods Appl. Mech. Engrg.*, vol. 197, no. 25-28, pp. 2210–2231, 2008.
- [13] D. Boffi, L. Gastaldi, and L. Heltai, “Numerical stability of the finite element immersed boundary method,” *Math. Models Methods Appl. Sci.*, vol. 17, no. 10, pp. 1479–1505, 2007.
- [14] D. Boffi, “Approximation of eigenvalues in mixed form, discrete compactness property, and application to  $hp$  mixed finite elements,” *Comput. Methods Appl. Mech. Engrg.*, vol. 196, no. 37-40, pp. 3672–3681, 2007.
- [15] D. Boffi, L. Gastaldi, and L. Heltai, “On the CFL condition for the finite element immersed boundary method,” *Comput. & Structures*, vol. 85, no. 11-14, pp. 775–783, 2007.
- [16] D. Boffi, L. Gastaldi, and L. Heltai, “Stability results and algorithmic strategies for the finite element approach to the immersed boundary method,” in *Numerical mathematics and advanced applications*, pp. 575–582, Berlin: Springer, 2006.
- [17] D. Boffi, M. Conforti, and L. Gastaldi, “Modified edge finite elements for photonic crystals,” *Numer. Math.*, vol. 105, no. 2, pp. 249–266, 2006.
- [18] D. Boffi and L. Gastaldi, “Interpolation estimates for edge finite elements and application to band gap computation,” *Appl. Numer. Math.*, vol. 56, no. 10-11, pp. 1283–1292, 2006.
- [19] D. Boffi, “On the finite element method on quadrilateral meshes,” *Appl. Numer. Math.*, vol. 56, no. 10-11, pp. 1271–1282, 2006.
- [20] D. Boffi, M. Costabel, M. Dauge, and L. Demkowicz, “Discrete compactness for the  $hp$  version of rectangular edge finite elements,” *SIAM J. Numer. Anal.*, vol. 44, no. 3, pp. 979–1004, 2006.
- [21] D. Boffi, F. Kikuchi, and J. Schöberl, “Edge element computation of Maxwell’s eigenvalues on general quadrilateral meshes,” *Math. Models Methods Appl. Sci.*, vol. 16, no. 2, pp. 265–273, 2006.
- [22] D. N. Arnold, D. Boffi, and R. S. Falk, “Quadrilateral  $H(\text{div})$  finite elements,” *SIAM J. Numer. Anal.*, vol. 42, no. 6, pp. 2429–2451 (electronic), 2005.
- [23] D. Boffi and L. Gastaldi, “Analysis of finite element approximation of evolution problems in mixed form,” *SIAM J. Numer. Anal.*, vol. 42, no. 4, pp. 1502–1526 (electronic), 2004.
- [24] D. Boffi and L. Gastaldi, “Stability and geometric conservation laws for ALE formulations,” *Comput. Methods Appl. Mech. Engrg.*, vol. 193, no. 42-44, pp. 4717–4739, 2004.

