

Philippe Chartier

<http://www.irisa.fr/ipso/perso/chartier/>

Senior Researcher INRIA

INRIA-RENNES/IRMAR/ENS RENNES

Campus de Beaulieu

35042 Rennes

Personal Information

54 years old (date of birth : 01/07/1966)

4 children

Telephone (Office) : +33 02 23 23 58 36

Cell Phone : + 33 6 07 44 33 22

Email : Philippe.Chartier@inria.fr

Education and Employment History

| | |
|---------------|---|
| Since 2019 | Senior Researcher (Directeur de recherche première classe) at INRIA. |
| Feb-Sept 2019 | Invited researcher at the University of the Basque Country, San Sebastian, INRIA Sabbatical Program. |
| 2015-2018 | Scientific Vice-Deputy at INRIA-RENNES. |
| Since 2011 | Senior Researcher (Directeur de recherche première classe) at INRIA. |
| Since 2003 | Senior Researcher at INRIA. |
| 2003-2017 | Scientific leader of the INRIA team IPSO . |
| 2000 | Habilitation Thesis in Mathematics, University of Rennes I, January 2000, " <i>Numerical methods for ordinary differential equations and differential-algebraic equations with application to hamiltonian systems</i> ". |
| 1994-2003 | Junior Researcher at INRIA. |
| 1993-1994 | Post-doctoral fellow, University of Auckland, department of mathematics (11 months). |
| 1990-1993 | PhD Thesis (grant CIFRE-SIMULOG) in Computer Science, University of Rennes I, " <i>Parallelism in the numerical solution of initial value problems for ODEs and DAEs</i> ". Supervisors : M. Crouzeix and B. Philippe . |
| 1989-1990 | Military service as engineer at SIMULOG (Groupe Astek) |
| 1988-1989 | Master 2 of Numerical Analysis, University of Paris VI (with distinction). |
| 1986-1989 | École Centrale Paris . |
| 1984-1986 | Preparatory classes at lycée Henri Poincaré, Nancy. |
| 1984 | Baccalauréat série C. |

Research Interests

Analysis, conception and implementation of numerical methods for

- ▷ ordinary differential and differential-algebraic equations,
- ▷ kinetic equations (Vlasov-Maxwell, Vlasov-Poisson),
- ▷ parabolic partial-differential equations,
- ▷ hamiltonian partial-differential equations,
- ▷ averaging methods for ODEs and PDEs (Schrödinger and wave equations, kinetic equations)

Project management

- 2018-2020 : Principal investigator of the INRIA-Raveltech research contract (01/09/2018-31/08/2020, budget 15 000 euros/year) This project also involves M. Lemou and F. Méhats in a collaboration with the startup RAVELTECH. The objective is to study the mathematical foundations of artificial intelligence and in particular machine learning algorithms for data anonymized through homomorphic encryption.
- 2018-2020 : Leader of the INRIA team [ANTIODE](#) on *Uncertainty quantification and multiscale methods*, with the University of Wisconsin, USA (Pr. Qin Li, Pr. S. Jin).
- 2014-2018 : Member of Project ANR (French National Agency of Research) [MOONRISE](#) in collaboration with the IMT, Toulouse and CEA/IRFM, Cadarache : “MODELS, Oscillations and Numerical Schemes”. Funding for the team IPSO : 250 k€
- 2012-2015 : Member of Project ANR Blanc International II [LODIQUAS](#) in collaboration with the WPI, Vienna : “Mathematical modelling and numerical simulation of stationary and time dependent NonLinear Schrödinger equations”. Funding for the team IPSO : 200 k€
- 2009-2013 : Co-supervisor (with T. Lelièvre) of the ANR project MEGAS : “Geometric methods and sampling : Application to Molecular Simulation”. Funding for the team IPSO : 50 k€
- 2009-2010 : Co-supervisor of the ARC project [VITELBIO \(Virtual TELluric BIOreactors\)](#) Funding for the team : 5 k€
- 2008-2011 : French coordinator of the PICASSO project [PHC](#) with the University of the Basque Country and the universities of Castellon, Valence and Valladolid. Funding for the team : 3k€
- 2008-2010 : Co-supervisor (20%) with E. Faou (80%) of the INRIA associated team [MIMOL](#) *Molecular dynamics and molecular simulation*, in collaboration with the University of Tübingen and the University of the Basque Country. Funding for the team IPSO : 40 k€
- 2006-2009 : Supervisor of the ANR project [Ingemol](#), devoted to numerical methods in molecular simulation. The [Ingemol](#) project included the following persons and institutions :
 - F. Castella, P. Chartier, M. [Crouzeix](#), G. Dujardin, E. Faou, G. [Vilmart](#) : IPSO
 - Ch. Chipot : CNRS, Nancy.
 - S. Descombes : ENS LYON.
 - E. Cancès, C. Le Bris, F. Legoll, T. Lelièvre, G. Stoltz : CERMICS, ENPC, Marne-la-Vallée.Funding for the team : 50 k€
- 2003- : Scientific leader of the INRIA team INRIA [IPSO](#). IPSO is a joint team between INRIA, ENS RENNES and the University of Rennes I. It is devoted to geometric numerical integration of ODEs and PDEs and is now composed of seven permanent members : [F. Castella](#), P. Chartier, [N. Crouzeilles](#), [A. Debussche](#), [E. Faou](#), [M. Lemou](#), [F. Méhats](#). Funding for the team : 30 k€ per year

Scientific committees

- Workshop “Multi-scale Numerical Methods for evolution equations, and uncertainty quantification method”, May 16th-17th, 2019, ENS Rennes (Co-organiser).
- Workshop on numerical methods for multi-scale PDEs, Institut d’études scientifiques de Cargèse, Cargèse, France, September 3-7, 2018 (Member of the scientific/organisation committee).
- [Workshop Henri Lebesgue Center on geometric and multi-scale methods for kinetic equations](#), Rennes, June 11-15, 2018 (Member of the scientific/organisation committee).
- [Enumath 2015](#), Ankara, Turkey, 14-18 September 2015 (Member of the scientific committee)
- [Enumath 2013](#), Lausanne, Switzerland, 26-30 August 2013 (Member of the scientific committee)
- [SciCADE 2013](#), Valladolid, Spain, 16-20 september 2013 (Member of the Scientific Commit-

