# Symposium of the International Association for Boundary Element Methods

**Paris, June 26-28 2018**

# Preface

Dear colleagues,

A very warm welcome to the IABEM symposium 2018 in Paris.

This symposium series has a long history and serves as an informal meeting for researchers working in the wide field of boundary integral/element methods. I am quite happy to see in the program that this meeting also perpetuates a very unique tradition of having participants from both applied mathematics and engineering. This allows fruitful interdisciplinary discussions and helps initiating interdisciplinary collaborations.

The IABEM community is an open community without any fees or strict memberships. The main focus of IABEM is to bring together researchers, stimulate scientific interactions, and provide with the symposium a stage for presenting new ideas for BIE/BEM. The first IABEM symposium, initiating this series, took place in Rome in 1990. The IABEM community has already been in Paris in 1998 and I have a pleasant memory of this symposium. Now, after 20 years we are back in Paris and two young colleagues, Stéphanie Chaillat and Xavier Claeys, have taken the burden to organise the symposium. Let us thank both for their excellent preparation of this meeting. The community also thanks the following organisations for supporting us: the Institut National de Recherche en Informatique et Automatique (INRIA), Sorbonne Université, Laboratoire Jacques-Louis Lions, and the Agence Nationale de la Recherche (ANR).

I wish all participants a very informative meeting, good discussions, and a pleasant time in Paris.
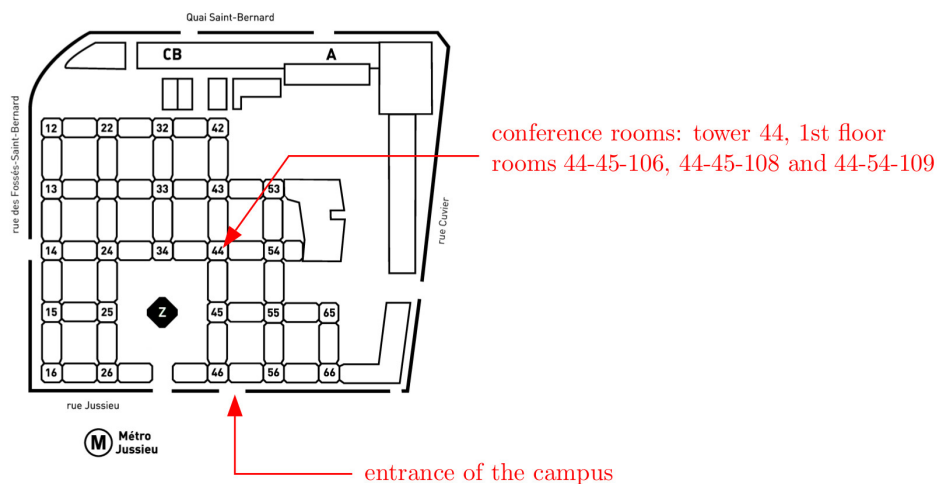
Martin Schanz (President of IABEM)

# Acknowledgements

## How to access the conference rooms on the campus of Jussieu

The conference will take place in rooms 44-45-106, 44-45-108 and 44-54-109 of the Jussieu campus. These rooms can be accessed by entering Tower 44 at ground level, taking the stairs or the elevator, and going to the first floor.



## How to go to the conference dinner

The conference dinner will take place at the restaurant «Bistro Parisien» (`https://www.bateauxparisiens.com/en/le-bistro-parisien.html`) located at the foot of the Eiffel Tower and alongside the Seine river:

Bistro Parisien
Port de la Bourdonnais, 75007 Paris
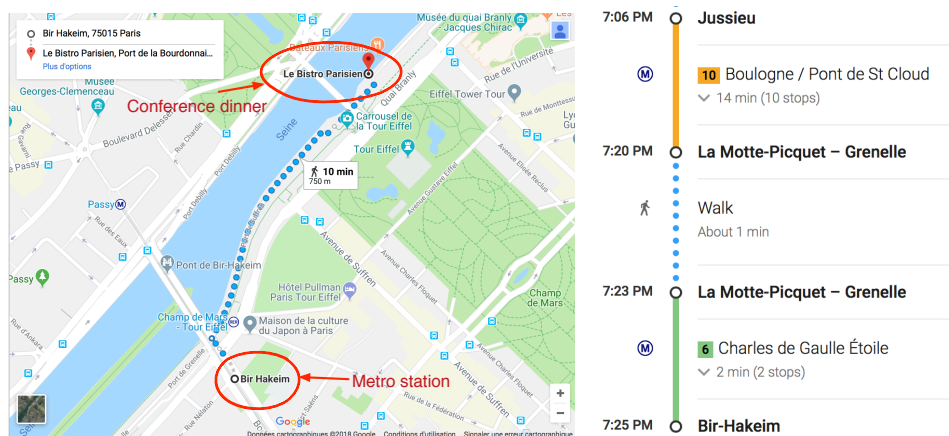


The closest metro station is the stop Bir-Hakeim of line 6. From the Jussieu station, take line 10 bound for Boulogne, get off at La Motte-Picquet - Grenelle, then take line 6 bound for Charles de Gaulle Etoile and get off at Bir-Hakeim.

# Wifi and internet access

In the conference rooms you can access internet via eduroam. If, for some reason, the connection to eduroam fails, you can connect via the eduspot network:

1) connect to the network named "eduspot" (SSID access)
2) open a browser, you should be redirected to an authentication portal
3) on this portal you first have to select an institution, choose "UPMC: Congrès et Invités" (see picture below)
4) you will then be asked for a login and password that you can obtain at the registration desk

With the eduspot network, if you encounter difficulties for accessing the authentication portal (step 2 above), try entering `http://www.upmc.fr` in the url bar of your browser.

After a long connection without any interruption, the eduspot connection might break down. In this situation, turn off your connection to the eduspot network for 15 minutes and try to connect anew.
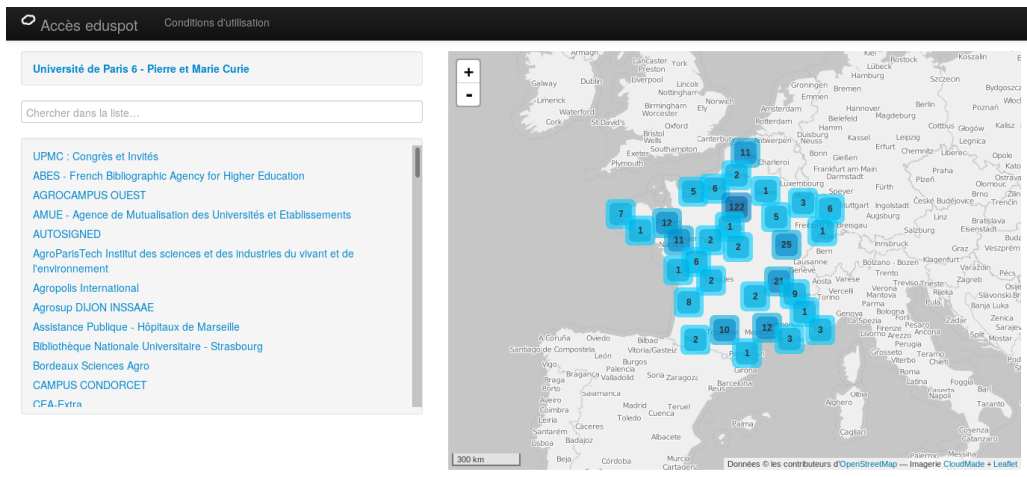
# Tuesday June 26 2018
# Morning Sessions

**08h30 - 08h50 Welcome of participants**
**08h50 - 09h00 Opening Session, Room 44-45-106**

**09h00 - 10h40 Room 44-45-106 - Chairperson: E. Darrigrand**

09h00-  S.E. Mikhailov: *Boundary-Domain Integral Equations for Stokes and Brinkman Systems with Variable Viscosity in $L_p$-based spaces on Lipschitz Domains*

09h25-  A. Ayala: *Linear time CUR approximation of BEM matrices*

09h50-  R. Haqshenas: *A fast coupled boundary element formulation for trans-abdominal high-intensity focused ultrasound therapy*