- [25] D. Boffi and L. Gastaldi, “On the time-harmonic Maxwell equations in general domains,” in *Numerical mathematics and advanced applications*, pp. 243–253, Springer Italia, Milan, 2003.
- [26] D. Boffi, L. Demkowicz, and M. Costabel, “Discrete compactness for  $p$  and  $hp$  2D edge finite elements,” *Math. Models Methods Appl. Sci.*, vol. 13, no. 11, pp. 1673–1687, 2003.
- [27] D. Boffi and L. Gastaldi, “A finite element approach for the immersed boundary method,” *Comput. & Structures*, vol. 81, no. 8-11, pp. 491–501, 2003. In honour of Klaus-Jürgen Bathe.
- [28] D. Boffi and L. Gastaldi, “On the quadrilateral  $Q_2$ - $P_1$  element for the Stokes problem,” *Internat. J. Numer. Methods Fluids*, vol. 39, no. 11, pp. 1001–1011, 2002.
- [29] D. Boffi and L. Gastaldi, “Edge finite elements for the approximation of Maxwell resolvent operator,” *M2AN Math. Model. Numer. Anal.*, vol. 36, no. 2, pp. 293–305, 2002.
- [30] D. N. Arnold, D. Boffi, and R. S. Falk, “Approximation by quadrilateral finite elements,” *Math. Comp.*, vol. 71, no. 239, pp. 909–922 (electronic), 2002.
- [31] D. Boffi and L. Gastaldi, “Eigenmodes computation on quadrilateral meshes,” *Comput. Vis. Sci.*, vol. 4, no. 2, pp. 87–92, 2001. Second AMIF International Conference (Il Ciocco, 2000).
- [32] D. N. Arnold, D. Boffi, R. S. Falk, and L. Gastaldi, “Finite element approximation on quadrilateral meshes,” *Comm. Numer. Methods Engrg.*, vol. 17, no. 11, pp. 805–812, 2001.
- [33] D. Boffi, “A note on the de Rham complex and a discrete compactness property,” *Appl. Math. Lett.*, vol. 14, no. 1, pp. 33–38, 2001.
- [34] D. Boffi, M. Farina, and L. Gastaldi, “On the approximation of Maxwell’s eigenproblem in general 2D domains,” *Computers & Structures*, vol. 79, pp. 1089–1096, 2001.
- [35] D. Boffi, “Fortin operator and discrete compactness for edge elements,” *Numer. Math.*, vol. 87, no. 2, pp. 229–246, 2000.
- [36] D. Boffi, C. Chinosi, and L. Gastaldi, “Approximation of the grad div operator in nonconvex domains,” *CMES Comput. Model. Eng. Sci.*, vol. 1, no. 2, pp. 31–43, 2000.
- [37] D. Boffi, C. Chinosi, and L. Gastaldi, “Penalized approximation of the vibration frequencies of a fluid in a cavity,” *Comput. Visual Sci.*, vol. 3, pp. 19–23, 2000.
- [38] D. Boffi, F. Brezzi, and L. Gastaldi, “On the problem of spurious eigenvalues in the approximation of linear elliptic problems in mixed form,” *Math. Comp.*, vol. 69, no. 229, pp. 121–140, 2000.
- [39] D. Boffi, R. G. Duran, and L. Gastaldi, “A remark on spurious eigenvalues in a square,” *Appl. Math. Lett.*, vol. 12, no. 3, pp. 107–114, 1999.
- [40] D. Boffi, P. Fernandes, L. Gastaldi, and I. Perugia, “Computational models of electromagnetic resonators: analysis of edge element approximation,” *SIAM J. Numer. Anal.*, vol. 36, no. 4, pp. 1264–1290, 1999.
- [41] D. Boffi and G. Cornetti, “A mixed finite element projection method for the incompressible Navier-Stokes equations,” *Pubblicazione IAN/CNR*, vol. 1092, 1998.
- [42] D. Boffi, F. Brezzi, and L. Gastaldi, “On the convergence of eigenvalues for mixed formulations,” *Ann. Scuola Norm. Sup. Pisa Cl. Sci. (4)*, vol. 25, no. 1-2, pp. 131–154, 1997. Dedicated to Ennio De Giorgi.
- [43] E. Alessandrini, D. Boffi, and A. Torelli, “Study of an obstacle vortex free boundary problem,” *Boll. Un. Mat. Ital. A (7)*, vol. 11, no. 3, pp. 747–757, 1997.
- [44] D. Boffi, “Three-dimensional finite element methods for the Stokes problem,” *SIAM J. Numer. Anal.*, vol. 34, no. 2, pp. 664–670, 1997.
- [45] D. Boffi and C. Lovadina, “Remarks on augmented Lagrangian formulations for mixed finite element schemes,” *Boll. Un. Mat. Ital. A (7)*, vol. 11, no. 1, pp. 41–55, 1997.
- [46] D. Boffi and C. Lovadina, “Analysis of new augmented Lagrangian formulations for mixed finite element schemes,” *Numer. Math.*, vol. 75, no. 4, pp. 405–419, 1997.
- [47] E. Alessandrini, D. Boffi, and A. Torelli, “On a new weak formulation for an obstacle vortex free boundary problem,” *Istit. Lombardo Accad. Sci. Lett. Rend. A*, vol. 130, no. 1-2, pp. 237–253 (1997), 1996.

- [48] D. Boffi, “Minimal stabilizations of the  $P_{k+1}$ - $P_k$  approximation of the stationary Stokes equations,” *Math. Models Methods Appl. Sci.*, vol. 5, no. 2, pp. 213–224, 1995.
- [49] D. Boffi and D. Funaro, “An alternative approach to the analysis and the approximation of the Navier-Stokes equations,” *J. Sci. Comput.*, vol. 9, no. 1, pp. 1–16, 1994.
- [50] D. Boffi, “Stability of higher order triangular Hood-Taylor methods for the stationary Stokes equations,” *Math. Models Methods Appl. Sci.*, vol. 4, no. 2, pp. 223–235, 1994.

### ***Editorial activity***

- [1] D. Boffi, F. Brezzi, L. F. Demkowicz, R. G. Durán, R. S. Falk, and M. Fortin, *Mixed finite elements, compatibility conditions, and applications*, vol. 1939 of *Lecture Notes in Mathematics*. Berlin: Springer-Verlag, 2008. Lectures given at the C.I.M.E. Summer School held in Cetraro, June 26–July 1, 2006, Edited by Boffi and Lucia Gastaldi.