- tee).
- [DD21](#) : 21th International Conference on Domain Decomposition Methods, 25-29 June 2012, Rennes, France (Member of the programm committee).
- SciCADE 2011, Torronto, Canada, july 11-15, 2011 (Member of the Scientific Committee).
- [INRIA Evaluation Seminar of Theme 1](#), march 2009 (Scientific Organizer).
- [SciCADE 2009](#), Beijing (Member of the [Scientific Committee](#)).
- [SciCADE 2007](#), Saint-Malo (**Chair** of the [Scientific Committee](#)).
- [Workshop in honor of M. Crouzeix](#), CANUM 2006 (Member of the Scientific Committee).
- Meeting “*Sparse matrices and differential equations*” 1999 (Member of the Scientific Committee).

Editorial boards

- Invited co-editor in chief (with Linda Petzold) of the special issue of *Mathematical Modelling and Numerical Analysis*, [Numerical ODEs today](#), Vol. 43 / 4 - July-August 2009, M2AN ([Preface](#)).
- Member of the editorial board of [ESAIM: Proceedings](#) (January 2008-january 2013).
- Member of the editorial board of [Mathematical Modelling and Numerical Analysis](#) (since January 2007).
- Invited co-editor in chief (with Bernard Philippe) of the special issue “Sparse Matrices and Differential Equations in Industry” of *Numerical Algorithms*, Volume 24, Number 4, 2000.
- Member of the editorial board of ISRN Mathematical Analysis.

Awards

- March 2012-January 2015 : Recipient of the “Prime d’excellence scientifique” INRIA (PES).
- September 2009 : “Honorary Fellowship” of the European Society of Computational Methods in Sciences and Engineering

PhD Supervision

- Co-supervisor of T. Laborde (Naval Group engineer), Cifre Naval Group, with F. Méhats and M. Lemou, from july 2020.
Subject : “Methodology of conception and use of artificial intelligence algorithms from sensitive data : application to acoustic submarine detection”
- Co-supervisor of Léopold Trémant (Master 2 UPMC- University Paris VI), INRIA Cordis Grant, with M. Lemou, from october 2018.
Subject : “Asymptotic analysis for dissipative multi-scale PDE models”.
- Co-supervisor of J. Sauzeau (Master 2 Ecole Normale Supérieure de Cachan), ASN Grant, with F. Castella, since september 2013, defended june 2016.
Subject : “Center manifolds and applications to ecology”.
- Co-supervisor of G. Leboucher, (Master 2 University of Rennes 1), Grant from the Brittany Council, with Florian Méhats, since september 2011, defended december 2015.
Subject : “Averaging methods for the wave equation”.
- Co-supervisor of S. Wang (Harbin University), INRIA Grant, with [A. Murua](#), 2009-2012.
Subject : “Splitting methods for the solution of highly-oscillatory differential equations”.
- Co-supervisor of G. [Vilmart](#) (Master 2 Ecole Normale Supérieure de Cachan), with E. [Hairer](#), thesis in co-tutelle with the University of Geneva, 2005-2008, defended 2008.
Subject : “Numerical methods for the rigid body problem”.
- Participation to the supervision of S. Rault, thesis co-supervised by J. Erhel and B. Philippe, 1995-1998 defended 1998.
Subject : “Numerical simulation of satellite trajectories”.
- Supervisor of A. Aubry (Master 2 University of Rennes 1), MESR Grant, jointly with M. [Crouzeix](#), 1994-1997, defended 1997.

- Subject : “Runge-Kutta methods for index-2 DAEs and hamiltonian systems”.
- Supervisor of E. Lapôtre (M2 Paris VI-ECP), with M. [Crouzeix](#), 1998-2000
- Subject : “Symmetric B-series”

Master theses and post-doc supervision

- 2020-2022 : I. Almuslimani (post-doc, 33%), Swiss National Fund, 18 months,
Subject : “Multi-scale methods for stochastic highly-oscillatory differential equations” S.
- 2017-2018 : X. Zhao (post-doc, 25%), Inria Project Lab Fratres, 12 months,
Subject : “Uniformly accurate methods for kinetic equations”.
- 2016-2017 : X. Zhao (post-doc, 50%), Inria RBA, 12 months,
Subject : “Uniformly accurate methods for kinetic equations”.
- 2014-2016 : Y. Zhang (post-doc, 33%), Lodiquas and Moonrise, 17 months,
Subject : “Uniformly accurate high-order schemes for kinetic equations”.
- 2013 : Y. Zhang (post-doc, 33%), WPI, Vienna : 4 months,
Subject : “Multi-revolution methods for the nonlinear Schrödinger equation”.
- 2009 : V. Maheshwari, Indian Institute of Technology Delhi, 3 months,
Subject : “Study of the modified equation obtained by stroboscopic averaging for the Fermi-Pasta-Ulam problem”.
- 2003-2005 : G. [Vilmart](#), E.N.S. Cachan, 3 months,
Subject : “Trees, B-series, Hopf algebras, continuous iteration of formal series.”
- 2001-2002 : M. Farah, M.Sc. student, 2 months,
Subject : “Reconstruction of a numerical flow and application to image processing”.
- 1997-1998 : G. Vial, E.N.S. Cachan, 2 months,
Subject : “Interval Methods for ODEs”
- 1996-1997 : Q. Zou, 3 months,
Subject : “Implementation in FORTRAN of singly-implicit Runge-Kutta methods ESIRK”.
- 1995-1996 : L. Winter, INSA Rouen, 3 months,
Subject : “Implementation FORTRAN on a parallel machine (KSR) of DIMSIM methods”.
- 1994-1995 : A. Aubry, University of Rennes I, 3 months,
Subject : “Automatic generation of order conditions using MAPLE”.
- 1991-1992 : P.M. Cutzach, University of Rennes I, 2 months,
Subject : “Implementation in FORTRAN on a parallel machine (INTEL IPSC2) of various ODE solvers”.

