Prof. Lorena Barba

Education and training:

Institution	Major	Degree	Year
Universidad Tecnica Federico Santa Maria, Chile	Mechanical Engineering	BSc	1989
Universidad Tecnica Federico Santa Maria, Chile	Mechanical Engineering	PEng	1998
California Institute of Technology, Pasadena, CA	Aeronautics	MSc	1999
California Institute of Technology, Pasadena, CA	Aeronautics	PhD	2004

Research and professional experience:

09/2008– Assistant Professor, Mechanical Engineering, Boston University

08/2004–09/2008 Lecturer in Applied Mathematics, University of Bristol, UK

Honors and awards:

02/2012 National Science Foundation CAREER award.

08/2011 NVIDIA Academic Partnership award ($25,000 unrestricted cash award)

01/2008 *Rising Star* Teaching Award for the Faculty of Science, University of Bristol

3/2005 The Nuffield Foundation Award to Newly Appointed Lecturers in Science, Engineering and Mathematics (£5000)

1999 *Amelia Earhart Fellowship Award*, for aerospace-related graduate studies at doctoral level, Zonta International Foundation ($6000).

Publications:

* Simon K. Layton, Anush Krishnan, L. A. Barba, cuIBM—A GPU-accelerated immersed boundary method, Submitted 2011. Preprint on arXiv:1109.3524
* Rio Yokota, L. A. Barba, Tetsu Narumi, Kenji Yasuoka, Petascale turbulence simulation using a highly parallel fast multipole method, *Computer Physics Communications*. Accepted, under revision. Preprint on arXiv:1106.5273
* Rio Yokota, L. A. Barba, A tuned and scalable fast multipole method as a preeminent algorithm for exascale systems, *Int. J. High-Performance Computing and Applications*. In press; published online Jan. 2012, doi:10.1177/1094342011429952
* Felipe A. Cruz, Simon K. Layton, L. A. Barba, How to obtain efficient GPU kernels: an illustration using FMM & FGT, *Computer Physics Communications*, **182**(10):2084–2098 (2011) doi:10.1016/j.cpc.2011.05.002
* Rio Yokota, Jaydeep P. Bardhan, Matthew G. Knepley, L. A. Barba, Tsuyoshi Hamada, Biomolecular electrostatics using a fast multipole BEM on up to 512 GPUs and a billion unknowns, *Computer Physics Communications*, **182**(6):1271–1283 (2011) doi:10.1016/j.cpc.2011.02.013
* Rio Yokota, L. A. Barba, Treecode and fast multipole method for N-body simulation with CUDA, Ch. 9 in GPU *Gems Emerald Edition*, Wen-mei Hwu, ed.; Morgan Kaufmann/Elsevier (Jan. 2011), pp. 113–132. Preprint on arXiv:1010.1482
* Felipe A. Cruz, L. A. Barba, Matthew G. Knepley, PetFMM—a dynamically load-balancing parallel fast multipole library. *Int. J. Num. Meth. Fluids*; doi:10.1002/nme.2972 (2010).
* Rio Yokota, L. A. Barba, Matthew G. Knepley, PetRBF—a parallel $\mathcal{O}(N)$ algorithm for radial basis function interpolation, *Comput. Meth. Appl. Mech. Eng.*, **199**(25–28):1793–1804 doi:10.1016/j.cma.2010.02.008 (2010).

Synergistic activities:

Dr Barba has consistently advocated and participated in the open science philosophy. Within her research group, all software developed is open-source and publicly available, at the different stages of development. Moderate-size codes are uploaded to Google code at the time of submission of a manuscript, while the preprint is uploaded to the Arxiv repository. More complex software projects have a public version-controlled repository, while documentation and links are provided on an informative and well-maintained group website.

Consistent with the open science commitment, Dr Barba also has engaged in the open course-ware movement. Her latest two courses taught at Boston University have been made available publicly in the form of (video) screencasts via iTunes U.

Jan.'11 *"PASI—Pan-American Advanced Studies Institute. Scientific Computing in the Americas: The challenge of massive parallelism"* (Valparaíso, Chile). Two-week advanced studies institute, organized entirely by Dr Barba and funded by NSF via award OISE-1036435 (amount $100,600). The focus of this PASI is on scientific discovery by means of high-performance computing, HPC, using the latest many-core computer hardware, in particular graphics processors, or GPUs. Dr Barba has been promoting GPU technology with her contacts in Latin America, as a technology that can level the playing field for countries of the "scientifically developing" category. Bringing this event to Chile aims at building scientific capacity, promoting collaboration, and advanced training of young researchers in HPC.

Nov.'05–Jul.'09 *"SCAT—Scientific Computing Advanced Training"*: Dr Barba put together an international network of collaboration involving 10 institutions in 6 countries, and prepared a proposal to the European Commission co-operation office for a grant under *Programme ALFA II*, for projects of collaboration of higher-education institutions in Europe and Latin America, for scientific and technical training and knowledge transfer. The proposal was successful and the project was awarded a budget of nearly **€1.4 million** for the whole duration. It was one of only six projects funded in 2005 within this program. The SCAT project involved more than 40 professors and researchers, it awarded nearly 30 grants for graduate students and postdocs to travel to a guest institution within the network to carry out research as a visiting scholar (for a collective 235 funded graduate-student months), and sponsored 10 international scientific meetings. Dr Barba hosted 6 of the grantees at Bristol, 4 of which continued studies in PhD programs around the world. More information on the website: `http://www.scat-alfa.eu`

Invited Seminars: Dr Barba has visited the following institutions to give seminars:

In 2010: Columbia University, Brown University, Worcester Polytechnic Institute.

2008–'09: Harvard University (Initiative in Innovative Computing, IIC), Illinois Institute of Technology, Purdue University, Northwestern University, University of Sussex UK, Instituto Madrileno de Estudios Avanzados IMDEA, Madrid.

2004–'07 University of Delaware, Exeter University UK, Technical University of Eindhoven, Johns Hopkins University, Bath University UK, ETH Zurich (Institute of Computational Science), University of Southampton UK, University of Leicester UK (Centre for Mathematical Modelling).