### ***Books or chapters of book (reverse chronological order)***

- [1] D. Boffi, F. Brezzi, and M. Fortin, *Mixed finite element methods and applications*. Springer Series in Computational Mathematics (SSCM), Springer-Verlag, 2012. In press.
- [2] D. Boffi, F. Gardini, and L. Gastaldi, “Some remarks on eigenvalue approximation by finite elements,” in *Frontiers in Numerical Analysis – Durham 2010*, vol. 85 of *Springer Lecture Notes in Computational Science and Engineering*, pp. 1–77, Springer-Verlag, 2012.
- [3] D. Boffi, F. Brezzi, and M. Fortin, “Finite elements for the Stokes problem,” in *Mixed finite elements, compatibility conditions, and applications* (D. Boffi and L. Gastaldi, eds.), vol. 1939 of *Springer Lecture Notes in Mathematics*, pp. 45–100, Springer-Verlag, 2008.
- [4] D. Boffi, “Compatible discretizations for eigenvalue problems,” in *Compatible spatial discretizations*, vol. 142 of *IMA Vol. Math. Appl.*, pp. 121–142, New York: Springer, 2006.
- [5] D. Boffi, “Finite elements for the time harmonic Maxwell’s equations,” in *Computational electromagnetics (Kiel, 2001)*, vol. 28 of *Lect. Notes Comput. Sci. Eng.*, pp. 11–22, Berlin: Springer, 2003.

### ***Papers in refereed proceedings (reverse chronological order)***

- [1] D. Boffi, N. Cavallini, G. Francesca, and L. Gastaldi, “Immersed boundary method: performance analysis of popular finite element spaces,” in *COUPLED PROBLEMS 2011* (M. Papradakakis, E. Oñate, and B. Schrefler, eds.), Cimne, 2011.
- [2] D. Boffi, “Discrete differential forms, approximation of eigenvalue problems, and application to the  $p$  version of edge finite elements,” in *Numerical Mathematics and Advanced Applications 2009* (G. Kreiss, P. Lötstedt, A. Målqvist, and M. Neytcheva, eds.), pp. 3–14, Springer-Verlag, 2010.
- [3] D. Boffi, L. Gastaldi, and L. Heltai, “The finite element immersed boundary method: model, stability, and numerical results,” in *COUPLED PROBLEMS 2005* (M. Papradakakis, E. Oñate, and B. Schrefler, eds.), Cimne, 2005.
- [4] D. Boffi, L. Gastaldi, and L. Heltai, “Stability results for the finite element approach to the immersed boundary method,” in *Computational fluid and solid mechanics 2005* (K.-J. Bathe, ed.), pp. 93–96, 2005.
- [5] D. Boffi, L. Gastaldi, and L. Heltai, “A finite element approach to the immersed boundary method,” in *Progress in Engineering Computational Technology* (B. Topping and C. Mota Soares, eds.), ch. 12, pp. 271–298, Stirling: Saxe-Coburg Publications, 2004.
- [6] D. Boffi and L. Gastaldi, “The immersed boundary method: a finite element approach,” in *Computational fluid and solid mechanics 2003* (K.-J. Bathe, ed.), pp. 1263–1266, 2003.

- [7] D. Boffi, “On the time harmonic Maxwell equations,” in *Proceedings of the JEE’02 Symposium* (B. Michielsen and F. Dacavèle, eds.), pp. 25–28, 2002.
- [8] D. Boffi, L. Gastaldi, and G. Naldi, “Application of Maxwell equations,” in *SIMAI 2002*, 2002.
- [9] D. Arnold, D. Boffi, and R. Falk, “Remarks on quadrilateral Reissner–Mindlin plate elements,” in *WCCM V, Fifth Congress on Computational Mechanics* (H. Mang, F. Rammerstorfer, and J. Eberhardsteiner, eds.), 2002.
- [10] D. Boffi and L. Gastaldi, “On the “ $-\text{grad div} + s \text{ curl rot}$ ” operator,” in *Computational fluid and solid mechanics, Vol. 1, 2* (Cambridge, MA, 2001), pp. 1526–1529, Amsterdam: Elsevier, 2001.
- [11] D. Boffi and L. Gastaldi, “On the q2-p1 stokes element,” in *Proceedings of the 14th Nordic Seminar on Computational Mechanics* (Beldie et als., ed.), pp. 91–93, 2002.
- [12] D. Boffi and L. Gastaldi, “Remarks on quadrilateral finite elements for a fluid-structure eigenproblem,” in *European Congress on Computational Methods in Applied Sciences and Engineering. ECCOMAS 2000*, 2000.
- [13] D. Boffi and L. Gastaldi, “Finite element approximation of maxwell’s eigenproblem,” in *Proceedings of Enumath99* (P. Neittaanmäki, T. Tiihonen, and P. Tarvainen, eds.), pp. 502–509, Singapore: World Scientific, 2000.
- [14] D. Boffi, P. Fernandes, L. Gastaldi, and I. Perugia, “Edge approximation of eigenvalue problems arising from electromagnetics,” in *Numerical methods in Engineering ’96* (Desideri, L. Tallec, Oñate, Periaux, and Stein, eds.), pp. 502–509, 1996.
- [15] D. Boffi, F. Brezzi, and L. Gastaldi, “Mixed finite elements for Maxwell’s eigenproblem: the question of spurious modes,” in *ENUMATH 97 (Heidelberg)*, pp. 180–187, World Sci. Publ., River Edge, NJ, 1998.

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