Teaching

- 2017 : Lecturer at University of Rennes 1, Master 2, “Semi-lagrangian methods” (12H).
- 2009-2019 : Lecturer at ENS Cachan-Bruz, Licence 3, “Ordinary differential equations” (24H).
- 2013, 2015, 2016 : Lecturer at University of Rennes 1, Master 2, “Geometric Numerical Integration and averaging methods” (24H).
- 2009-2014 : Assistant in mathematics (“colleur”), Mathématiques Spéciales, Lycée Chateaubriant, Rennes, (50H).
- 2005-2009 : Assistant in mathematics (“colleur”), Mathématiques Supérieures, Lycée Chateaubriant, Rennes, (60H).
- Juin 2003 : Lecturer at the University of Rennes I, Master 2, “*Symplectic integration of integrable hamiltonian systems and long-time behaviour*” (12H).
- 2001-2003 : Lecturer at the University of Rennes I, Master 1, “Hyperbolic systems, Laplace and Schrödinger equations” (24H).
- 1995-1998 : Lecturer at the Ecole Centrale Paris, Master 2, “Parallel numerical methods for ODEs” .
- 1992-1994 : Assistant in mathematics (“colleur”), Mathématiques Supérieures, Lycée Chateaubriant, Rennes, (60H).

Lectures to general audiences

- Summer School CEA-EDF-INRIA “[Simulation of hybrid dynamical systems and applications to molecular dynamics](#)”, IHP-Paris, 27-30 septembre, 2010.
- Formation Inspecteurs Principaux Régionaux, “[Numerical modelisation of physical phenomena](#)”, October 2008, ENS Cachan Antenne de Bretagne.
- School UNESCO-TLEMCCEN, “[Mathematical models for water flows and water refining](#)”, May 2008, Tlemcen (Algeria).
- Summer School CEA-EDF-INRIA, “[Optimal control: algorithms and applications](#)”, May-June 2007.
- Winter School “[Mathematical methods for molecular simulation](#)”, C.I.R.M., Luminy (France), January 2006.
- Winter School GO++ “[Numerical methods for Hamilton-Jacobi-Bellman equations](#)”, Rocquencourt, 9-12 Décembre 2002.
- Winter School CEA-EDF-INRIA, “[Numerical methods for atomistic simulation : from micro to meso](#)”, November, 2001.

Invitations at international conferences and colloquia

- [Geometric Numerical Integration](#), Oberwolfach Workshop, 28 March-3 April 2021.
- “[Multiscale Analysis and Methods for Dispersive PDEs and Fluid Equations](#)”, Institute for Mathematical Sciences (IMS), National University of Singapore (NUS), 24 - 28 February 2020, Singapore (invited speaker).
- [Scicade 2019](#), the International Conference on Scientific Computation and Differential Equations, University of Innsbruck, Austria, July 22 - 26, 2019 (invited speaker).
- [International Congress on Industrial and Applied Mathematics](#), ICIAM 2019, Co-organizer of the Minisymposium “[Advanced numerical methods for differential equations](#)” (with Mechthild Thalhaammer and Mohammed Lemou), July 15-19, Valencia, Spain.
- [Workshop HaLu-2019](#), June 17 - June 21 2019, Gran Sasso Science Institute (GSSI) School of Advanced Studies, L’Aquila - Italy (**Invited Plenary Speaker**).
- [Nonlinear Evolution Equations: Analysis and Numerics](#), 3 February - 9 February 2019, Mathematisches Forschungsinstitut Oberwolfach (MFO), Oberwolfach, Germany.
- [The 12th AIMS Conference on Dynamical Systems, Differential Equations and Application](#), July 5 - July 9, 2018 Taipei, Taiwan, (Invited Speaker).
- [FoCM 2017, Foundations of Computational Mathematics](#), Barcelona, Spain, July 10th-13th, 2017 (Invited Speaker).
- International conference on “[Mathematical and Computational Methods for Quantum and Kinetic Problems](#)”, Beijing Computational Science Research Center (CSRC), Beijing, China, June 12-14 2017 (Invited Speaker).
- [Kinema 2017: Numerical Modelling of Kinetic Magnetised Plasmas](#), Spring School, Institut d’études scientifiques de Cargèse, Cargèse, France, April 3-7, 2017 (Invited Speaker).
- [Mould calculus, from multiple zeta values to B-series](#), Pau, December 1-2, 2016 (Invited Speaker). Title “[A formal series approach to the center manifold theorem. Algebraic aspects](#)”.
- ICNAAM, Rhodes, Greece, September 19-25, 2016 (**Invited Plenary Speaker**).
- [GAMPP](#) Workshop, IPP Garching, Germany, September 12-16, 2016 (Invited Speaker). Title : “[An averaging technique for kinetic equations](#)”.
- [SDIDE 2016](#) - 5th workshop, Stability and discretization issues in differential equations, Trieste, 21-24, June 2016. Title “[A formal series approach to the center manifold theorem](#)”.
- [Workshop Geometric Numerical Integration](#), MFO, Oberwolfach, Germany, March 20-26, 2016.
- Colloquium, School of Mathematics in Georgia Tech, Atlanta, USA, October 27-30, 2015. Title : “[Algebraic methods in numerical analysis](#)”.

