Madge MARTIN

MSME, Université Paris-Est-Créteil, 61 av du Général de Gaulle – Créteil 94010 - FRANCE
+33 (0) 6 87 22 82 79
madge.martin.4@gmail.com
https://madgemartin.wordpress.com

(Bio-) mechanics PhD

Main research interests: computational modeling of multiphysical and biological systems; tissue remodeling, growth and regeneration; multiscale approaches, micromechanics.

Best PhD Thesis 2020 of the Société de Biomécanique (French-speaking Biomechanics Society)
3rd ex-aequo best PhD Thesis 2020 of the Val-de-Marne (French department)
Laureate of the 2019 "For Women in Science" L'Oréal-UNESCO "Rising Talents" fellowship
Passionate with early music and dance.

Professional experience

Laboratoire MSME (Multiscale Modelling and Simulation), Paris area (France)
Centre National de la Recherche Scientifique

01/2022-now **CNRS Researcher**

LBMC - *ENS Lyon / INRIA – Equipe Dracula,* Lyon (France)

01/2021-12/2021 **Post-doctoral fellowship**

Development of a dynamic multiscale model of the T CD8 cell immune response.

STBio / SAINBIOSE - Mines Saint-Etienne, Saint-Etienne (France)

01/2020-12/2020 **Post-doctoral fellowship**

Development of an arterial mechanobiological model accounting for vascular cells phenotype transition, collagen synthesis and calcification.

BSRG - Queensland University of Technology, Brisbane (Australia)
Laboratoire MSME (Multiscale Modelling and Simulation), Paris area (France)

10/2016-12/2019 **Joint PhD thesis: Bone remodelling and mechanomics**

supervised by V. Sansalone, P. Pivonka, T. Lemaire and G. Haïat.

Conception of a multi-scale theory of bone remodelling: energetic contributions of biochemical phenomena, actions of signalling pathways;

In silico model of an anabolic drug treatment of osteoporosis with romosozumab;

Development of a Matlab numerical algorithm driving a finite-element interface to simulate bone remodelling in 2D and 3D;

Design of a clinical study: vertebral body tissue properties and remodeling in adolescent idiopathic scoliosis subjects.

Laboratoire Navier (ENPC) - IFSTTAR, Paris area (France)

03/2016-08/2016 **Master thesis: Reinforcing metallic structures with adhesive bonding**

Stryker, Selzach (Switzerland)

08/2015-02/2016 **Intern Materials Engineering & Concept development**

	EPFL - Laboratory of Biomechanics and Orthopedics, Lausanne (Switzerland)
02/2015-07/2015	**Project: FE modelling of micro-motions at the bone-implant interface**
	UFMG (Federal University of Minas Gerais), Belo Horizonte (Brazil)
02/2014-07/2014	**Intern in the Biomaterials laboratory: design of a bio-composite foam**
	Julius Wolff Institute - Charité, Berlin (Germany)
08/2013-02/2014	**Intern in Mechanobiology: immunohistochemistry, mice dissection and handling, genotyping, FE modelling of bone aging and remodelling (C++/Abaqus routine)**
	Universitat Politècnica de València, Valencia (Spain)
04/2012-07/2012	**Intern in Coastal Engineering: wave behaviour in intermediate water**

Teaching

Total « TD equivalent » academic teaching hours: 180 hours

	Ecole des Mines Saint-Etienne (France)
03/2020-12/2020	**Sessional academic (Masters)** Homogenization methods (replacing head of course) – 13.5 hours (CM 7.5, TP 6) Continuum mechanics – 3 hours (TD) Biomechanics – 7 hours (CM)
	Queensland University of Technology, Brisbane (Australia)
08/2018-12/2018	**Sessional academic: teaching assistant (undergraduate level)** Computer labs in biomechanics (TP) – 20 hours.
	Université Paris-Est Créteil, Paris area (France)
10/2016-12/2019	**Sessional academic: teaching assistant (undergraduate level)** Tutorials in fluid mechanics (TD) – 78 hours. Computer labs in solid mechanics (TP) – 57 hours. Computer labs in finite-element modelling (TP) – 21 hours. Introduction to computer tools (TP) – 12 hours.
	Complétude, and private, Paris area (France)
2013-2016	**Math, Physics and Chemistry tutor (high school level)**

