

# MATHIEU BOUFFARD

## PERSONAL INFORMATION

*Born in France, 24 February 1990*

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*phone* +33 6 70 83 06 19

## EDUCATION

*Nov 2017 - present* Max Planck Institute - Göttingen (Germany)

*Postdoctoral Researcher* Postdoctoral Researcher in Planetary Interiors at the Max Planck Institute for Solar System Research (Göttingen, Germany). Topics of interest: core dynamics, formation and dynamics of a stratified layer in planetary cores, double-diffusive convection, magnetic field generation by dynamo action.

*Sept 2014 - Aug 2017* LGL, ENS Lyon - LGP, Nantes

*PhD* First project: development of a particle-in-cell method for the study of double-diffusive convection in the liquid layers of planetary interiors. Implementation of the coupling of thermochemical boundary conditions. Applications to geodynamo and to icy satellites. Second project: numerical study of the role of water on plate tectonics, application to the Earth and Venus. Laboratoire de Géologie de Lyon, ENS Lyon and Laboratoire de Planétologie et Géodynamique, Nantes.  
Supervisors: Stéphane LABROSSE, Gaël CHOBLET

*2013-2014* LGL, ENS Lyon - LPG, Nantes

*PhD preparation* Development of a particle-in-cell method for the study of double-diffusive convection in the liquid layers of planetary interiors. Laboratoire de Géologie de Lyon, ENS Lyon and Laboratoire de Planétologie et Géodynamique, Nantes.  
Mentors: Stéphane LABROSSE, Gaël CHOBLET

*2011-2013* ENS Lyon

*Master of Physics* Ecole Normale Supérieure de Lyon · *Mention Assez Bien* ·

*2010-2011* ENS Lyon

*Bachelor of Physics* Ecole Normale Supérieure de Lyon · *Mention Bien* ·

*2008-2010* Lycée Henri IV, Paris 05

*CPGE - PCSI* Passed competition examination for the Ecole Normale Supérieure de Lyon.

*2008* Lycée Blaise Pascal, Clermont-Ferrand

*Baccalaureat* Scientific baccalaureat. *Félicitations du jury, mention européenne (English).*

## INTERNSHIPS

*April-July 2013* Laboratoire de Géologie de Lyon, - ENS Lyon

Internship at ENS Lyon. Subject: Role of water in the tectonics of Earth and Venus. Work with Paul Tackley's code STAGYY  
Mentor: Stéphane LABROSSE

*May-July 2012* Jet Propulsion Laboratory (NASA), Pasadena

Internship at Jet Propulsion Laboratory (NASA), Pasadena, California. Subject:

Thermodynamics of high pressure ices and application to Ganymede's structure. Work with Matlab.  
Mentors: Steve VANCE, Mathieu CHOUKROUN, Christophe SOTIN. Paper published in *Planetary and Space Science*.

*May-June*                      Laboratoire Joliot Curie - ENS Lyon  
*2011*

Internship at Laboratoire Joliot Curie (ENS Lyon). Subject: 'Understanding morphogenesis in plants: toward a map of the mechanical properties of the hypocotyl of *Arabidopsis Thaliana*'. Experimental work with confocal microscopy and a micropress.  
Mentors: Arezki BOUDAUD, Olivier HAMANT. Paper submitted to *FASEB*.

## TEACHING EXPERIENCE

*September*  
*2014 - present*

64h of teaching per year at ENS de Lyon (bachelor and master level) in mathematics, thermodynamics, numerical methods, cartography, physics of the Earth, computer tools for scientists.

*2016*

Occasional lessons of ballroom dancing at "Académie de Danse Adriana Teoli", Lyon (replaced dance teachers).

*2012 - 2014*

Lessons of piano to a 12 year-old girl, Lyon (1h/week during 2 years).

*April-July*  
*2013*

'Colles' (oral tutorials, 2 hours per week) of physics in PCSI and MPSI at lycée Jean Perrin, Lyon

*2010 - 2011*

Private lessons of mathematics, physics and chemistry to a student in CPGE (PC). 2 hours per week.