- [Workshop Modelling and Numerics for Quantum Systems](#), Toulouse, September 2-4, 2015 (**plenary talk**). Title : “Averaging methods for ODEs and PDEs : from formal series to numerical methods”.
- [The 9th International Conference on Computational Physics](#), Singapore, 7-11 Jan 2015. Title : “Superconvergence of Strang Splitting for NLS in the torus”.
- [Miskif 2014](#), september 29th-october 3rd 2014, Cargèse, France. Title : “Numerical Methods for Highly Oscillatory PDEs”.
- [The 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications](#), Madrid, Spain, July 07-11, 2014. Title : “Superconvergence of Strang splitting for NLS in the d-dimensional torus”.
- [SciCADE13](#), Valladolid, Spain, September 16-20, 2013. Title : “Multi-revolution composition methods for highly oscillatory differential equations”.
- [Topics in Numerical Analysis for Differential Equations](#), ICMAT, Madrid, July 8-12, 2013. Title : “Uniformly accurate numerical schemes for highly oscillatory nonlinear Schrödinger equations”.
- Workshop on “Confined Quantum Systems : Modeling, Analysis and Computation”, WPI, Vienna, 4-8 February 2013 (**Plenary talk**). Title : “Averaging for evolution equations : the multi-frequency case ”.
- Tenth International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2012) in honor of Gerhard Wanner, Greece, September 19-25, 2012 (**Plenary speaker**). Title : “Stroboscopic Averaging Method for the Schrödinger equation”.
- Workshop [INNOVATIVE TIME INTEGRATION](#), Innsbruck, Austria, May 13-16, 2012 (**Plenary speaker**). Title : “Stroboscopic Averaging Method for the Schrödinger equation”.
- FOCM’11, Budapest, Hungary, July 4-6, 2011. Title : “Numerical stroboscopic averaging and possible extensions”.
- [Meeting on Geometric Numerical Integration](#), Oberwolfach, March 20-26, 2011. Tile : “Averaging methods for highly-oscillatory ODEs : the non-autonomous case”.
- [Congreso de la Real Sociedad Matematica Espanola](#), special session ”Numerical integrators for Hamiltonian systems and related problems”, Avila, February 1-5, 2011. Title : “Numerical stroboscopic averaging and possible extensions”.
- [Workshop DANCE on Dynamics, Attractors and Nonlinearities](#), Calatayud, November 4-6, 2010. Title : “Stroboscopic averaging using B-series”.
- [IMAC Workshop on Splitting methods for differential equations](#), Castellon, September 6-8, 2010. Title : “Composition and splitting methods with complex times for (complex) parabolic equations”.
- [Workshop on Combinatorics and Control, Madrid \(CSIC\)](#), April 6-9, 2010, (**plenary talk**). Title : “Stroboscopic averaging using B-series”.
- Seventh International Conference of Numerical Analysis and Applied Mathematics 2009 (ICNAAM 2009), Crete, September 17-23, 2009 (**plenary speaker**). Title : “An averaging technique for highly-oscillatory problems”.
- [SciCADE 2009](#), Beijing, China, May 25-29, 2009.
- Workshop “[Numerical methods and Hopf algebras of trees](#)”, Clermont-Ferrand, October 23-24, 2008. Title : “Numerical methods preserving polynomial invariants or volume forms”.
- Workshop “Structure preserving schemes for evolution equations”, E.N.S. Lyon, November 8-10, 2006. Title : “Numerical schemes preserving invariants or volume”.
- [Conference on Geometric Integration](#), Castellón, Spain, September 18-22, 2006. Title : “Preserving invariants and volume for split systems”.
- Workshop “Geometric Numerical Integration”, Mathematisches Forschungsinstitut Oberwolfach, Germany, March 19-25, 2006.
- Workshop Molecular Simulation organized by Claude Le Bris, ENPC, 2005.
- Workshop MULTIMAT organized by Grégoire Allaire, IHP, 2005.
- [SciCADE’05](#) Conference, Nagoya, Japon, May 2005.
- [SciCADE’03](#) Conference, Trondheim, Norway, July 2003.

- SciCADE Conference, Vancouver, Canada, July 2001.
- National Research Symposium on Geometric Integration, Melbourne, Australia, December 10-16, 2000.
- NUMDIFF-9, Halle, Germany, September 2000 (**plenany talk**).
- SciCADE'01 Conference, Queensland, Australia, August 9-13, 1999.
- Anode Conference, Auckland, New-Zealand, July 1998.
- Workshop on Numerical Methods, Beirut, Liban, Mars 1998 (**plenany talk**).
- SciCADE Conference, Stanford, California, USA, May 27-30, 1995.
- 15th IMACS World Congress, Berlin, Germany, August 25-30, 1997.

Invited visits

- 2019 : 8 months, INRIA Sabbatical Program, collaboration with A. Murua, University of the Basque Country, San Sebastian, Spain.
- 2019 : september, 1 week, collaboration with Q. Li and seminar, Univ. of Wisconsin, USA.
- 2019 : august, 4 days, collaboration with M. Tao and seminar, Georgia Tech, USA.
- 2019 : july, 1 week, collaboration with F. Casas, University of Jaume I, Castellon, Spain.
- 2019 : january, 1 week, collaboration with G. Vilmart, University of Geneva, Switzerland.
- 2018 : october, 1 week, collaboration with Q. Li and seminar, University of Wisconsin, USA.
- 2018 : march, 1 week, collaboration with E. Sonnendrücker, Max Planck Institute, Garching, Germany.
- 2018 : february, 3 days, collaboration with Chr. Besse, University of Toulouse 3.
- 2018 : january, 1 week, collaboration with G. Vilmart, Univ. of Geneva, Switzerland.
- 2018 : january, 1 week, collaboration with A. Murua, Univ. of the Basque Country, Spain.
- 2017 : june, 3 days, collaboration with F. Casas, University of Jaume I, Castellon, Spain.
- 2015 : december, 1 week, collaboration with A. Murua, Univ. of the Basque Country, Spain.
- 2015 : july, 1 month, University of Geneva, Geneva, collaboration with Gilles Vilmart.
- 2015 : june, 1 week, WPI, Vienna, collaboration with W. Bao, N. Mauser, M. Thalhammer.
- 2014 : june, 1 week, Univ. of the Basque Country, collaboration with A. Murua.
- 2012 : may, 1 week, University of the Basque Country, collaboration with A. Murua.
- 2010 : may, 2 weeks, University of the Basque Country, collaboration with A. Murua.
- 2009 : november, 1 week, University of the Basque Country, collaboration with A. Murua.
- 2009 : november, 1 week, University of Tübingen, collaboration with Chr. Lubich.
- 2009 : march, 1 week, University of Valladolid, collaboration with J.M. [Sanz-Serna](#).
- 2008 : february-march, 5 weeks, Univ. of the Basque Country, collaboration with A. Murua.
- 2007 : november, 1 week, University of Geneva, collaboration with E. [Hairer](#) and G. Wanner.
- 2007 : october, 2 weeks, University of the Basque Country, collaboration with A. Murua.
- 2007 : january, 1 week, Isaac Newton Institute, Cambridge, collaboration with A. Iserles.
- 2006 : june, 1 week, University of the Basque Country, collaboration with A. Murua.
- 2006 : september, 1 week, University of Geneva, collaboration with E. [Hairer](#) and G. Wanner.
- 2004 : july, 1 week, University of the Basque Country, collaboration with A. Murua.
- 2001 : march, 4 weeks, University of Geneva, collaboration with E. [Hairer](#) and G. Wanner.
- 2000 : may, 1 week, University of Tübingen, collaboration with Chr. Lubich.
- 1996 : 8 weeks, University of Geneva, collaboration with E. [Hairer](#) and G. Wanner.
- 1996 : 2 weeks, University of Arizona, Tempe, collaboration with Z. Jackiewicz and J.C. [Butcher](#).
- 1993-1994 : 10 months, University of Auckland, collaboration with J.C. [Butcher](#), INRIA grant.
- 1992 : 6 weeks, CWI, Amsterdam, collaboration with B.P. Sommeijer and P.J. van der Houwen.