Education

2014 - 2016	**MSc Materials Science and Engineering** EPFL, Lausanne (Switzerland)
2011 - 2017	**Engineering diploma in Mechanical Engineering and Materials Science** Ecole des Ponts ParisTech (ENPC), Paris area (France)
2009 - 2011	**Scientific higher school preparatory classes (selective undergraduate studies)** Lycée Charlemagne, Paris (France)
2009	**Baccalauréat (end of French secondary education)**

Computer skills

Finite elements analysis: Abaqus, Comsol

3D CAD design, image processing: Catia, ProE, Solidworks, ImageJ, Amira, Geomagic, Simpleware

Formal calculations: Maple, Mathematica

High performance computing: finite-element analysis (Abaqus solver), experience with molecular dynamics and density functional theory

Programming: Matlab, C, C++, Python, Visual Basic Applications, HTML/Javascript

Office automation software: Word, Excel, PowerPoint

Operating systems: Mac OS, Windows, Linux (Ubuntu)

Imaging: experience with immunohistochemistry, light microscopy and micro-CT.

Supervision

09/2020-now	Federica Galbiati (PhD student). **Patient-specific prediction of aneurysm growth and rupture in the ascending thoracic aorta.**
09/2019-03/2020	Alexis Arslan (internship). **Biomechanical characterization of the vertebral body in adolescent idiopathic scoliosis subjects.**
03/2019-08/2019	Laure Stickel (internship). **Biomechanical characterization of the vertebral body in adolescent idiopathic scoliosis subjects.** Jurgis Ruza (internship). **Structural characterization of the vertebral body in adolescent idiopathic scoliosis subjects using Raman spectroscopy and quantitative back-scattering electron imaging.**
04/2018-10/2018	Yexuan Sun (Bachelor project). **Cortical bone remodelling: modelling travelling BMUs to simulate the evolution of mineralization and porosity.** Christopher Chan (Bachelor project). **Influence of mechanical stimulus on tissue orientation: 2D models of trabecular and cortical remodelling.** Haimeng Ma (Bachelor project): **A finite-element model of traveling BMUs.**

Social and outreach programs

Télémaque – Fondation L'Oréal Women in Science, online

01/2020-now **Online weekly coaching**

Coaching and mentoring aimed at underpriviledged high school female students in scientific subjects.

Teleconcerts.fr, Paris area (France)

03/2020-07/2020 **Online live classical music concerts during Covid-19 crisis**

Over 30 musicians (including amateurs and professionals, from Europe, Asia and Australia) recruited for weekly free live broadcasted concerts over the 2.5 month period on dedicated website www.teleconcerts.fr;

Average 150 people audience for each concert;

Live streaming, moderation, organization, community management.

Maison de l'adolescent, Paris area (France)

04/2019-02/2020 **Mentoring and alphabetization of teenage migrants**

DévelopPonts, Paris area (France)

10/2011-04/2012 **Active member of a social organization (communication, outreach, humanitarian trip)**

Humanitarian trip in Togo (3 weeks): technical solutions (solar oven, water pump) and knowledge transfer.

Organization of biweekly sessions opening to science for underpriviledged high school students (7 months).

Languages

French	Native speaker
English	Proficient, IELTS: C2 level 8.5/9 (2016)
Portuguese	Fluent (tandem, lived in Brazil for 5 months)
Spanish	Fluent, DELE C1 certification (2013)
German	Basic (tandem, total of 12 months in German speaking areas)

Miscellaneous

Dancer (social, competition): west coast swing, latin;

Recorder and violin player and early music enthusiast, former member of Queensland Baroque orchestra, member of Ensemble Cols Verts and Parvana ensembles;

Singer (Kammerchor des Collegium Musicum Berlin (Germany), Coral da UFMG (Belo Horizonte, Brazil), Jubilate in Biel (Switzerland)).