10h15-  A. Dansou: *Modeling crack propagation in 3D heterogeneous multi-cracked roads by Fast Multipole Symmetric Galerkin Boundary Element Method*

**09h00 - 10h40 Room 44-45-108 - Chairperson: M. Karkulik**

09h00-  R. Hiptmair: *First-Kind Galerkin Boundary Element Methods for the Hodge-Laplacian*

09h25-  M. Bonnet: *Asymptotic expansion of the Maxwell integral equation formulation for the eddy current regime*

09h50-  G. Of: *Some boundary element methods for multiply-connected domains*

10h15-  P. Musolino: *Converging expansions for Lipschitz self-similar perforations of a plane sector*

**10h45 - 11h15 Coffee Break**

**11h15 - 12h55 Room 44-45-106 - Chairperson: C. Jerez-Hanckes**

11h15-  S. Falletta: *Wavelets and convolution quadrature for a time domain boundary integral formulation of the wave equation*

11h40-  E.P. Stephan: *Time Domain BEM for Fluid-Structure Interaction*

12h05-  D. Pölz: *Collocation Methods for Retarded Potential Boundary Integral Equations with Space-Time Trial Spaces*

12h30-  S. Dohr: *Parallelized space-time boundary element methods for the heat equation*

**11h15 - 12h55 Room 44-45-108 - Chairperson: M. Darbas**

11h15-  E. Demaldent: *Multi-trace boundary integral formulations with eddy current models*

11h40-  S. Adrian: *Refinement-Free Preconditioning Strategies for the Electric Field Integral Equation*

12h05-  P. Escapil-Inchauspé: *Fast Calderón Preconditioning for the EFIE*

12h30-  R. van Venetië: *Optimal preconditioning of operators of negative order*

**13h00 - 14h10 Lunch**

# Tuesday June 26 2018
# Afternoon Sessions

**14h10 - 15h50 Room 44-45-106 - Chairperson: M. Bonnet**

14h10-  F. Le Louër: *Material derivatives of boundary integral operators in electromagnetism and applications*

14h35-  K. Nakamoto: *A shape and topology optimisation using the BEM and an explicit boundary expression with the level set method*

15h00-  M.L. Rapun: *Solving inverse multiple scattering problems in three-dimensional electromagnetism by topological gradient methods*

15h25-  H.B. Chen : *Toward the optimization of acoustic performance using boundary element method*

**14h10 - 15h50 Room 44-45-108 - Chairperson: B. Thierry**

14h10-  C. Erath: *Approximation of a parabolic-elliptic interface problem with a non-symmetric FEM-BEM and backward Euler coupling approach*

14h35-  R. Schorr: *Stable non-symmetric coupling with the boundary element method for a convection-dominated parabolic-elliptic interface problem*

15h00-  V. Dominguez: *An overlapped BEM-FEM coupling for simulating acoustic wave propagation in unbounded heterogeneous media*

15h25-  L. Desiderio: *BEM-FEM coupling for estimating anchor losses in MEMS*

**15h50 - 16h20 Coffee Break**

**16h20 - 18h00 Room 44-45-106 - Chairperson: N. Nishimura**

16h20-  E. Rejwer: *On increasing effciency of kernel-independent fast multipole method in 2D and 3D problems*

16h45-  J. Dölz: *Interpolation-based $H^2$-compression of Higher Order Boundary Element Methods on Parametric Surfaces*

17h10-  C. Jelich: *Inverse Fast Multipole Method Applied to the Galerkin Boundary Element Method*

17h35-  G. Martinsson: *Accelerated Direct Solvers for Boundary Integral Equations*

**16h20 - 18h00 Room 44-45-108 - Chairperson: N. Heuer**

16h20-  M. Ganesh: *A class of forward and inverse algorithms for a stochastic wave propagation model*

16h45-  T. Hirai: *An isogeometric BEM for a 3D doubly-periodic PEC surface in electromagnetism*

17h10-  G. Beer: *Isogeometric boundary element method for problems with inelastic inclusions*