External Collaborators

- [Ander Murua](#), University of the Basque Country, Spain : we have co-authored 14 papers.

Most of our common work is devoted to algebraic structures encountered in the numerical analysis of ODEs and aims at characterizing with the help of trees certain geometric properties of integrators (preservation of energy, of quadratic invariants, of volume form...). It uses recent developments in algebra (in particular the connection between Hopf algebras and trees).

- [Ernst Hairer](#), University of Geneva, Switzerland : we have co-supervised the thesis of [Gilles Vilmart](#) 2005-2008, and co-authored 4 papers related to the *substitution law* and its applications. In addition, we had many more informal discussions during cross-visits since 1994.
- [Jesus-Maria Sanz-Serna](#) : six papers co-authored since 2010 on averaging methods for ordinary differential equations.

Thematic Mobility

- Parallel numerical methods for ODEs (1990-1998)
- Numerical methods for DAEs (1992-2002)
- Geometric numerical methods with application to molecular dynamics and laser-waves propagation (2000-)
- Algebraic structures in numerical analysis (2004-)
- Splitting methods for ODEs and PDEs (2008-).
- averaging methods (2010-).
- Hamiltonian PDEs, kinetic and Schrödinger equations (2011-).

Responsibilities within and out of INRIA

- 2015-2018 : Scientific Vice-Deputy at INRIA-Rennes.
- 2015-2018 : member of the COSI committee (INRIA Internal Scientific Committee).
- 2015-2018 : Member of the [INRIA Evaluation Committee](#).
- 2004-2017 : Team leader of [IPSO](#).
- 2016 : Member of the hiring committee (associate professor) at NTNU (Norwegian University of Science and Technology).
- 2014 : Member of the (admission) committee for the recruitment of [Junior and Advanced Research Positions](#) at INRIA.
- 2013 : Member of the committee for the recruitment of Junior Researchers at INRIA-Rennes.
- 2008- : Board member of the team-projects committee within the research unit of INRIA-Rennes.
- 2010 : Member of the committee in charge of the "prime d'excellence scientifique INRIA"
- 2009 : Member of the committee for the recruitment of Senior Researchers at INRIA
- 2009 : Member of the committee for the recruitment of Junior Researchers at INRIA-Rocquencourt.
- 2008-2011 : Elected Member of the INRIA Evaluation Committee
- 2008 : Member of the committee for the recruitment of Junior Researchers at INRIA-Rennes.
- 2007 : Member of the committee for the recruitment of Junior Researchers at INRIA-Rennes.
- 2006-2009 : Head of ANR project [Ingemol](#).
- 2004-2007 : Member of the Committee of Scientific and Technologic Orientation (COST) at INRIA in charge of the Prospective.
- 2001 : Member of the committee for the recruitment of Junior Researchers at INRIA-Sophia-Antipolis.
- 2000, 2001 : Member of the committee for the recruitment of Junior Researchers at INRIA-Rennes.
- 1999, 2000 : Member of the committee for the recruitment of Junior Researchers at INRIA-Grenoble.
- 1999-2002 : Elected Member of the INRIA Evaluation Committee

- 1999-2002 : Member of the team-projects committee within the research unit of INRIA-Rennes.
- 1999 : Member of the committee for the recruitment of Junior Researchers at INRIA-Nancy.

Organisation of conferences, workshops, and mini-symposia

- July 2019 : Co-organizer of the Minisymposium “Advanced numerical methods for differential equations” (with Mechthild Thalhammer and Mohammed Lemou), International Congress on Industrial and Applied Mathematics, ICIAM 2019, July 15-19, Valencia, Spain.
- May 2019 : Workshop ”Multi-scale Numerical Methods for evolution equations, and uncertainty quantification method”, May 16th-17th, 2019, ENS Rennes (Co-organiser).
- September 2018 : Co-organizer (with C. Besse, M. Lemou and F. Méhats) of the MOONRISE Workshop on ”Numerical methods for multi-scale PDEs”, Institut d’études scientifiques de Cargèse.
- June 2018 : Co-organizer (with N. Crouseilles, M. Lemou and F. Méhats) of the Workshop Henri Lebesgue Center on ”Geometric and multi-scale methods for kinetic equations”, June 11-15, Rennes.
- December 2016 : Co-organizer (with F. Castella) of the meeting IPSO-MOONRISE with the support of the ANR MOONRISE, Saint-Malo.
- August 2015 : Co-organizer (with B. Boutin and N. Crouseilles) of the Labex Henri Lebesgue workshop “Geometric and asymptotic-preserving numerical schemes for ODEs and PDEs”, Rennes, 2015.
- August 2013 : Co-organizer (with M. Lemou) of the Mini-Symposium “Asymptotic preserving schemes for highly-oscillatory PDEs”, ENUMATH 2013, Lausanne, 2013.
- January 2011 : Co-organizer (with F. Méhats and M. Lemou) of the workshop “Numerical methods for stiff problems in Hamiltonian systems and kinetic equations”, Dinard, 2011.
- January 2010 : Organizer of the workshop “Numerical methods for Highly-oscillatory ODEs and PDEs”, Dinard 2010.
- June 2009 : Co-organizer (with A. Murua) of the Mini-Symposium “Algebraic tools in the numerical analysis of ODEs”, [Conference on Scientific Computing](#), Geneva 2009.
- May 2009 : Co-organizer (with H. Munthe-Kaas) of the Mini-Symposium “B-series and Butcher trees”, [SciCADE 2009](#), Beijing.
- March 2009 : Organizer (scientific) of the INRIA evaluation seminar (Theme 1).
- July 2007 : Main organizer of the international conference [SciCADE 2007](#), [Saint-Malo](#).
- May 2006 : Organizer of the Mini-Symposium “Molecular Simulation”, CANUM 2006.
- March 1999 : Co-organizer (with B. Philippe) of the meeting “*Sparse matrices and ODEs*”.