Awards and sponsorships

Third (ex-aequo) best PhD thesis of the Val-de-Marne department, 2020

Doctoral thesis award of the Société de Biomécanique, 2020

"For Women in Science" L'Oréal-UNESCO "Rising Talents" fellowship, 2019

QUT SEF-HDR Student Society "Best Presentation Award", 2018

QUT School of Chemistry, Physics and Mechanical Engineering (CPME) Scholarship, 2018

UPEC Joint PhD Scheme Top-up Scholarship, 2017

CAPES-COFECUB Scholarship (France-Brazil student exchange program), 2014

List of publications

Articles in peer-reviewed journals

Martin, M., Avril, S., Morin, C. Modelling arterial growth in the context of arterial media calcification. *Journal of the Mechanics and Physics of Solids*, *in prep*.

Martin, M., Avril, S., Morin, C. Mechanoregulation in the development of arterial calcifications. *IEEE Reviews in Biomedical Engineering*, *submitted*.

Sansalone, V., **Martin, M.**, Haïat, G., Pivonka, P., & Lemaire, T. (2021). A new model of bone remodeling and turnover set up in the framework of generalized continuum mechanics. *Mathematics and Mechanics of Solids*, https://doi.org/10.1177/1081286520984690.

Martin, M., Avril, S., Morin, C. (2020). A micromechanical framework of arterial tissue growth in the context of medial calcification. *Computer Methods in Biomechanics and Biomedical Engineering,* 23(sup1): S194-S196. https://doi.org/10.1080/10255842.2020.1813423.

Martin, M., Lemaire, T., Haïat, G., Pivonka, P., & Sansalone, V. (2020). Bone orthotropic remodeling as a thermodynamically-driven evolution. *Journal of Mechanics in Medicine and Biology*, 20(04):1950084. https://doi.org/10.1142/S0219519419500842.

Martin, M., Sansalone, V., Cooper, D. M. L., Forwood, M., Pivonka, P. (2020). Assessment of romosozumab efficacy in the treatment of postmenopausal osteoporosis: results from a mechanistic PK-PD mechanostat model of bone remodeling. *Bone,* 133:115223. https://doi.org/10.1016/j.bone.2020.115223

Martin, M., Pivonka, P., Haïat, G., Sansalone, V., Lemaire, T. (2019). An enriched continuum mechanics description of bone tissue to describe mineralization and mechanobiology in bone remodeling. *Computer Methods in Biomechanics and Biomedical Engineering,* 22(sup1):S74-S75. https://doi.org/10.1080/10255842.2020.1713484

Martin, M., Sansalone, V., Cooper, D. M. L., Forwood, M., Pivonka, P. (2019). Mechanobiological osteocyte feedback drives mechanostat regulation of bone in a multiscale computational model. *Biomechanics and Modeling in Mechanobiology*, 18(5):1475-1496. https://doi.org/10.1007/s10237-019-01158-w

Kruck, B., Zimmermann, E. A., Damerow, S., Figge, C., Julien, C., Wulstein, D., Thiele, T., **Martin, M.**, Hamdy, R., Reumann, Marie K, Georg, D., Checa, S., Willie, B. (2018). Sclerostin-neutralizing antibody treatment enhances bone formation but does not rescue mechanically-induced delayed healing. *Journal of Bone and Mineral Research*, 33(9):1686-1697. https://doi.org/10.1002/jbmr.3454

Martin, M., Lemaire, T., Haïat, G., Pivonka, P., Sansalone, V. (2017). A thermodynamically consistent model of bone rotary remodeling: a 2D study. *Computer Methods in Biomechanics and Biomedical Engineering*, *20*(sup1):127–128. https://doi.org/10.1080/10255842.2017.1382894

Book chapters

Martin, M., Pivonka P., Haïat, G., Sansalone, V., Lemaire, T. (2020). Algorithmic formulation of bone fabric evolution based on the dissipation principle: a 2D finite-element study. In Bilen Emek Abali and Ivan Giorgio (Eds.), *Advanced Structured Materials,* pp. 49-69.