17h35-  F. Wolf: *Isogeometric Boundary Element Methods for Electromagnetic Problems: Discretisation and Numerical Examples*

**18h00 - 19h00 IABEM General Assembly**

# Wednesday June 27 2018
# Morning Sessions

**08h45 - 10h25 Room 44-45-106 - Chairperson: A. Gillman**

08h45-  P. Zaspel: *Scalable parallel BEM solvers on many-core clusters*

09h10-  Y. Matsumoto : *A Fast Direct Solver for the One-Periodic Transmission Problems Formulated with the Multi-Trace Boundary Integral Equation*

09h35-  J. Zapletal: *Vectorized approach to the evaluation of boundary integral operators*

10h00-  F. Kpadonou: *Efficient parallel implementation of H-matrix based solvers for 3D Helmholtz and elastodynamic oscillatory kernels*

**08h45 - 10h25 Room 44-45-108 - Chairperson: S. Chandler-Wilde**

08h45-  T. Chaumont-Frelet: *High frequency behaviour of corner singularities in Helmholtz problems*

09h10-  E. Spence: *The Helmholtz h-BEM: what can be proved about the pollution effect and the behaviour of GMRES?*

09h35-  S. Baydoun: *A Pollution Effect Induced by Numercial Damping in the Acoustic Boundary Element Method for Duct Problems*

10h00-  E. Parolin: *A Hybrid Numerical-Asymptotic Collocation BEM for High-Frequency Scattering by 2D Planar Screens*

**08h45 - 10h25 Room 44-54-109 - Chairperson: A. Sellier**

08h45-  J. Ravnik: *Boundary element based solution of Navier-Stokes equations with variable material properties*

09h10-  J. Tibaut: *Acceleration of the boundary-domain integral representation of the velocity-vorticity form of Navier-Stokes equations*

09h35-  J. Watson: *Boundary elements for surfaces in contact in three dimensions*

10h00-  L. Gray: *Volume Integration for the 3D Stokes Equation*

# Wednesday June 27 2018
# Morning Sessions

**11h00 - 12h40 Room 44-45-106 - Chairperson: F. Andriulli**

11h00-  M. Darbas: *Analytic preconditioners for 3D high-frequency elastic scattering problems*

11h25-  B. Thierry: *Single scattering preconditioner applied to boundary integral equations*

11h50-  C. Urzua-Torres: *Preconditioning for the Electric Field Integral Equation on Screens*

12h15-  A. Molavi Tabrizi: *Modeling multiscale interface phenomena
using nonlinear transmission conditions*

**11h00 - 12h40 Room 44-45-108 - Chairperson: M. Ganesh**

11h00-  D. Hewett: *Scattering by Fractal Screens and Apertures: I - Functional Analysis*

11h25-  S. Chandler-Wilde: *Scattering by Fractal Screens and Apertures: II - Numerical Computation*

11h50-  A. Zemlyanova: *Singular integral equations method for a fracture problem
with a surface energy in the Steigmann-Ogden form on the boundary*

12h15-  T. Maruyama: *Application of numerical continuation method to BIE
for steady-state wave scattering by a crack with contact acoustic nonlinearity*

**11h00 - 12h40 Room 44-54-109 - Chairperson: J. Ravnik**

11h00-  A. Sellier: *Fundamental coupled MHD creeping flow and electric potential
for a conducting liquid bounded by a plane slip wall*

11h25-  H. Fendoglu:  *MHD flow in a rectangular duct with a perturbed boundary*

11h50-  K. Yang: *Radial integration BEM for nonlinear heat conduction problems
with temperature-dependent conductivity*

12h15-  J. Zhang: *How to achieve the goal of 5aCAE based on BIE*

**12h40 - 14h00 Lunch**

# Wednesday June 27 2018
# Afternoon Sessions

**14h00 - 16h05 Room 44-45-106 - Chairperson: O. Steinbach**

14h00-    F. Amlani: *Anisotropic mesh adaptation for 3D accelerated high-order boundary element methods in acoustics*

14h25-    S. Schimanko: *Adaptive BEM with inexact PCG solver yields almost optimal computational costs*