Papers published in international journals

1. Philippe Chartier and Ander Murua, The method of majorants for the N-body problem, in preparation, to be included into the special issue “Geometric Numerical Integration, Twenty-Five Years Later” of the International Journal of Computer Mathematics
2. Sergio Blanes, Fernando Casas, Philippe Chartier, Alejandro Escorihuela-Tomàs, On symmetric-conjugate composition methods in the numerical integration of differential equations, submitted.
3. Philippe Chartier, Mohammed Lemou, Léopold Trémant, Uniformly accurate numerical schemes for a class of dissipative systems, in revision for Mathematics of Computation.
4. Philippe Chartier, Mohammed Lemou, Florian Méhats, Xiaofei Zhao, Derivative-free high-order uniformly accurate schemes for highly-oscillatory systems, in revision for IMA Journal of Numerical Analysis.
5. Mikel Antoñana, Philippe Chartier, Joseba Makazaga, Ander Murua, Global time-regularisation of the gravitational N-body problem, SIAM Journal on Applied Dynamical Systems, to appear.
6. Fernando Casas, Philippe Chartier, Alejandro Escorihuela, Yong Zhang, Compositions of pseudo-symmetric integrators with complex coefficients for the numerical integration of differential equations, Journal of Computational and Applied Mathematics, Volume 381, 2021.
7. Philippe Chartier, Nicolas Crouseilles, Mohammed Lemou, Florian Méhats, Averaging of highly-oscillatory transport equations, Kinetic and Related Models, Volume 13 (6), 2020.
8. Philippe Chartier, Nicolas Crouseilles, Mohammed Lemou, Florian Méhats, Xiaofei Zhao, Uniformly accurate methods for three dimensional Vlasov equations with strong magnetic field under varying direction, SIAM Journal on Scientific Computing, Volume 42, Issue 2, 2020.
9. Philippe Chartier, Mohammed Lemou, Florian Méhats, Gilles Vilmart, A new class of uniformly accurate numerical schemes for highly oscillatory evolution equations, Foundations of Computational Mathematics, Volume 20, 2020.
10. Fernando Casas, Philippe Chartier, Ander Murua, Continuous changes of variables and the Magnus expansion, Journal of Physics Communications, Volume 3, Number 9, 2019.
11. Philippe Chartier, Nicolas Crouseilles, Mohammed Lemou, Florian Méhats, Xiaofei Zhao, Uniformly accurate methods for Vlasov equations with non-homogeneous strong magnetic field, Mathematics of Computation, Volume 88, American Mathematical Society, 2019.
12. Philippe Chartier, Mohammed Lemou, Florian Méhats, Gilles Vilmart, Highly-oscillatory problems with time-dependent vanishing frequency, SIAM Journal on Numerical Analysis, Volume 57(2), 2019.
13. Philippe Chartier, Loïc Le Treust, Florian Méhats, Uniformly accurate time-splitting methods for the semiclassical linear Schrödinger equation, ESAIM : Mathematical Modelling and Numerical Analysis, Volume 53, Number 2, 2019.
14. Philippe Chartier, Nicolas Crouseilles, Xiaofei Zhao, Numerical methods for the two-dimensional Vlasov-Poisson equation in the finite Larmor radius approximation regime, Journal of Computational Physics, Volume 375, 2018.
15. François Castella, Philippe Chartier, Julie Sauzeau, A formal series approach to the center manifold theorem, Foundations of Computational Mathematics, Springer Verlag, Volume 18 (6), 2018.
16. Philippe Chartier, Mohammed Lemou, Florian Méhats. Highly-oscillatory evolution equations with multiple frequencies : averaging and numerics, Numerische Mathematik, Springer Verlag, 2017, 136 (4), pp.907-939.