*2008-2009*

Private lessons 1h/week to a high school student at lycée Henri IV, Paris.

## STUDENTS

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|-------------|---|
| <i>2017</i> | - Supervised two bachelor students from ENS Lyon (Clémentine Bouchant, Max Beaurepaire) during one month. Subject: continuation of Colin Pagani's work on the role of water in plate tectonics. |
| <i>2016</i> | - Supervised the internship of Colin Pagani, during one month in January, then during 6 weeks in June/July. Subject: simulations of mantle dehydration and its impact on plate tectonics.       |

## OTHER SCIENTIFIC ACTIVITIES

*April 2013 -*  
*present*

*Laboratoire Junior*                      Member of the 'Laboratoire Junior Dynamique des fluides planétaires' at ENS Lyon.

## PUBLICATIONS

*2017*

**A particle-in-cell method for the study of double-diffusive convection in the liquid layers of planetary interiors.**

(accepted for *Journal of Computational Physics*)

**Mathieu Bouffard**, Stéphane LABROSSE, Gaël CHOBLET, Alexandre FOURNIER, Julien AUBERT, Paul TACKLEY

**Optimizations of the particle-in-cell method in spherical geometry.**

(in prep.)

**Mathieu Bouffard**

**Thermochemical convection and chemical stratification in planetary cores.**

(in prep.)

**Mathieu Bouffard** Stéphane LABROSSE, Gaël CHOBLET

**Numerical study of the role of water in plate tectonics.**

(in prep.)

**Mathieu Bouffard**, Stéphane LABROSSE, Paul TACKLEY, Colin PAGANI, Max BEAUREPAIRE, Clémentine BOUCHANT, Adrien MORISON

2014

**Ganymede's Internal Structure Including Thermodynamics of Magnesium Sulfate Oceans in Contact with Ice**

*Planetary and Space Science*

Steve VANCE, **Mathieu Bouffard**, Mathieu CHOUKROUN, Christophe SOTIN

**Going deeper: the inside story of plant biomechanics**

*FASEB*

Naomi NKAYAMA, Richard MALGAT, Annamaria KISS, **Mathieu Bouffard**, Olivier HAMANT, Francois FAURE, Arezki BOUDAUD

**ATTENDED SCHOOLS AND CONFERENCES**

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|------|---|
| 2017 | - Workshop "Convection and interfaces", Marseille, France   |
| 2016 | - AGU, San Francisco, USA<br>- Autumn school in Barcelonnette, France<br>- Summer school "Planetary Interiors" in l'Aquila, Italy<br>- SEDI, Nantes, France                                 |
| 2015 | - EPSC, Nantes, France<br>- Workshop on High Parallel Computing, Toulouse, France   |
| 2014 | - ELSI summer school, Tokyo, Japan<br>- SEDI, Japan<br>- Les Houches summer school, France<br>- Workshop at College de France, Paris, France (Structure and Dynamics of Earth-like Planets) |
| 2013 | - Workshop on the inner core, Grenoble, France  |

**COMPUTER SKILLS**

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|-----------------|--|
| <i>Basic</i>    | Adobe Illustrator, GMT, C, Python, Git   |
| <i>Advanced</i> | L <sup>A</sup> T <sub>E</sub> X, Matlab, Fortran 90, parallelization MPI (4 days course at IDRIS in Paris, February 2014), parallelization OpenMP, High Parallel Computing |

**OTHER INFORMATION**

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|-------------------------|---|
| <i>Responsibilities</i> | 2011 - 2012 · President of ENS de Lyon's dance club.<br>2010 - present · Member of ENS de Lyon's dance club.<br>2010 - 2013 · Member of the choir and chamber music club of ENS Lyon. |
|-------------------------|---|

*Languages*

FRENCH · Mothertongue

ENGLISH · Excellent (very fluent)

SPANISH · Basic

*Interests*

Piano · Clarinet · Cooking · Dancing (20 dances practised, competitions in latin and standard ballroom dancesport) · Hiking, skiing...

November 3, 2017