15h15-    A. Haberl: *Adaptive BEM for the Helmholtz equation*

15h15-    H. Harbrecht: *Adaptive Wavelet Boundary Element Methods*

15h40-    Y. Zhang: *An efficient adaptive solution technique for periodic Stokes flow*


**14h00 - 16h05 Room 44-45-108 - Chairperson: S. Rjasanow**

14h00-    N. Heuer: *A non-conforming domain decomposition approximation for the Helmholtz screen problem with hypersingular operator*

14h25-    P. Marchand: *Two-level preconditioning for BEM with GenEO*

14h50-    A.S. Bonnet-Ben Dhia: *Coupling BEMs in overlapping domains when a global Green's function is not available*

15h15-    B. Caudron: *An optimized domain decomposition method between interior and exterior domains for harmonic, penetrable and inhomogeneous electromagnetic scattering problems*

15h40-    V. Mattesi: *A Padé-localized absorbing boundary condition for 2D time-harmonic elastodynamic scattering problems*


**14h00 - 16h05 Room 44-54-109 - Chairperson: M. Schanz**

14h00-    A. Sellier: *Particle-particle interactions in axisymmetric MHD creeping flow*

14h25-    M. Ancellin: *Recent developments of the linear potential flow solver NEMOH and its application for the design of wave energy converters*

14h50-    E. Darrigrand: *FastMMLib: a generic library of fast multipole methods*

15h15-    E. van't Wout: *Using boundary element methods to analyse the low-frequency resonance of fish schools*

15h40-    M. Aussal: *FEM-BEM coupling using Gypsilab*


**16h05 - 16h30 Coffee Break**

# Wednesday June 27 2018
# Afternoon Sessions

**16h30 - 18h10 Room 44-45-106 - Chairperson: D. Hewett**
16h30-  A. Gibbs: *A new toolbox for highly oscillatory and singular integrals*
16h55-  S. Langdon: *Hybrid numerical-asymptotic boundary element methods*
        *for high frequency scattering by penetrable convex polygons*
17h20-  H. Gimperlein: *Higher-order and adaptive boundary elements for the wave equation*
17h45-  B. Gilvey: *Evaluation of highly oscillatory Partition of Unity BEM integrals*
         *arising in 2D wave scattering simulations*


**16h30 - 18h10 Room 44-45-108 - Chairperson: V. Dominguez**
16h30-  O. Steinbach: *On the coupling of space-time finite and boundary element methods*
16h55-  F.J. Sayas: *Time Domain Boundary Integral Equations for scattering by obstacles*
        *with locally homogeneous material properties*
17h20-  J. Tausch: *Fast Galerkin BEM for parabolic moving boundary problems*
17h45-  L. Desiderio: *A stable 2D energetic Galerkin BEM approach for linear elastodynamic problems*


**16h30 - 18h10 Room 44-54-109 - Chairperson: V. Mantic**
16h30-  K. Kuzmina: *The Hierarchy of Numerical Schemes for Boundary Integral Equation Solution*
        *in 2D Vortex Methods at Airfoil Polygonal Approximation*
16h55-  S. Veerapaneni: *Integral equation methods for electro- and*
        *magneto-hydrodynamics of soft particles*
17h20-  C. Jerez-Hanckes: *Boundary Integral Formulation for Helmholtz and Laplace Dirichlet*
        *Problems On Multiple Open Arcs*
17h45-  M. Scroggs: *Weak imposition of boundary conditions using a penalty method*


**20h00 - 23h00 Conference Dinner at "Le Bistro Parisien"**

# Thursday June 28 2018
# Morning Sessions

**08h45 - 10h25 Room 44-45-106 - Chairperson: G. Of**

08h45- V. Mantic: *Complex variable BEM for a Gurtin-Murdoch material surface in the form of a circular arc in an elastic plane under far-field loads*

09h10- A. Furukawa: *A Boundary Element Method for Antiplane Wave Analysis of Frozen Porous Media*

09h35- J.W. Lee: *Combination of the CHIEF and the self-regularization technique for solving 2D exterior Helmholtz equations with fictitious frequencies in the indirect BEM and MFS*