17. Philippe Chartier, Florian Méhats, Mechthild Thalhammer, Yong Zhang. Convergence of multi-revolution composition time-splitting methods for highly oscillatory differential equations of Schrödinger type, *ESAIM : Mathematical Modelling and Numerical Analysis*, EDP Sciences, 2017, 51 (5), pp.1859 - 1882.
18. P. Chartier, F. Méhats, M. Thalhammer and Y. Zhang, Improved error estimates for splitting methods applied to highly-oscillatory nonlinear Schrödinger equations, *Mathematics of Computation*, Vol. 85, pp 2863-2885, 2016.
19. P. Chartier, A. Murua and J.M. Sanz-Serna, Erratum to : Higher-order averaging, formal series and numerical integration II : the quasi-periodic case, *FOCM*, DOI 10.1007/s10208-016-9311-2, 2016.
20. P. Chartier, N. Mauser, F. Méhats and Y. Zhang, Solving highly-oscillatory NLS with SAM : numerical efficiency and geometric properties, *DCDS*, Vol. 9, No. 5, 2016.
21. F. Castella, P. Chartier, F. Méhats and A. Murua, Stroboscopic averaging for the nonlinear Schrödinger equation, *FOCM*, DOI 10.1007/s10208-014-9235-7, 2015, Vol. 15, Issue 2, pp 519-559, 2015.
22. P. Chartier, N. Crouseilles, M. Lemou and F. Méhats, Uniformly accurate numerical schemes for highly oscillatory Klein-Gordon and nonlinear Schrödinger equation, *Numerische Mathematik*, Vol. 129, Issue 2, pp 211-250, 2015.
23. P. Chartier, J. Makazaga, A. Murua, and G. Vilmart, Multi-revolution composition methods for highly oscillatory differential equations, *Numerische Mathematik*, online, 2014.
24. P. Chartier, A. Murua and J.M. Sanz-Serna, Higher-order averaging, formal series and numerical integration III : error bounds, *FOCM*, DOI : 10.1007/s10208-013-9175-7, 2013.
25. P. Chartier, *Symmetric Methods*, *Encyclopedia of Applied and Computational Mathematics*, Springer, 2013.
26. P. Chartier, A. Murua, J.M. Sanz-Serna, A formal series approach to averaging : exponentially small error estimates, *Discrete and Continuous Dynamical Systems (DCDS-A)*, Vol. 32, no. 9, 2012.
27. P. Chartier, A. Murua and J.M. Sanz-Serna, Higher-order averaging, formal series and numerical integration II : the quasi-periodic case, *FOCM*, DOI : 10.1007/s10208-012-9118-8, 2012.
28. S. Blanes, F. Casas, P. Chartier and A. Murua, Optimized high-order splitting methods for some classes of parabolic equations, *Math. Comput.* In Press. arXiv :1102.1622v1, 2012.
29. M.P. Calvo, P. Chartier, A. Murua and J.M. Sanz-Serna, Numerical experiments with the stroboscopic method, *Appl. Numer. Math.* 61 (2011), 1077-1095.
30. M.P. Calvo, P. Chartier, A. Murua and J.M. Sanz-Serna, A stroboscopic numerical method for highly oscillatory problems, in *Numerical Analysis and Multiscale Computations*, B. Engquist, O. Runborg and R. Tsai, editors, *Lect. Notes Comput. Sci. Eng.*, Vol. 82, Springer 2011, 73-87.
31. P. Chartier, A. Murua and J.M. Sanz-Serna, Higher-order averaging, formal series and numerical integration I : B-series, *FOCM*, Vol. 10, No. 6, 2010.
32. P. Chartier, E. Darrigrand and E. Faou, A Fast Multipole Method for Geometric Numerical Integrations of Hamiltonian Systems (Part I and Part II), *BIT Numerical Mathematics*, Vol. 50, No. 1, 2010.
33. P. Chartier, E. Hairer and G. Vilmart, Algebraic structures of B-series, *FOCM*, Vol. 10, No. 4, 2010.
34. P. Chartier and A. Murua, An algebraic theory of order, *M2AN*, Vol. 43 No. 4, 2009.
35. F. Castella, P. Chartier and E. Faou, An averaging technique for highly-oscillatory Hamiltonian problems, *SIAM J. Numer. Anal.* Volume 47, Issue 4, 2009.
36. F. Castella, P. Chartier, S. Descombes and G. Vilmart, Splitting methods with complex times for parabolic equations, *BIT Numerical Mathematics*, Vol. 49, No. 3, 2009.

37. P. Chartier and E. Faou, Volume-energy preserving integrators for piecewise smooth approximations of Hamiltonian systems, *M2AN*, Vol. 42, No. 2, 2008.
38. P. Chartier and E. Faou, A simple proof of the existence of adiabatic invariants for perturbed reversible systems, *J. Phys. A : Math. Theor.* 41 No 47, 2008.
39. P. Chartier, E. Hairer, and G. Vilmart, Numerical integrators based on modified differential equations, *Mathematics of Computation*, 2007, Vol. 76 : 260.
40. P. Chartier, E. Hairer and G. Vilmart, Modified differential equations, *ESAIM Proceedings*, Vol. 21, 2007.
41. P. Chartier and A. Murua, Preserving first integrals and volume forms of additively split systems, *IMA Journal of Numerical Analysis* 2007, Vol. 27 :2.
42. P. Chartier, E. Faou and A. Murua, An algebraic approach to invariant preserving integrators : The case of quadratic and Hamiltonian invariants, *Numerische Mathematik*, Vol. 103, 2006.
43. E. Cancès, F. Castella, P. Chartier, E. Faou, C. Le Bris, F. Legoll and G. Turinici, Long-time averaging using symplectic solvers with application to molecular dynamics, *Numerische Mathematik*, Vol. 100, 2005.
44. R.P.K. Chan , P. Chartier and A. Murua, Reversible methods of Runge-Kutta type for Index-2 Differential-Algebraic Equations, *Numerische Mathematik*, Vol. 97, No. 3, 2004
45. F. Castella, P. Chartier, and E. Faou , Raman Laser Modeling : Mathematical and Numerical Analysis, *Mathematical Modelling and Numerical Analysis*, Vol. 38 No. 3, 2004.
46. E. Cancès, F. Castella, P. Chartier, E. Faou, C. Le Bris, F. Legoll and G. Turinici, High-order averaging schemes with error bounds for thermodynamical properties calculations by MD simulations, *Journal of Chemical Physics*, Vol. 121 (21) 10346-10355, 2004.
47. F. Leplingard, C. Martinelli, S. Borne, L. Lorcy, T. Lopez, D. Bayart, F. Castella, P. Chartier, and E. Faou, Modeling of multi-wavelength Raman fiber lasers using a new and fast algorithm, *IEEE Photonics Technology Letters*, Vol. 16, No. 12, 2004.
48. F. Bonnans, P. Chartier and H. Zidani, Discrete approximation of the Hamilton-Jacobi equation for a control system of a differential-algebraic system, *Control and Cybernetics*, Vol. 32, No.1, 2003.
49. F. Castella, P. Chartier, and E. Faou , Analysis of a Poisson system with boundary conditions, *C. R. Acad. Sci. Paris, Ser. I* 336, 2003.
50. R.P.K. Chan , P. Chartier and A. Murua, Post-projected Runge-Kutta methods for index-2 differential-algebraic equations, *Appl. Numer. Math.*, Vol. 42, 2002.
51. R.P.K. Chan and P. Chartier, Classification of High-Order Implicit Runge-Kutta Methods by Characterization of their Properties, *New-Zealand Journal of Mathematics*, Vol. 29, 2000.
52. J.C. Butcher and P. Chartier, The effective order of singly-implicit Runge-Kutta methods, *Numerical Algorithms*, Vol. 20, No. 4, pp. 269-284, 1999.
53. J.C. Butcher, P. Chartier and Z. Jackiewicz, Experiments with a variable-order type 1 DIMSIM code, *Numerical Algorithms*, Vol. 22, No. 3,4, pp. 237-261, 1999.
54. A. Aubry and P. Chartier, On Improving the Convergence of Radau IIA methods when Applied to Index-2 DAEs, *SIAM J. Numer. Anal.*, Vol. 35, No. 4, 1998.
55. A. Aubry and P. Chartier, Pseudo-symplectic Runge-Kutta Methods, *BIT*, Vol. 38, No. 3, pp. 229-246, 1998.
56. P. Chartier, On diagonally-iterated Runge-Kutta methods for dissipative ODEs, *J. of Comp. and Appl. Math.*, Vol. 89, No. 1, pp. 73-85, 1998.
57. A. Aubry and P. Chartier, A note on pseudo-symplectic Runge-Kutta methods, *BIT*, Vol. 38 , No. 4, 1998.
58. P. Chartier, The potential of parallel multi-value methods for the simulation of large real-life problems, *CWI Quaterly*, Vol. 11, No.1, 1998.