Martin, M., Sansalone, V., Pivonka P. (2020) Development of a computational modeling platform for patient-specific treatment of osteoporosis. In Miller K., Wittek A., Joldes G., Nash M., Nielsen P. (eds) *Computational Biomechanics for Medicine*. MICCAI 2019, MICCAI 2018. Springer, Cham. https://doi.org/10.1007/978-3-030-42428-2_6

Conference proceedings

Martin, M.*, Avril, S., Morin, C. A micromechanical framework of arterial tissue growth in the context of medial calcification. In *45th Congress of the Société de Biomécanique (SB2020)*. Metz, France.

Stickel, L., **Martin, M.**, Miller, C., Little, J. P., Izatt, M., Labrom, R. D., Askin, G. N., Pivonka, P*. (2020). Insights into trabecular bone adaptation in adolescent idiopathic scoliosis using microCT analysis. In *Spineweek 2020*. Melbourne, Australia.

Arslan, A., **Martin, M.**, Miller, C., Little, J. P., Izatt, M., Labrom, R. D., Askin, G. N., Pivonka, P*. (2019). Assessment of trabecular bone adaptation in adolescent idiopathic scoliosis due to altered joint loading. In *16th Adelaide Spinal Research Symposium*. Adelaide, Australia.

Martin, M., Pivonka, P., Haïat, G., Sansalone, V.*, Lemaire, T. (2019). An enriched continuum mechanics description of bone tissue to describe mineralization and mechanobiology in bone remodeling. In *44th Congress of the Société de Biomécanique (SB2019)*. Poitiers, France.

Martin, M., Pivonka, P., Haïat, G., Sansalone, V., Lemaire, T.* (2019). Un modèle multi-échelles de remodelage osseux reliant les influences biochimiques et mécaniques. In *Congrès Français de Mécanique*. Brest, France.

Martin, M.*, Sansalone, V., Cooper, D. M. L., Forwood, M., Pivonka, P. (2019). A multi-scale model of remodeling bridging bone mechanics and biochemistry. In *European Society of Biomechanics Conference 2019*. Vienna, Austria.

Martin, M., Pivonka P., Haïat, G., Lemaire, T., Sansalone, V.* (2019). A novel generalized continuum thermodynamics framework to describe bone remodeling and mineralization. In *International Conference on Nonlinear Solid Mechanics*. Roma, Italy.

Martin, M.*, Sansalone, V., Cooper, D. M. L., Forwood, M., Pivonka, P. (2018). A model of bone mechanostat directed by osteocytes mechanosensation. In *11th Australasian Biomechanics Conference 2018*. Auckland, New Zealand.

Martin, M.*, Sansalone, V., Cooper, D. M. L., Forwood, M., Bonewald L., Pivonka, P. (2018). Effect of sclerostin monoclonal antibody therapy on BMD is linked to osteocyte sensitivity – insights from a mechanobiological model of bone remodeling. In *ANZBMS 24th Annual Scientific Meeting*. Queenstown, New Zealand.

Pivonka, P.*, **Martin, M.**, Scheiner, S., Sansalone, V., Cooper, D., Forwood, M., Bonewald, L. (2018). A multiscale computational model for mechanostat regulation in bone based on biochemical osteocyte feedback. In *Lacroix, Damien (Ed.) 8th World Congress of Biomechanics*. Dublin, Ireland.

Sansalone, V.*, **Martin, M.**, Lemaire, T., Haiat, G., Pivonka, P., Sansalone, V. (2018). Bone remodeling recast in the generalized continuum mechanics. In *Euromech 594 Bone remodeling: multiscale mechanical models and multiphysical aspects*. Nancy, France.

Martin, M.*, Lemaire, T., Haiat, G., Pivonka, P., Sansalone, V. (2017). A thermodynamically consistent model of bone rotary remodeling: a 2D study. In *42nd Congress of the Société de Biomécanique (SB2017)*. Reims, France.

Martin, M.*, Lemaire, T., Haiat, G., Pivonka, P., Sansalone, V. (2017). Thermodynamics rendering rotary bone remodeling: a 2D model. In *4th ECCOMAS Young Investigators Conference*. Milan, Italy.