10h00- P. Fedeli: *Application of Boundary Integral Equations to MEMS working in near vacuum*

**08h45 - 10h25 Room 44-45-108 - Chairperson: F.J. Sayas**

08h45- M. Schanz: *Elastodynamic BE formulation with Runge-Kutta based Generalised Convolution Quadrature Method*

09h10- M. Zank: *Space-Time Variational Formulations for the Wave Equation*

09h35- C. Jerez-Hanckes: *Multiple Traces Formulation and Semi-Implicit Scheme for Modelling Biological Cells under Electrical Stimulation*

10h00- V. Arnautovski-Toseva: *Solving Electromagnetics Problems by Using Mixed Potential Integral Equation*

**11h00 - 12h40 Room 44-45-106 - Chairperson: E. Spence**

11h00- B. Quaife: *A Boundary Integral Equation for the Clamped Bi-Laplacian Eigenvalue Problem*

11h25- T. Führer: *On the coupling of DPG and BEM*

11h50- M. Karkulik: *The inverse of a finite element discretization of the fractional Laplacian can be approximated by H-matrices*

12h15- S. Rjasanow: *Matrix-valued radial basis functions for the BEM treatment of the Lamé system*

**11h00 - 12h40 Room 44-45-108 - Chairperson: J. Tausch**

11h00- M. Leitner: *Uncoupled Thermoelastic Boundary Element Formulation with Variable Time Step Size*

11h25- K. Niino: *Computation of layer potentials in the BEM with the space-time method for the heat equation in 2D*

11h50- A. Haider: *Data-Sparse Boundary Element Methods for Elastic Waves*

12h15- N. Dumont : *Conceptually Consistent Formulation of the Boundary Element Method and Arbitrarily High Accurate Numerical Integrations for the Analysis of 2D Problems of General Topology and Shape*

# Thursday June 28 2018
# Afternoon Sessions

**14h00 - 15h40 Room 44-45-106 - Chairperson: G. Martinsson**

14h00- A. Gillman: *A fast direct solver for boundary value problems on evolving geometries*

14h25- N. Nishimura: *Optimisation of Electromagnetic Metamaterials Using Periodic FMM and Cylindrical-Hole Topological Derivatives*

14h50- M. Oneil: *A Fast Boundary Integral Method for Generating High-order Surface Meshes*

15h15- G. Oelker Silva: *Quantification of the Impact of Small Random Perturbations in Electromagnetic Scattering from Reflective Gratings*

**14h00 - 15h40 Room 44-45-108 - Chairperson: R. Hiptmair**

14h00- A. Kleanthous: *Electromagnetic scattering by ice crystals and implementation using Bempp*

14h25- M. Issa: *Boundary Element Method for Conductive Thin Layer in 3D Eddy Current Problems*

14h50- Q. Sun: *Wavelength stable field-only boundary regularised integral solution of electromagnetic scattering based on the Helmholtz equation*

15h15- X.W. Gao: *Non-Conventional Boundary Elements and Their Applications in BEM Analysis of Structurally Multi-Scale Problems*

**15h40 - 16h15 Coffee Break**

**16h15 - 17h55 Room 44-45-106 - Chairperson: F. Le Louër**

16h15- O.I. Yaman: *Reconstruction of surface impedance functions from the acoustic far field pattern*

16h40- K. Matsushima: *A topology optimisation of elastic wave absorber with the BEM and H-matrix method*

17h05- H. Isakari: *A topology optimisation for photonic crystals using a fast boundary element method*

17h30- A. Lefebvre-Lepot: *The Sparse Cardinal Sine Decomposition (SCSD) and its application to the simulation of suspensions*

**16h15 - 17h55 Room 44-45-108 - Chairperson: J. Zhang**

16h15- J.R. Poirier: *Boundary Integral Equations and Hierarchical Matrices for a Waveguide Mode Solver*

16h40- C. Ju: *A binary-tree subdivision method for evaluation of nearly singular integrals and singular integrals in 3D BEM*

17h05- B.Chi: *A binary-tree subdivision method for volume integrals in BEM*

17h30- H.F. Peng: *Radial Integration BEM for solving convection-conduction problems*