59. J.C. Butcher and P. Chartier, A generalization of singly-implicit Runge-Kutta methods, *J. of Appl. Numer. Math.*, Vol. 24, No. 2-3, 1997.
60. J.C. Butcher, P. Chartier and Z. Jackiewicz, Nordsieck representation of DIMSIMs, *Numerical Algorithms*, Vol. 16, No. 2, pp. 209-230, 1997.
61. R.P.K. Chan and P. Chartier, A Composition Law for Runge-Kutta Methods Applied to Index-2 Differential Algebraic Equations, *BIT*, Vol. 36, No. 2, pp. 229-246, 1996.
62. A. Aubry and P. Chartier, On the structure of errors for Radau IA methods applied to index-2 DAEs, *J. of Appl. Numer. Math.*, Vol. 22, No. 1-3, 1996.
63. J.C. Butcher and P. Chartier, Parallel general linear methods for stiff ordinary differential and differential algebraic equations, *J. of Appl. Numer. Math.*, Vol. 17, No. 3, pp. 213-222, 1995. P
64. . Chartier, L-Stable Parallel One-Block Methods for Ordinary Differential Equations, *SIAM J. Numer. Anal.*, Vol. 31, No. 2, pp. 552-571, April 1994.
65. P. Chartier and B. Philippe, A Parallel Shooting Technique for Solving Dissipative ODEs, *Computing*, Vol. 51, No. 3-4, 1993.

Papers published as Proceedings of international conferences

1. P. Chartier,
Application of Bellen's Parallel Method to ODE's with Dissipative Right-Hand Side,
Proceedings of the 10th International Conference on Computing Methods
in Applied Science and Engineering, Paris, France, February 11-14, 1992.
2. P. Chartier et B. Philippe,
L-Stable Parallel One-Block Methods for Stiff ODE's,
Proceedings of the sixth SIAM Conference on Parallel Processing for Scientific
Computing, Norfolk, Virginia, USA, March 22-23, 1993.
3. J.C. Butcher et P. Chartier,
*Parallel general linear methods for stiff ordinary differential and differential algebraic
equations*,
Proceedings of the 14th IMACS World Congress on Computational and Applied Mathema-
tics,
Atlanta, Georgia, USA, July 11-15, 1994.
4. P. Chartier,
On diagonally-iterated Runge-Kutta methods for dissipative ODEs,
15th IMACS World Congress, Berlin, Allemagne, 25-30 Août 1997.
5. A. Aubry et P. Chartier,
Pseudo-symplectic Runge-Kutta methods,
Proceedings of the Anode Conference, Auckland, New-Zealand, July 1998.
6. P. Chartier and E. Faou,
A numerical method for Hamiltonian systems based on piecewise smooth space-approximations,
Mathematisches Forschungsinstitut Oberwolfach Report No. 14/2006.
7. P. Chartier, A. Murua and J.M. Sanz-Serna, A New Approach to High-Order Averaging,
AIP (American Institute of Physics) Conference Proceedings
8. P. Chartier, A. Murua and J.M. Sanz-Serna, Stroboscopic averaging in Banach spaces :
application to NLS, AIP (American Institute of Physics) Conference Proceedings.

Research Reports unpublished as articles

1. J.C. Butcher and P. Chartier,
The construction of DIMSIMs for stiff ODEs and DAEs, Report Series No. 308, July 1994,
University of Auckland, New Zealand.
2. P. Chartier and E. Lapôtre,
Reversible B-series, INRIA report No. 1221, 1998.

Theses

1. P. Chartier, *Parallelism in the Numerical Solution of Initial Value Problems in Differential and Differential-Algebraic Equations*,
Thesis No. 981, University of Rennes I, June 1993.
2. P. Chartier, *Numerical methods for ODEs and DAEs with application to hamiltonian systems*,
Habilitation degree in mathematics, University of Rennes I, January 2000.

Softwares

- ▷ SOLVEGL : Splitting methods with complex coefficients for the complex Ginzburg-Landau equation.
Available at : <http://www.irisa.fr/ipso/perso/chartier.html>
- ▷ RADAU5M : numerical solver for DAEs.
Available at : <http://www.irisa.fr/ipso/perso/chartier.html>
- ▷ RKPS63 : numerical solver for hamiltonian systems.
Available at : <http://www.irisa.fr/ipso/perso/chartier.html>